northwestraillink

Tallawong Road, Rouse Hill
Rapid Transit Rail Facility

State Significant Infrastructure
Response to Submissions

Submitted to Department of Planning and Infrastructure on behalf of Transport for New South Wales

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JBA Urban Planning Consultants Pty Ltd operates under a Quality Management System. This report has been prepared and reviewed in accordance with that system. If the report is not signed below, it is a preliminary draft.

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Executive Summary

This Response to Submissions is submitted to the Department of Planning and Infrastructure (DP&I) in support of a State Significant Infrastructure application for a Rapid Transit Rail Facility (RTRF) at Tallawong Road, Rouse Hill.

This SSI Application seeks approval for an expanded train stabling and maintenance facility at Tallawong Road, Rouse Hill which is capable of servicing an expanded network of single-deck rapid transit trains, including the North West Rail Link and the future rapid transit network consistent with *Sydney's Rail Future – Modernising Sydney's Trains*. The RTRF would operate 24 hours per day, seven days per week and, at capacity, will provide stabling for 45 trains and maintenance services for a fleet of 76 trains.

An Environmental Impact Statement was prepared for the RTRF and was placed on public exhibition by the NSW Department of Planning and Infrastructure for 33 days, from 7 August 2013 to 9 September 2013. During this time, a total of 18 submissions were received by the DP&I, including six from State government agencies and 12 from the public, including Blacktown City Council.

The key issues raised in submissions by government agencies and the local community were:

- Noise.
- Stormwater management and flooding.
- Local amenity issues, including visual impacts and site security.
- Strategic planning, including the suitability of the Site.

This Response to Submissions report summarises the key issues raised in submissions and responds to the identified issues.

No changes have been required to the RTRF proposal as a result of submissions received, with the exception of a predicted increase in on-site stormwater detention capacity from 7,600 m^3 to 12,750 m^3.

The mitigation measures detailed in the EIS have been supplemented to provide consistency with the mitigation measures for SSI-5414. No additional mitigation measures were required as a result of the submissions received or the further environmental assessment undertaken and detailed in this report.

1.0 Introduction

This Response to Submissions (RTS) is submitted to the Department of Planning and Infrastructure (DP&I) in support of a State Significant Infrastructure (SSI) application for a Rapid Transit Rail Facility (RTRF) at Tallawong Road, Rouse Hill.

The RTS has been prepared by JBA on behalf of Transport for NSW (TfNSW).

1.1 Project Background

The North West Rail Link (NWRL) project will deliver a new automated rapid transit high frequency single deck train system between Cudgegong Road, Rouse Hill and Chatswood. The NWRL includes eight new stations, approximately 15.5 kilometres of tunnels from Epping to Bella Vista, a four kilometre elevated 'skytrain' (viaduct) between Bella Vista and Rouse Hill, and conversion of the existing Epping to Chatswood Rail Link. The NWRL SSI Approvals include the development of a train stabling and maintenance facility at Tallawong Road, Rouse Hill to support the operations of the NWRL.

Sydney's Rail Future – Modernising Sydney's Trains was released by the NSW Government on 20 June 2012 and is integral to the NSW Long Term Transport Master Plan. Under the plan NWRL rapid transit trains will continue on to the Sydney CBD via a second Sydney Harbour rail crossing, and sectors of the existing suburban rail network will subsequently be converted to rapid transit rail, requiring the development of additional associated infrastructure and service facilities.

This SSI Application seeks approval for an expanded train stabling and maintenance facility at Tallawong Road, Rouse Hill which is capable of servicing an expanded network of single-deck rapid transit trains, consistent with *Sydney's Rail Future – Modernising Sydney's Trains*.

The RTRF would operate 24 hours per day, seven days per week and, at capacity, will provide stabling for 45 trains and maintenance services for a fleet of 76 trains.

An Environmental Impact Statement (EIS) was prepared for the RTRF. The EIS provides an assessment of the environmental impacts of the project in accordance with the Director-General's environmental assessment requirements (DGRs) and sets out the undertakings made by TfNSW to manage and minimise potential impacts arising from the development.

1.2 Public Exhibition

In accordance with Section 115Z(3) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) the Department of Planning and Infrastructure (DP&I) made the EIS publicly available for 33 days, from 7 August 2013 to 9 September 2013. During this time:

- The EIS was available for download from the DP&I website, as well as from the TfNSW NWRL website: www.northwestrail.com.au..
- Hard copies of the EIS were available for inspection at Blacktown City Council, the Dennis Johnson Library, the Max Webber Library, the Vinegar Hill Memorial Library, the Nature Conservation Council, the NWRL Community Information Centre, and DP&I's Information Centre.

The DP&I publicly advertised the exhibition period in the Sydney Morning Herald on 7 August 2013, and TfNSW advertised the exhibition period in the Blacktown

City Sun, Blacktown Advocate, Rouse Hill Times and the Rouse Hill and Stanhope Gardens News on 31 July 2013.

A total of 18 submissions were received by the DP&I as follows:

- Six (6) from Government agencies including:
  - Environment Protection Authority (EPA).
  - NSW Office of Water (NOW).
  - Roads and Maritime Services (RMS).
  - Office of the Environment and Heritage (OEH).
  - Heritage Branch of the OEH, on behalf of the NSW Heritage Council.
  - Department of Trade and Investment, Regional Infrastructure and Services, Resources and Energy Division (DTIRIS).
- Twelve (12) from local Government, stakeholders and members of the community, including
  - Blacktown City Council.
  - The Rouse Hill Heights Action Group (RHHAG).

1.3 Notification of EIS Exhibition

TfNSW undertook an extensive community information notification process prior to the EIS exhibition.

This included advertisements in the local press as detailed above. In addition, 1,750 copies of an A4 format, four page colour information newsletter were distributed to all households in the vicinity of the Site.

Information was also placed on the project website, www.northwestrail.com.au.

The NWRL Place Manager made direct contact with households directly surrounding the Site and also distributed a separate DL sized invitation to attend the community information session conducted at the Rouse Hill Community Centre on 10 August 2013.

Subsequently, an email notification was sent to all people who have previously registered interest in the NWRL project with the project team.

In addition, a full copy of the RTRF EIS, as well as display information, was provided at the NWRL project's Community Information Centre at Castle Hill.

1.4 Purpose of RTS

In accordance with Section 115Z(5) and (6) of the EP&A Act, the DP&I has provided a copy of the submissions to TfNSW and requested that TfNSW provide a response to the issues raised in the submissions.

The purpose of this RTS Report is to document the response to the issues raised in submissions to assist the DP&I in relation to its assessment of the RTRF SSI Application and, where appropriate, to assist in the preparation of suitable conditions of approval.

1.5 Changes to the SSI

An increase in stormwater detention is proposed to be provided. This increase has been determined on the basis of refined stormwater discharge modelling to address comments made in submissions, including comments from Blacktown City Council.

No other changes to the design of the RTRF have been made as a result of the issues raised in submissions, or for any other reason since the public exhibition of the EIS.

The mitigation measures detailed in the EIS have been supplemented to provide consistency with the mitigation measures for SSI-5414. No additional mitigation measures were required as a result of the submissions received or the further environmental assessment undertaken and detailed in this report. A consolidated set of the proposed mitigation measures is provided in **Section 4**.

2.0 Summary of Issues Raised in Submissions

2.1 Key Issues

The key issues raised by agencies and the local community are:

- Noise.
- Stormwater management and flooding.
- Local amenity issues, including visual impacts and site security.
- Strategic planning, including the suitability of the Site.

Each of the above issues has been determined to be a key issue because:

- they were raised in a large proportion of the submissions from the community, indicating that it is an issue of concern broadly; or
- they are issues raised by an agency or a community member which represents a technically complicated matter which requires technical analysis in order to respond.

A summary of the issues raised in the submissions is provided below. The issues raised in each submission are further detailed in **Appendix A**, as well as the summary response to each issue.

2.2 Noise

Noise was raised by both the EPA and members of the local community as summarised below.

2.2.1 Issues Raised by the EPA

The EPA identified that the acceptableness of the predicated noise impacts needs to be assessed in accordance with Chapters 8 and 9 of the *Industrial Noise Policy* (INP).

The EPA has proposed conditions which:

- Requires the RTRF to be designed and operated to comply with trigger levels set out in the *Rail Infrastructure Noise Guidelines*, in accordance with the *Industrial Noise Policy* and in accordance with *Assessing Vibration: a Technical Guideline*.
- Requires an Operational Noise and Vibration Review in order to confirm the final package of noise mitigation measures which are to be applied.
- Sets limits on construction hours which are consistent with the conditions in SSI-5100.

2.2.2 Issues Raised by the Community

Members of the local community (including the RHHAG) raised concerns about the impact of noise on the residential areas south of Schofields Road and within the new residential precinct in the vicinity of Cudgegong Road Station, including:

- Construction noise impacts which exceed the Noise Management Levels.
- Background noise monitoring was conducted during road works on Schofields Road, and therefore is not representative of the pre-existing background (i.e. when construction works are not being undertaken).

- Operational noise impacts which exceed the Project Specific Noise Criteria (PSNC) by up to 10 dBA. A concern that these noise impacts are unacceptable.
- A concern about 24 hour impacts associated with "brake screeching".
- A concern that no serious noise mitigation has been proposed.
- Concerns that noise mitigation measures and other restrictions could be lifted or relaxed over time.

2.3 Stormwater and Flooding

Comments and concerns were raised in relation to stormwater and flooding impacts by Blacktown City Council as well as members of the community. These are summarised below.

2.3.1 Issues Raised by Blacktown City Council

Council noted that stormwater modelling details were not provided in the EIS, but acknowledged that the stormwater discharge criteria were assessed as being met. However, the stormwater basin detention volume was noted to be low and should be checked during design refinement, particularly as the Site is in the vicinity of flood affected properties and dwellings.

Council similarly identified that the proposed area for bi-retention appears to be low and should be checked. Council specifies that a target for hydrocarbon removal should be provided, and that outlets should be designed in accordance with NSW Office of Water requirements.

2.3.2 Issues Raised by the Community

A member of the local community has submitted a detailed submission raising concerns about stormwater and localised flooding impacts immediately to the west of the RTRF site. In particular, this submission sets out the following concerns:

- The culvert on Gordon Road is already constrained, and restricts flow in the creek such that localised flooding occurs upstream (i.e. in the First Ponds Creek corridor immediately to the west of the site).
- The RTRF will exacerbate this pre-existing constraint because it will increase base flows into the creek resulting "in a net doubling of annual stormwater runoff".
- The EIS did not consider cumulative discharges from upstream of the culvert.

Other concerns raised by members of the local community include:

- Additional stormwater will increase risk of flooding and erosion within First Ponds Creek.
- The RTRF Site encroaches on the floodplain of First Ponds Creek.
- There is no provision for water recycling at the RTRF.
- There is no explanation of how the water treatment will be undertaken prior to release to First Ponds Creek.

2.4 Local Amenity and Security

The majority of objectors from the local community (eight out of ten) raised concerns relating to local amenity impacts, and how this will affect the

characteristics of the surrounding residential area and the quality of life for the community. Particular issues raised by objectors related to:

- Noise impacts (see above).
- Visual impacts, including that the RTRF will be very visible, block views and be an eyesore.
- One submission requested that the RTRF include additional landscaping and the thickening of boundary planting.
- Pollution.

These local amenity issues include concerns about security and the possibility that the RTRF will attract troublemakers to the area. The submissions raise concerns that the RTRF will result in an increase in graffiti and vandalism in the vicinity of the Site and in nearby public reserves and parks.

These issues stem from the understanding that the new suburb of The Ponds (and other nearby residential areas) would be an idyllic setting, and that the RTRF will undermine this.

The culmination of these local amenity concerns is that the RTRF will result in an adverse impact to house prices in the surrounding residential areas, and particularly that house buyers were not informed of the RTRF at the time of purchasing their properties.

2.5 Strategic Planning

A number of submissions from the local community, including the Rouse Hill Heights Action Group, have raised issues relating to strategic planning, including:

- That the RTRF should be located in an industrial area, not in a residential area or surrounded by residential areas.
- That a site located in the Marsden Park Industrial Area would be a more appropriate location, as it is within an industrial area and well away from residential areas.
- The RTRF will occupy almost all of the land designated for employment uses in the *Draft Cudgegong Road Structure Plan*, impacting on the ability to provide other employment generating development in the Cudgegong Road precinct. Further industrial land should be rezoned north of the RTRF Site, and more land should be zoned for medium/high density housing in the vicinity of the Cudgegong Road Station in order to compensate for the site of the facility.
- There is no guarantee that Second Sydney Harbour Crossing will occur, so a facility of this size may never be needed. The RTRF should therefore be built as a temporary facility, with another site reserved at Marsden Park, Marsden Park North or Shanes Park for the full scale RTRF.

2.6 Other Issues

2.6.1 Local Community Issues

Other issues raised by members of the local community include:

- Ecology:
  - The Site encroaches on the riparian corridor of First Ponds Creek.
  - The Site is within 200m of a protected Cumberland Plain Woodland (CPW).

- Critically endangered wildlife species exist in the immediate environment, including the Cumberland Plain Land Snail.
- TfNSW has removed CPW since acquiring two-thirds of the Site.
- It has not been demonstrated that a constant flow of excess water into First Ponds Creek will not have a detrimental effect on wildlife and downstream ecology.

- Air Quality: Adverse impact on air quality due to the nature of the proposed operations, on a 24 /7 basis and poor air circulation in summer.
- Stakeholder Engagement: Members of the local community who live near the Site were not informed of the EIS being on exhibition.
- Property Acquisition: Land which has been compulsorily acquired is now earmarked for future industrial development, so the Government will be the beneficiary of the new zoning, at the expense of the current landowner, even though the land is not required for the RTRF.

2.6.2 Environment Protection Authority

In addition to noise issues described above, the EPA also raised the following issues:

- Waste and Contamination: The EPA identified that detailed site investigations have not been carried out to determine the extent of possible ground contamination and the quantity of contaminated material that will require disposal. The EPA has proposed conditions of approval which require:
  - Further assessment of contamination and remediation as required prior to construction.
  - Inclusion of the measures to handle and manage potential contaminated soil, material and groundwater in the Construction Environmental Management Plan.
  - That all wastes are assessed and classified in accordance with the *Waste Classification Guidelines*.
- Air Quality: The EPA has proposed conditions to manage the generation of dust during construction works as follows:
  - That the construction works are carried out in a manner to minimise dust emissions, and that if dust emissions occur at any time the feasible and reasonable dust mitigation measures (including cessation of relevant works) shall be implemented such that visible dust emissions cease.
  - Clearing should be staged to minimise the amount of exposed surfaces.
  - A Construction Air Quality Management Plan should be prepared to detail how construction impacts on air quality will be minimised and managed.

2.6.3 NSW Office of Water

The NOW raised three issues:

- Ecology (Riparian): The proposed mitigation measure for planting on the western boundary of the Site using native species is supported.
- Groundwater: Some dewatering during construction is likely to be required and should be carried out in accordance with the Aquifer Interference Policy. It is requested that baseline groundwater monitoring data be provided, and that post construction groundwater monitoring be carried out for 5 years, in accordance with a monitoring and management plan which is prepared to the satisfaction of the NOW.

- Soil Salinity: Clarification as to whether the soil in the vicinity of First Ponds Creek has moderate or high salinity is requested, and confirmation that the proposed mitigation measures are appropriate.

2.6.4 Roads and Maritime Services

The RMS recommends that a range of conditions stipulated within the SSI Approval SSI-5100 would be equally applicable to the RTRF. In addition to these conditions of approval, the RMS recommends the following conditions:

- The design and construction of the Site and/or its vehicular access to any classified road shall be in accordance with Austroads, AS2890.1 – 2004, AS2890.2 - 2002 and RMS requirements.
- Any proposed road infrastructure works, road restoration works, vehicular accesses or signalised intersections located along the state classified road system shall be designed to meet RMS requirements. The design requirements shall be in accordance with Austroads, RMS supplements and technical directions and other Australian Codes of Practice. The certified copies of the civil, structural and traffic signal design plans shall be submitted to RMS for consideration and acceptance prior to commencement of RTRF EIS works.
- The RTRF work site is affected by Schofields Road upgrade. RTRF buildings, structures or detention basin(s) should be located clear of the land required for road upgrades.
- The location of the construction site access point along Tallawong Road must be generally in accordance with the EIS.
- Where reasonable and feasible, spoil movements leaving the RTRF construction site must not occur until the signalisation of the intersection of Schofields Road/ Tallawong Road associated with the Stage 1 – Schofields Road upgrade is commissioned.
- To avoid, manage and reduce identified potential impacts associated with construction and operational traffic, the proponent must implement the proposed mitigation measures.

2.6.5 Office of Environment and Heritage

The OEH made two submissions.

The OEH made a submission on behalf of the Heritage Council of NSW, which supports the proposed planting of vegetation along the northern boundary of the RTRF as an appropriate response to the proximity of the State Heritage listed site of Rouse Hill House.

The OEH had no comment to make on the proposal in relation to Aboriginal Heritage and ecology.

2.6.6 Department of Trade & Investment, Regional Infrastructure and Services

DTIRIS raised no specific issues with the proposal, however it identified that a Petroleum Exploration Licence is held over a broad regional area that includes the Site. This Petroleum Exploration Licence raises no issues of concern for the RTRF.

2.6.7 Blacktown City Council

In addition to stormwater issues (detailed in **Section 2.3.1** above), Council raised the following issues:

- The proposed traffic related commitments and mitigation measures are supported. Council requests it be included in future consultation.

- That further Aboriginal heritage surveys be carried out in relation to the parts of the Site not yet surveyed, including appropriate consultation with local Aboriginal representatives.

3.0 Response to Key Issues Raised in Submissions

A response to the key issues raised in submissions is provided below. A specific response to each issue raised in each individual submission is provided in **Appendix A**.

3.1 Noise

3.1.1 Relevant Noise Guidelines

TfNSW generally support the EPA's proposed conditions of approval. However, it is highlighted that the RTRF has been assessed against the INP as it is the relevant noise guideline.

TfNSW notes that the EPA have recommended a condition requiring rail line components of the RTRF to be designed and operated in accordance with the *Rail Infrastructure Noise Guidelines*. However, the *Rail Infrastructure Noise Guideline* specifically states that it does not apply to maintenance facilities which are assessed under the INP. The full extent of the RTRF is assessable under the INP, and so the *Rail Infrastructure Noise Guideline* is not relevant to the control of noise at the RTRF.

3.1.2 Noise Impacts

The noise assessment provided as part of the EIS sets out the process for minimising noise impacts with application of reasonable and feasible noise mitigation measures.

The RTRF will be operated with the objective of meeting the Project Specific Noise Levels as established under the INP. Mitigation measures will be analysed and all reasonable and feasible mitigation measures will be implemented. In assessing the feasibility and reasonableness of noise barriers the advice provided in the RTA's *Environmental Noise Management Manual* (ENMM) will be considered.

The effectiveness (including technical effectiveness and cost effectiveness) of the possible inclusion of a noise barrier has been assessed in accordance with the ENMM, and is not considered to be a reasonable or feasible noise mitigation measure at this stage. The possible inclusion of a noise barrier will be further considered at the detailed design stage when on-site noise sources are better understood.

The assessment of mitigation measures in the EIS indicates that there are several mitigation options available for consideration during the detailed design stage that are expected to provide compliance with the Project Specific Noise Goals for the RTRF. Such measures could be provided for on the Site, as required.

A full review of noise associated with the operation of the project will be undertaken at the detailed design stage. If there are residual operational noise impacts after the detailed design assessment, the acceptableness of remaining impacts will be determined in accordance with Sections 8 and 9 of the INP. This is consistent with the EPA's proposed condition.

3.1.3 Background Noise Monitoring

Background noise monitoring was undertaken at three locations surrounding the proposed facility with the data being processed in accordance with the procedures outlined in the INP. At one location (BG25), the background noise data appeared to be influenced by construction noise. As construction noise is considered to be

'extraneous noise' and not representative of the underlying ambient noise environment, time periods affected by construction noise were excluded from the analysis using engineering judgment.

3.2 Stormwater and Flooding

3.2.1 Gordon Road Culvert

Submissions raised the concern that the EIS did not fully take into account the existing constraint of the Gordon Road stormwater culvert on the First Ponds Creek catchment upstream of the culvert. Supplementary stormwater modelling has been carried out in order to analyse and document the effect that the culvert has on the proposed stormwater management regime. This supplementary stormwater modelling was carried out by the hydrological consultants, and is provided in **Appendix B**.

The presence of the Gordon Road stormwater culvert reduces the capacity of First Ponds Creek to convey stormwater water. An appropriate assessment of stormwater therefore requires that the catchments that currently convey water upstream and downstream of the culvert be treated separately. Approximately 75 per cent of the Site in its current state conveys water to the creek upstream of the culvert (and approximately 25 per cent downstream of the culvert). Conversely 100 per cent of the Site once developed for the RTRF will direct water upstream of the culvert.

Revised stormwater modelling was carried out to determine the amount of additional stormwater detention that would be required to compensate for the change in catchment parameters of the modelling. Anecdotal evidence provided in a submission indicates that the critical storm event is the 2 year Annual Recurrence Interval (ARI) event. As such, the supplementary modelling included a range of stormwater events, including the 1, 2, 5, 20 and 100 year ARI events.

The model was run to establish the smallest stormwater detention capacity required to be provided such that the peak flow rates for each of the modelled storm events were no greater in the developed scenario compared to the pre-development scenario. It was determined that with the provision of 12,750 m^3 of stormwater detention storage, the peak flow from the Site post-development would not exceed the pre-development peak flow rates.

Ultimately the volume of stormwater detention to be provided at the RTRF Site will be determined during the detailed design stage, as it will depend on specific design parameters of the detention basins themselves, including the size and location of their outlets. The analysis provided above, and in **Appendix B**, demonstrates that the RTRF can be constructed and operated with minimal impact on the stormwater system and First Ponds Creek.

It is noted that the land most impacted by the existing flooding situation, being the land immediately upstream of the Gordon Road culvert, has been rezoned under *State Environmental Planning Policy (Sydney Region Growth Centres) 2006* (Growth Centre SEPP) as SP2 Drainage. This rezoning acknowledges the existing sub-optimal stormwater/flooding situation on this land.

3.2.2 Flooding and Erosion Impacts in First Ponds Creek

While there were some concerns about increases to the volume of water entering First Ponds Creek, the RTRF will only increase overall volumes by a small amount when considered in the context of the entire catchment.

Flooding and erosion impacts are related to peak discharges, rather than low flow discharges outside of the peak. The stormwater management system includes for

on-site storage detention which reduces the peak discharge flows so that the Site would not exceed the existing peak flow discharges for a range of storm events.

Since peak discharge flow rates would be designed so that they remain below the existing peak discharge flow rates the impacts on flooding and erosion within First Ponds Creek will be negligible.

3.2.3 Floodplain Encroachment

The RTRF has been designed to ensure all structures are outside of the 100 year ARI flood extent, which is the flood extent for the purposes of design.

3.2.4 Water Quality Treatment

The proposed on-site storage basins incorporate a bio-retention system which will reduce stormwater pollution loads. The bio-retention system has been modelled a part of the EIS, to demonstrate that best practice stormwater pollution reduction targets are likely to be met using common place technologies.

It is expected that an oil grit separator will be used in maintenance areas to trap both free phase hydrocarbons and hydrocarbons attached to sediments.

The bio-retention system will also provide a high hydrocarbon removal efficiency. A target of 90% is achievable through the proposed treatment techniques.

3.3 Local Amenity and Security

Noise related amenity impacts have been addressed in **Section 3.1** above. Other amenity issues, including visual impacts, security and property prices are addressed below.

3.3.1 Visual Impacts

The concern of the local community arises from two factors. Firstly, that the 'height' of the RTRF will be up to 30m high, and secondly that the RTRF will be of a scale that will make it visible extensively throughout the nearby residential areas, in part because it is it located 'at the top of a hill'.

As shown in Figure 40 of the EIS, most of the RTRF will have no permanent structures of substantial bulk and height, being limited to tracks (including overhead wiring structures) along which trains will move or be stabled on, roads and landscaped areas. It is acknowledged that the western and northern parts of the RTRF would be located on top of land that is raised by up to 8m above existing ground level. However, this modified ground level is below the existing ground level on Tallawong Road (on the eastern boundary of the site), and so is not out of context in terms of the current state of the Site being an undulating landscape with a substantial variation in elevation across the Site.

The EIS identifies prominent visual elements of the RTRF as being the buildings, sheds, workshops and enclosures associated with rail maintenance operations, and the buildings and structures associated with the administration building, training area and sub-station.

Workshops and sheds associated with building maintenance will generally be limited to 12-15m in height, and are located in north-western part of the site. The only element that will be higher than the buildings will be the communications tower which will extend to a height of approximately 30m.

Communications Tower

The communications tower is likely to be visible from Tallawong Road and from land to the east and north of the RTRF. However, only glimpses of it would be likely to be seen in amongst the screening vegetation from the southern residential areas.

The communications tower would have a narrow width and an open character, and would incorporate small scale communications equipment. It is considered that the structure would not be visually conspicuous or offensive in an urban context.

Impacts on Existing Residential Areas

The Maintenance Workshop Building is the largest building at 15m in height, and will be visible from the residential suburbs to the south. It is also acknowledged that the Maintenance Workshop Building will be located on a filled part of the Site, upon an 8m embankment. However, as described above the post-development ground level at the western end of the Site would be below the existing ground level at the eastern part of the Site, and so is in keeping with the local topographical context.

The separation distance is a significant mitigating factor, with the building located more than 250m from the boundary of the Site, and some 300m from the southern extent of the building to the southern boundary of Schofields Road (as it will be updated as part of Stage 2 of the RMS upgrade program). It is also highlighted that the RTRF buildings are generally likely to only be visible from the future houses immediately south of Schofields Road. Views to the RTRF from houses further to the south will be screened by the intervening future residential development.

As shown in Photomontage 3 (provided in Appendix C of the EIS), the intervening vegetation that would be planted on the southern boundary of the Site would also provide a level of screening. Any future development in the residual employment land along Schofields Road would also assist to screen views from the southeast. As requested in a submission from a local resident, TfNSW will maximise the boundary planting on the southern boundary in order to achieve a maximum level of screening to residential suburbs.

Finally, whilst the RTRF is larger than what was originally proposed as part of the NWRL SSI Applications, it is also set further back from the southern boundary of the Site. The visual amenity impacts to the residential areas south of Schofields Road are likely to be similar to the visual impacts arising from the approved Tallawong Road Stabling and Maintenance Facility (approved under NWRL approvals for SSI-5100 and SSI-5414).

Impacts on Areas to the North, East and West

The RTRF will be visible from properties to the north, east and west of the Site. For these properties the visual setting will change significantly in coming years due to the increasing urbanisation of the North West Growth Centre.

Whilst the RTRF maintenance and infrastructure workshops are located near the western boundary of the Site, and on an 8m embankment, there is significant separation between the RTRF and the properties to the west, including a heavily forested riparian corridor along First Ponds Creek. Extensive landscape plantings are also proposed on the western boundary of the Site to further screen the development from properties to the west.

On the eastern frontage, the administration building will consist of two storeys, and is likely to be set lower than Tallawong Road. Appropriate landscape

plantings are proposed on the eastern boundary of the Site to further screen the development from properties to the east.

Land immediately to the north of the RTRF is currently proposed for employment uses in the *Cudgegong Road Draft Structure Plan*. As such, the Landscape Plan indicates limited landscape planting along the northern boundary of the Site.

Visual Character

The RTRF is proposed to be established within an area designated in the *Cudgegong Road Draft Structure Plan* as being for employment uses. Buildings in industrial areas (and other employment use zones) are routinely in the order of 15m, and of a similar nature to the workshops and sheds proposed as part of the RTRF. The construction of buildings for employment uses would generally require large floor plate buildings that would also require substantial earthworks and re-grading on the undulating Site. For instance, the height limits specified in *The Hills Local Environmental Plan 2012* and *Development Control Plan 2012* provide for at least 15m buildings in industrial areas for buildings 30m or more from the boundary of an adjoining residential property.

As such, the visual character of the RTRF is consistent with what would be expected in this area in the future.

3.3.2 Security

Safety is of paramount importance to TfNSW. The RTRF will be staffed continuously and operational on a 24 hours-a-day 7-days-a-week basis. As such, security is a critical issue for operational and safety reasons at the RTRF.

The RTRF would be a high security site with perimeter fencing and internal fencing (where appropriate). Access to the Site would be strictly controlled. Security monitoring will be undertaken by a physical security presence and via CCTV.

As stated above, the RTRF includes buildings that are consistent in character to buildings that might otherwise be located in an area zoned for employment uses, and should not result in any additional attraction for vandals or graffiti in the area. Conversely, the high importance that will be placed on security at the RTRF should minimise the attraction of vandals compared with other possible facilities that might otherwise be located at the Site.

With consideration of the above, TfNSW does not believe that the RTRF will attract troublemakers or increase vandalism in nearby public reserves and parks.

3.3.3 Property Prices

Property prices are a complex aggregation of a large number of factors.

As detailed in the EIS, and further demonstrated within this RTS Report, the residual impacts of the RTRF would be minimal, and there are a range of management and mitigation measures that would be implemented to further minimise residual impacts as much as possible.

Conversely the beneficial aspects of the development are significant. The RTRF will provide an initial capital investment, temporary construction employment, on-going permanent employment, as well as providing substantive infrastructure to support the provision of public transport to North West Sydney. The NWRL is part of a suite of infrastructure improvements throughout the North West Growth Centre which underpins the urbanisation of the region, which will deliver a widespread increase in property values across the region. Importantly, the location of a train stabling and maintenance facility in the general location of the Site has been provided for in the planning approvals for the NWRL.

The RTRF is part of a public transport infrastructure project (the NWRL and the rapid transit rail system) which will contribute significantly to the amenity of the area by supporting public transport improvements. Based on experience around other rail stations within Sydney and elsewhere, the proximity of land around the RTRF to the passenger train network would be anticipated to have a positive impact on property prices over the long term.

It is also noted that property values of land to the east, west and north of the Site is variable due to the ongoing strategic planning processes which will determine the long term future land uses in the North West Growth Centre and in the Cudgegong Road Station precinct.

3.4 Strategic Planning

Land Use Zoning

The Site and the immediately surrounding land, including the land to the immediate north of the Site and the residual land to the southeast of the RTRF, have been designated in the *Cudgegong Road Draft Structure Plan* for employment uses. The use of such land for the RTRF is consistent with the nature and character of development that would be expected to occur within land zoned for this purpose.

The Site is also adjacent to a future mixed use and local centre planned around the Cudgegong Road Station. North of the mixed use local centre the land is currently designated for medium density residential. North of the Site, beyond the employment land, the land is designated for low density residential.

The *Cudgegong Road Draft Structure Plan* is part of the Department of Planning and Infrastructure's North West Rail Corridor Strategy, which is undergoing a review of submissions as part of the process to finalise the strategy and the associated plans. As such, there remains the opportunity for refinements to the land use structure around the Site. In particular, TfNSW would support the zoning of additional land to the north of the RTRF for industrial or employment generating uses so as to minimise the potential for land use conflict at the boundary.

This issue (and this opportunity) is specifically acknowledged in the EIS, which includes a commitment to continue liaising with the DP&I and Blacktown City Council to ensure the RTRF is integrated with local and regional land use planning strategies and plans.

Land to the south and west has already been rezoned predominantly for low and medium residential uses. As set out in **Section 3.3** above, there are substantial mitigation measures included within the EIS in order to protect the amenity of these properties.

Finally, there remains the opportunity in carrying out development on all sides of the RTRF (but especially for land to the north, east and west), to ensure that the future presence of the RTRF is taken into account, and suitable design parameters (such as siting and orientation of buildings, location of windows, and the like) are included in the surrounding development. One advantage of obtaining a single planning approval for the entire RTRF at this time is that it provides a higher degree of certainty for all parties, including statutory planning agencies, existing residents, land use developers and future residents, in relation to the scale and extent of the RTRF.

Other Options

A number of submissions from the local community indicated that the RTRF should be located within the Marsden Park Industrial Area.

Locating the RTRF at Marsden Park would require the extension of the railway line west of Cudgegong Road. At this time the NSW Government has identified a corridor west of Cudgegong Road Station, but no decision has been made as to mode to be utilised. An extension of the transport corridor beyond the terminus of the NWRL is subject to a separate study and beyond the scope of the assessment of the RTRF.

It is NSW Government Policy, as set out in the *Long Term Transport Masterplan* and *Sydney's Rail Future – Modernising Sydney's Trains*, to construct a Second Sydney Harbour Crossing and convert selected southern lines to rapid transit trains. The RTRF has been designed to accommodate this ultimate outcome, however it is proposed for the RTRF to be progressively developed in accordance with the demand for stabling and maintenance requirements.

For these reasons TfNSW has decided to obtain planning approval at this time for the RTRF at the Tallawong Road site. This will provide maximum certainty for all parties, including statutory planning agencies, existing residents, and future residents, in relation to the proposed ultimate scale, extent and operational characteristics of the RTRF.

3.5 Other Issues

3.5.1 Ecology

The whole of the RTRF site (excluding First Ponds Creek to the west of its western boundary) has been 'bio-certified' under the *Threatened Species Conservation Act 1995* pursuant to Growth Centres SEPP.

Whilst the removal of Cumberland Plain Woodland and other vegetation at the RTRF site is acknowledged to have a biodiversity impact, this land is identified as "certified" land. The loss of all vegetation from the RTRF site has therefore been taken into account in the 'Biodiversity Certification' process for the North West Growth Centre and appropriate mitigation measures have been established.

The RTRF will not have any direct impacts or require the removal of any vegetation that is outside of the Bio-Certified area. In particular, the RTRF has been specifically designed to avoid the need for works in the First Ponds Creek riparian area which is not Bio-Certified.

Due to the close proximity of the western boundary of the Site to the First Ponds Creek riparian corridor, TfNSW has committed to using endemic species for landscape treatments, particularly along the western boundary. This has been supported by the NSW Office of Water.

A number of mitigation measures are proposed in the EIS to minimise ecological impacts of the development. No additional mitigation measures are considered necessary.

3.5.2 Waste and Contamination

The issues associated with waste management and contamination are similar to those assessed as part of SSI-5100. In this context, the conditions of approval of the RTRF should be consistent with the NWRL SSI approvals.

Conditions C15 and C16 (below) of the approval for SSI-5100 provide the same outcomes as the conditions proposed in the EPA submission.

C15. The following documents shall be submitted to the Director General, within the identified timeframes, unless otherwise agreed by the Director General:

(a) reports detailing Stage 2 Contamination Site Investigations in areas identified as having a moderate to high risk of contamination, and a Site Auditor endorsed Remediation Action Plan (or similar), where required, prior to site preparation or construction; and

(b) Certification by a Site Auditor that any contaminated land and/or groundwater, identified in (a) has been remediated to a standard consistent with the intended land use, prior to the use of the land.

C16. Where the investigations identify that the site is suitable for the intended operations and that there is no need for a specific remediation strategy, measures to identify, handle and manage potential contaminated spoils, materials and groundwater shall be incorporated into the Construction Environmental Management Plan.

It is therefore requested that conditions proposed by the EPA in its submission be replaced by conditions C15 and C16 of approval SSI-5100.

3.5.3 Air Quality

Operational activities of the RTRF will have minimal impact on local air quality as NWRL passenger trains will be electrically powered. One or two diesel powered infrastructure maintenance vehicles would be operated from the RTRF, with infrequent use. The infrastructure maintenance equipment essentially moves down the railway line to areas of track which require maintenance, and the maintenance is carried out at this location. As such, the infrastructure maintenance equipment is stabled at the RTRF, but it is not extensively used at the RTRF.

Maintenance activities that are carried out at the RTRF would predominantly occur within the enclosed maintenance workshop and generally these activities have low potential for any significant off-site emissions or odours to arise as they will occur within a building. However, maintenance activities for the RTRF itself (tracks, overhead wiring other equipment, rail welding etc) would occur external to the enclosed maintenance workshop. These activities would occur on an infrequent basis.

Because of this, air quality is not expected to be adversely affected due to the operation of the RTRF.

Regarding construction phase air quality impacts, the issue is similar in nature and scale to that assessed as part of SSI-5100. In this context, it is preferable that the conditions of approval of the RTRF are consistent with the other NWRL SSI approvals.

The requirement (as proposed by the EPA) to carry out the SSI in a manner which minimises dust emissions and the preparation of a Construction Air Quality Management Plan are consistent with approval SSI-5100, and are accepted as reasonable conditions.

However, TfNSW oppose the EPA proposed condition which requires the clearing works to be staged. The methods to be implemented to minimise dust emissions would be most appropriately dealt with in the Construction Air Quality Management Plan. This plan will set out all of the measures to be implemented to minimise dust emissions, including the feasible and reasonable dust mitigation measures which will be implemented such that visible dust emissions cease.

3.5.4 Groundwater

Additional Information

Two boreholes measured groundwater levels at the Site. The details of the relevant groundwater bores are provided in **Table 1** below and borehole data is provided in **Appendix C**.

Table 1 – Groundwater Bore Data

Borehole No.	Borehole Depth (m)	Depth to Groundwater(metres below ground level).	Location Relevant to Site
NWR-BH084	20	At ground level (Artesian)	Cudgegong Road Station
NWR-BH085	20	Not observed	Cudgegong Road Station
NWR-BH088	**20**	**6.5 to 17.6 (fluctuates)**	**On-Site (Tallawong Road)**
NWR-BH199	12	Not observed	Cudgegong Road Station
NWR-BH200	14	Not observed	Cudgegong Road Station
NWR-BH201	14	Not observed	Cudgegong Road Station
NWR-BH202	13	Not observed	Cudgegong Road Station
NWR-BH203	8	Not observed	Cudgegong Road Station
NWR-BH134	**20**	**0.50 (perched)**	**On-Site (Tallawong Road)**

*Note: the most relevant boreholes are depicted in **bold**.*

As stated in the EIS, the depth of excavation at the location of borehole NWR-BH088 is 10-12m below ground level (bgl).

In addition, seven boreholes between 8m deep and 20m deep are located within the Cudgegong Road Station works site of the NWRL. Six of these groundwater bores did not record groundwater, and one indicated a groundwater level at ground level (i.e. as an Artesian well).

Based on the above information and the expected geological conditions there is unlikely to be a major aquifer which can yield productive volumes of groundwater at the RTRF Site. Accordingly no considerable intersection between the excavation and a potential aquifer in this location is expected. The excavation is not likely to have any significant impact on any groundwater system within this area.

The excavation and construction at the Site could therefore be carried out in accordance with the principals of the Aquifer Interference Policy (AIP).

Groundwater Monitoring

In relation to the NOW's request for 5 years of post-construction groundwater monitoring, it is highlighted that Condition C37 of both SSI-5414 and SSI-5100 provides for a Water Quality Monitoring Program. The Water Quality Monitoring Program includes a requirement to carry out background monitoring of groundwater quality parameters to establish baseline conditions as well as post-construction monitoring for a minimum period of three years following the completion of construction or until the affected groundwater resources are certified by an independent expert as being rehabilitated to an acceptable condition.

TfNSW suggest that a condition consistent with that provided in the approvals for SSI-5414 and SSI-5100 would be reasonable and preferable for the RTRF.

3.5.5 Soil Salinity

Salinity potential maps prepared by the former Department of Infrastructure, Planning and Natural Resources identify the potential risk of soil salinity. As stated in the EIS (Section 9.4.6) the area around First Ponds Creek, including the RTRF Site, show moderate salinity potential.

As set out in Section 4.7 of Appendix G of the EIS, soils in the vicinity of First Ponds Creek have been identified as having a high salinity potential. This area is generally limited to the riparian corridor of First Ponds Creek, as can be seen in **Figure 1**.

Figure 1 – Soil Salinity Map Extract (Source: TfNSW, NWRL EIS1)

Works at the majority of the Site are therefore unlikely to impact on soils with high soil salinity. However, along the western boundary, the construction of the retaining structures is likely occur in close proximity to soils with high soil salinity. Accordingly, it is proposed to implement appropriate soil salinity mitigation measures in accordance with Western Sydney Regional Organisation of Council's *Draft Salinity Code of Practice* and the former Department of Infrastructure, Planning and Natural Resources' *Guidelines to Accompany Map of Salinity Potential in Western Sydney*.

3.5.6 Traffic

RMS Issues

TfNSW generally accepts the proposed conditions recommended by the RMS, in particular:

- TfNSW support the application of conditions of approval which are consistent with SSI Approval SSI-5100.
- TfNSW accepts the RMS design standards are appropriate for all works which connect to a classified road.
- The RTRF buildings, structures or detention basin can be constructed on land outside of the land required for Schofields Road upgrade.
- TfNSW intend to construct and operate the RTRF in accordance with the proposed mitigation measures.

TfNSW notes the proposed condition requiring the use of Tallawong Road to be avoided until the Tallawong Road / Schofields Road intersection has been signalised. This condition is not required as TfNSW will continue to liaise with

RMS in relation to construction traffic management as part of the Traffic and Transport Liaison Group.

Council Issues

Where appropriate, Council would be consulted in relation to traffic issues.

The RMS's Traffic Management Centre (TMC) is the appropriate body to coordinate traffic incidents or undue congestion. Appropriate liaison between the TMC and Council would be expected to occur as necessary, but is outside the scope of the scope of assessment of the RTRF.

3.5.7 Aboriginal Heritage

As specified in the EIS, further ground verification of Indigenous cultural and archaeological heritage will be carried out prior to the commencement of construction on the six northern properties for which access was not attained in the preparation of the Aboriginal Cultural Heritage Report prepared by Artefact.

4.0 Mitigation Measures

The collective measures required to mitigate the impacts associated with the proposed works are detailed in **Table 2** below. The mitigation measures detailed in the EIS have been supplemented to provide consistency with the mitigation measures for SSI-5414. No additional mitigation measures were required as a result of the submissions received or the further environmental assessment undertaken and detailed in this report.

Additions to the mitigation measures are limited to the inclusion of the following mitigation measures:

- OpGHG1 – The RTRF would minimise GHG emissions through energy reduction and avoidance, energy efficiency and onsite and offsite renewable or low carbon energy in accordance with the NWRL Environment and Sustainability Policy.
- OpGHG5 – The RTRF would source at least 10% of the annual operational energy demand at the site (not including that required for traction) from onsite renewable or low carbon sources.

Table 2 – Mitigation Measures Summary Table

No.	Mitigation Measures
Soils, Groundwater and Contamination	
Construction	
Contamination	
SG14	In the event of discovery of previously unidentified area(s) of potentially contaminated material, all work would cease in the vicinity of the discovery and not recommence until the extent of contamination has been assessed and if necessary, a Remediation Action Plan or similar has been prepared and endorsed by an accredited Site Auditor.
SG15	A Site Auditor would be required to certify that any contaminated areas have been remediated to a standard consistent with the intended land use prior to operation of the remediated site(s)
SG16	Bunds around fuel depots and stockpile areas would be installed to minimise the risk of contaminants reaching the water table.
Groundwater Management	
SG17	A groundwater monitoring plan would be prepared for the duration of the construction period. Parameters to be monitored would include groundwater levels and groundwater quality with field parameters, laboratory parameters and sample frequency to be developed prior to construction.
SG19	Water sampling and testing of groundwater would be undertaken during construction to determine the most suitable treatment processes to meet the required water quality standards.
Groundwater Treatment	
SG26	All feasible and reasonable opportunities for groundwater reuse for construction purposes or recycling nearby would be utilised in the first instance. Should groundwater inflows and required treatment volumes outstrip potential for water reuse for construction purposes, options for discharge would be investigated.
SG27	Where water salinity is found to be too high for discharge to creeks, brackish water reverse osmosis would be undertaken.
SG28	Dissolved iron would typically be removed from discharge water by oxidising the Ferric ion (Fe3+) to

No.	Mitigation Measures
	Ferrous (Fe2+) which enables precipitation and physical removal.
SG29	Water turbidity would typically be treated by settling / filters.
SG30	Iron reducing bacteria in discharge water would be typically treated by biocide dosing.
Soil Salinity	
SG34	Appropriate soil salinity mitigation measures would be adopted in accordance with Western Sydney Regional Organisation of Council's Draft Salinity Code of Practice and the former Department of Infrastructure, Planning and Natural *Resources' Guidelines to Accompany Map of Salinity Potential in Western Sydney* (2002). These mitigation measures would be included within Sub-Plans to the CEMP at all sites within areas of known risk of soil salinity.
Soil Contamination	
SG41	Excavation for offsite disposal will be subject of additional assessments for waste classification with particular focus on Areas of Environmental Concern including above-ground storage tanks, farm dams and asbestos in buildings.
SG48	Retaining walls will be designed to be free draining.
Operation	
Soils and Contamination	
OpSG2	Procedures to quickly address any contaminant spill or accident would be developed and implemented during operation of the station sites.
Traffic and Transport	
Construction	
T1	Directional signage and line-marking would be used to direct and guide drivers and pedestrians past construction sites and on the surrounding network. This would be supplemented by permanent and portable Variable Message Signs, where reasonable and feasible, to advise drivers of any potential delays, traffic diversions, speed restrictions, or alternative routes.
T2	The public would be notified of proposed traffic changes by newspaper, radio, project web site and other forms of community liaison.
T3	Co-ordination would occur with RMS via the Transport Management Centre's Traffic Operations Manager in the event of incidents or undue congestion.
T4	Management of pedestrian and vehicular access to and past construction sites would occur to ensure safe entry and exit procedures. Depending on the location, this may require manual supervision, physical barriers, temporary traffic signals and modification to existing signals or, on occasions, police presence.
T5	Access to existing properties and buildings would be maintained.
T6	Traffic controllers would manage heavy vehicle movements at worksites, and monitor the need for pedestrian control.
T7	All trucks would enter and exit the worksites in a forward direction, where feasible and reasonable.
T10	The need for, and provision of, alternative remote parking locations and shuttle bus transfers for daytime and night time construction staff would be considered for all construction sites during detailed construction planning.
T12	The Traffic and Transport Liaison Group established for the NWRL would consider individual events and any other special event needs and, make reasonable and feasible short-term adjustment to the

No.	Mitigation Measures
	construction phase activities and / or review and update detailed TMPs.
T34	Shuttle bus services for construction workers, would be provided to service strategic off-site parking areas and public transport facilities, such as Schofields Railway Station.
T35	Scheduling the movements of heavy vehicle haulage and deliveries outside peak periods, where feasible and practicable.
T36	TfNSW would liaise with the RMS and other stakeholders to manage cumulative issues during RTRF construction.
Operation	
OpT6	Consideration of peak period movements in assigning shift hours and changeover patterns for maintenance staff at the RTRF. Ideally these should be undertaken outside identified peak periods, noting that some staff may be constrained by rail operations.
OpT7	Preparation of workplace travel plans for RTRF entities that would provide alternative modes for journeys to/from work. The proximity of the future Cudgegong Road Station provides a significant opportunity to contribute towards a higher public transport mode share for RTRF staff journeys. The potential for RTRF staff shuttle services between the site and Cudgegong Road Station should be considered as part of this workplace travel plan
Noise and Vibration	
Construction	
NV1	Noise and vibration mitigation measures described in the NWRL Construction Noise and Vibration Strategy would be implemented.
Operation	
OpNV8	The implementation of feasible and reasonable noise and vibration mitigation measures such as: - The design of the sheds and equipment for the train wash and wheel lathe facilities would include noise mitigation as required in order to comply with the applicable noise criteria at the nearest noise sensitive receivers.
OpNV9	The implementation of feasible and reasonable noise and vibration mitigation measures such as: - Investigate the option to incorporate silencers in the compressed air lines of the rolling stock to reduce noise associated with brake air release events.
OpNV10	The implementation of feasible and reasonable noise and vibration mitigation measures such as: - Investigate methods to minimise rolling stock auxiliary noise levels during procurement.
OpNV14	Liaise with Planning Authorities and land development / delivery organisations to minimise the potential future land use conflict between the RTRF and future residential development in order minimise noise impacts on future residents.
Surface Water and Flooding	
Construction	
Flooding	
SW3	Construction equipment (or excess material) would be removed from flood prone areas (being the 100 year ARI flood extent) if wet weather is approaching and at the completion of each day's work activity. Stockpile sites would be located outside the Probable Maximum Flood. (check wording and use SW3)
Water Quality and Erosion and Sediment Control	
SW14	Water quality mitigation measures would be implemented in accordance with relevant requirements

No.	Mitigation Measures
	of: - Landcom Managing Urban Stormwater - Soils and Construction Volumes 1 and 2 (2009). - NOW Guidelines for Controlled Activities. - ANZECC Guidelines for Fresh and Marine Water Quality. - ANZECC Guidelines for Water Quality Monitoring and Reporting. - Water Management Act 2000. - Applicable Environment Protection Licences.
SW15	Treatment measures would be applied to water collected in sediment basins, including settling of coarse sediments, the use of flocculation for finer sediments and pH correction.
SW16	As a first preference, treated surface water collected in sediment basins would be reused onsite, eg for dust suppression. Additional opportunities for re-using water on site or for construction would be investigated and implemented where feasible and reasonable.
SW17	Exclusion zones would be designated on construction sites to limit disturbance.
SW18	Re-vegetating or stabilising disturbed areas would occur as soon as feasible.
SW20	Appropriate erosion control measures would be installed such as sediment fencing, check dams, temporary ground stabilisation, diversion berms or site regrading.
SW21	Clean water runoff would be diverted away from the works or disturbed areas wherever possible.
SW22	Temporary sediment basins would be installed as appropriate. The exact size and layout of sediment basins would be determined as part of the CEMP in accordance with the requirements of the relevant Environment Protection Licence.
SW26	Surface controls to promote ground stability, limit run-off lengths and reduce run-off velocities within the work sites would be implemented.
SW27	Ground stability would be re-established as soon as practicable following the completion of construction.
SW28	Installation of any permanent scour protection measures required for the operational phase would occur as soon as practical.
Riparian Corridor	
SW32	Where water is released into local creeks, outlet scour protection and energy dissipation would be implemented. The discharge point would be at the upstream end of a large pool where feasible and reasonable, to allow for slowing of water.
SW37	Temporary stockpile locations for both site establishment and earthworks operations would be specified prior to the commencement of construction activities. Diversion drains and erosion and sediment control measures would be in place prior to the commencement of any stockpiling activities. Material would only be stockpiled in designated stockpiling areas.
Contamination and Spills	
SW38	Site specific controls would be developed to reduce the potential for environmental releases of potentially harmful chemicals and to reduce the risk of any such releases entering local waterways. Storage of hazardous materials such as oils, chemicals and refuelling activities would occur in bunded areas.
Monitoring and Implementation	
SW40	A qualified environmental officer would be employed to advise on appropriate controls and to monitor the implementation and maintenance of mitigation measures.
SW41	All site staff would be engaged through toolbox talks or similar with appropriate training on soil and

No.	Mitigation Measures
	water management practices.
SW42	A surface water quality monitoring program for the construction period would be implemented to monitor water quality upstream and downstream of the construction areas. The monitoring programme would commence prior to commencement of any construction works and would build on available water quality data.
SW43	Surface water and water quality monitoring would be carried out periodically and after rainfall events. Monitoring would examine a range of appropriate indicators in accordance with standard guidelines.
SW44	Inspection of water quality mitigation controls (e.g. sediment control fences, sediment basins) would be carried out regularly and following significant rainfall to detect any breach of performance.
SW45	A stormwater management plan that identifies the appropriate design standards for flood mitigation based on the duration of construction, proposed activities and flood risks would be developed for each construction site. The plan would develop procedures to ensure that threats to human safety and damage to infrastructure are not exacerbated during the construction period.
Operations	
OpSW4	Treatment measures would be applied to water collected in on site detention basins, including settling of coarse sediments, the use of flocculation for finer sediments and pH correction.
OpSW6	The RTRF would be located above the 100 year ARI flood level.
OpSW11	Development within the floodplain would be designed to minimise adverse impacts on adjacent development for flooding up to the 100 year ARI event. And would be designed to maintain the operation of key evacuation routes, minimise impacts on critical infrastructure and flood hazard for flooding up to the PMF.
OpSW14	Water quality treatment measures (including a combination of swales, bioretention systems, water quality basins, gross pollutant traps) would be integrated into the drainage system to mitigate impacts to waterways.
OpSW15	A holistic approach to water quality and stormwater management would be adopted that incorporates Water Sensitive Urban Design principles to minimise impacts on the existing hydrologic regime. Such measures would include: - Managing total runoff volumes through the use of rainwater tanks and measures that promote stormwater infiltration. - Minimising increases in peak flows through the use of detention and retention measures as appropriate. - Preserving and enhancing the amenity of waterways by maintaining or providing natural vegetated measures. - Treating stormwater through a range of at source and end point measures that are integrated with the urban landscape.
OpSW16	A surface water quality monitoring program would be developed post construction to monitor water quality upstream and downstream of the works. Monitoring procedures and performance criteria would be established in consultation with local councils and relevant government agencies.
Non-Indigenous Heritage	
Operation	
OpEH2	The inclusion of a vegetated buffer or boundary screening along the northern frontage of the study area will be provided to minimise the potential for views from Rouse Hill House and the house at 128 Westminster Street, Schofields.
Ecology	
Construction	

No.	Mitigation Measures
E1	The ecological component of the site induction would include information on: - Sensitivity of surrounding vegetation (particularly threatened vegetation). - Sensitivity of threatened fauna species (birds and bats). - Site environmental procedures (vegetation management, sediment and erosion control, protective fencing, weed control). - Emergency and incident response/ spill management (chemical spills, fire, injured fauna).
E2	Pre-clearing surveys would be undertaken to identify the presence of: - Hollow bearing trees and other habitat features - Threatened flora and fauna.
E6	Trees containing hollows would be felled using "Slow drop" technique (or similar as agreed with OEH). The slow-drop technique involves nudging and shaking the tree, followed by a controlled lowering of the tree to the ground.
E7	Where feasible and reasonable, topsoil and habitat elements (eg logs and felled trees) from sites that have few weed species would be stored and reused onsite.
E10	Construction sites would be revegetated using endemic native plant species where appropriate.
E12	To prevent establishment or spread of weeds: - Machinery would be cleaned before entering work sites - Weeds would be removed from within the mapped native vegetation areas at least 10m from the edge of the construction footprint (where access allows). - Cleared weed material would be disposed of at a site licensed to receive green waste.
E22	Where native vegetation is to be retained adjacent to or within construction sites, protective fencing and signage would be maintained in accordance with Australian Standard 4970 – 2009 Protection of Trees.
Operation	
OpE2	Noxious and environmental weeds would be controlled within the site boundary
OpE6 and E15	To reduce disturbance to bats and nocturnal birds where reasonable and feasible, a range of measures would be undertaken, such as: - Artificial lighting would be directed to where it is needed and in a downwards orientation to avoid light spillage, Artificial light would be positioned to face away from areas of native vegetation. - Low-pressure sodium lamps would be used instead of high-pressure sodium or mercury lights. Where mercury lights are used, UV filters would be fitted. - The brightness of lights would be reduced to as low as legally possible, and in conformance with workplace health and safety standards. - Amplified speakers would be directed downwards and away from areas of native vegetation
Indigenous Heritage	
Construction	
IH4	The Indigenous Heritage component of the site induction would include information on: - Aboriginal heritage conservation areas and/or no-go zones for each construction site. - The legislation and penalties for impacting Aboriginal heritage objects would be conveyed to all construction managers and personnel.
IH7	Prior to the commencement of construction further ground verification of indigenous cultural and archaeological heritage will be carried out on the six northern properties for which access was not attained in the preparation of the Aboriginal Cultural Heritage Report prepared by Artefact.

No.	Mitigation Measures
Visual Amenity	
Construction	
V1	Existing vegetation around the perimeter of the construction sites would be retained where feasible and reasonable to act as a visual screen.
V2	Cut-off and directed lighting would be used to ensure glare and light trespass are minimised.
V4	Regular maintenance of site hoarding and perimeter site areas would be undertaken, including the prompt removal of graffiti.
V5	Visual mitigation would be implemented as soon as feasible and reasonable, and remain for the duration of the construction period.
V10	Hoardings would be designed to visually recede in more rural or bushland settings.
Operation	
OpV2	Cut–off and directed lighting would be used to ensure glare and light spill on surrounding existing and future residents are minimised.
OpV3	The colour and materials of service facility buildings would be selected to blend into adjacent bushland setting.
OpV10	High quality landscape and urban treatments would be used in and around the RTRF including: - Landscaping around detention ponds. - Landscaping along the Tallawong Road frontage. - Tree planting along the southern embankment. - Landscaping and tree planting along the Hambledon Road frontage to form a green buffer to retaining walls. - Retaining walls to be coloured in a muted natural tone or use natural materials (such as stones). - Buildings to consider use of a muted natural tone with landscaping to their northern elevations. - Integrated landscaping and security fencing. - Landscaping and tree planting along the northern frontage to form a green buffer to retaining walls
Local Business, Land Use and Community Facilities	
Operation and Construction	
LC1	Liaison would continue with statutory organisations, DP&I and local Councils to ensure the Project is integrated with local and regional land use planning, and that environmental planning instruments reflect the planning, construction and operation of the Project, and include integrated planning provisions to enhance potential future development.
LC2	Consultation would continue with the community throughout the project planning and construction phases to ensure that community members have adequate information about the project, the timing and scope of activities in their local area and impacts on their local facilities and recreational areas. Area specific Place Managers have been allocated to undertake this ongoing consultation.
LB2	The project has specialist Place Managers to act as a single, identifiable and direct point of contact for local residents, business people and community groups with the project during construction. Place Managers would work closely with all affected local businesses to help ensure timely responses to queries.

No.	Mitigation Measures
Climate change and greenhouse gas emissions	
Construction	
GHG1	Spoil management would be undertaken in accordance with the spoil reuse hierarchy
GHG2	Where feasible and reasonable local materials would be preferentially used.
GHG3	If feasible and reasonable low GHG intensive alternative fuels (for example biofuels) would be used in construction equipment and vehicles.
GHG4	Vehicles with low fuel consumption ratings would be preferentially used where feasible and reasonable.
GHG5	Construction equipment and vehicle operators would be trained in driving practices which reduce fuel consumption.
GHG6	Construction equipment and vehicles would be regularly maintained to maximise fuel efficiency.
GHG9	A minimum of 20% of electricity needs associated with construction works would be offset.
GHG 11	If feasible and reasonable materials with lower embodied emissions would be preferentially specified for use.
GHG 12	An updated GHG assessment would be prepared during the detailed design stage of the project.
Operation	
OpGHG1	The RTRF would minimise GHG emissions through energy reduction and avoidance, energy efficiency and onsite and offsite renewable or low carbon energy in accordance with the NWRL Environment and Sustainability Policy.
OpGHG5	The RTRF would source at least 10% of the annual operational energy demand at the site (not including that required for traction) from onsite renewable or low carbon sources.
Air Quality	
Construction	
A1	Working face and areas of open excavation would be kept to a minimum, where feasible and reasonable.
A2	Water suppression would be used for active earthwork areas, stockpiles, gravel roads and loads of soil being transported to reduce wind-blown dust emissions.
A4	The amount of excavated material held on site would be minimised.
A5	Areas of exposed earth would be minimised by staging construction activities and progressively landscaping and vegetating completed areas as the construction activities proceed, where feasible and reasonable.
A6	Enclosed rubble chutes and conveyors would be used where feasible and reasonable. Drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment would be minimised and/or water used to suppress dust emissions from such equipment.
A7	Cutting, grinding or sawing equipment would only be used in conjunction with suitable dust suppression techniques such as water sprays or local extraction.
A9	Dust generating activities would be assessed during periods of strong winds and rescheduled, where required.
A10	All vehicles carrying loose or potentially dusty material to and/or from the site would be covered.

No.	Mitigation Measures
Spoil Stockpiles	
A11	Stockpiles would be located away from sensitive receivers, where feasible and reasonable, and protected from the elements through barriers, covering or establishing a cover crop.
Haul Roads	
A12	Longer term and/or heavily used haul roads would generally be sealed. The criteria for sealing haul roads would be defined during detailed construction planning. Sealed haul roads would be regularly cleaned.
A13	Unsealed haul roads would be regularly damped down with fixed or mobile sprinkler systems.
A14	Vehicular and foot traffic would be restricted to designated areas.
A15	Appropriate site speed limits would be imposed and signed on haul routes.
A16	Wheel-wash facilities or rumble grids would be provided and used near site exit points, and a street-cleaning regime would be implemented to remove any dirt tracked onto roads.
Demolition	
A17	Water suppression would be used during demolition as required.
A18	The insides of buildings would be stripped where feasible and reasonable, before demolition.
A19	Biological debris (such as bird nests and droppings) would be bagged and removed or damped down prior to building demolition.
A20	Debris screens or sheeting would be used to screen buildings, where dust-producing activities are taking place.
A21	An asbestos survey would be undertaken of buildings that would be demolished as part of the NWRL construction works. The survey would be conducted by a suitably qualified person.
A22	Asbestos handling and management would be in accordance with: - NSW Occupational Health & Safety Act 2000. - NSW Occupational Health & Safety Regulation 2001. - Code of Practice for the Safe Removal of Asbestos 2nd edition (NOHSC, 2005). - Code of Practice for the Management and Control of Asbestos in Workplaces (NOHSC, 2005). - NSW Protection of the Environment Operations (Waste) Regulation 2005: 'Section 42 Special Requirements Relating to Asbestos Waste'. - AS2601:1991 Demolition of Structures.
Vehicles and Equipment	
A23	Engines of on site vehicles and plant would be switched off if left idling for extended periods of time.
A24	Low emission vehicles and plant fitted with catalysts, diesel particulate filters or similar devices would be used, where feasible and reasonable.
A25	Plant would be well maintained and serviced in accordance with manufacturers' recommendations.
A26	Haul routes and plant (including generators) would be sited away from sensitive receivers, such as dwellings and schools, where feasible and reasonable.
Operation	
OpA1	Develop an OEMP including an Air Quality section, which would include consideration of areas on the site to be maintained in a condition to minimise erosion (water and wind erosion). This may

No.	Mitigation Measures
	include vegetation, gravel surfacing, or paving of heavily trafficked areas.
OpA2	Location and design of air ventilation, car parks and kiss and ride facilities to consider avoidance of air quality impacts on sensitive receivers.
OpA3	Dedicated painting, degreasing, cutting, grinding, welding and similar such areas to be fitted with effective fume extraction systems to protect workers adequately, and if necessary filtration to ensure that no excessive impacts occur at nearby receptors.
OpA3	Where possible, activities where large quantities of solvents or air pollutants may be released near the site boundary and upwind of a receptor should be avoided or postponed to a more suitable period of weather. Where possible, low VOC solvents should be used, in the minimal quantity necessary to be effective.
Waste Management	
Construction	
W1	All waste would be assessed, classified, managed and disposed of in accordance with the Waste Classification Guidelines (DECC, 2008).
W2	All waste materials removed from the sites would only be directed to a waste management facility lawfully permitted to accept the materials.
W3	Excavated material and spoil would be beneficially reused on the NWRL project site or other sites, where feasible and reasonable, in accordance with the NWRL spoil use hierarchy.
W4	Appropriate storage, treatment and disposal procedures would be implemented for any contaminated spoil.
W5	Cleared site vegetation would be mulched for reuse in rehabilitation and landscaping works. Topsoil generated during site preparation activities would be stockpiled for reuse in landscaping activities.
W6	Initial and ongoing education would be provided to staff and sub-contractors regarding the importance of appropriately managing waste.
W7	Recyclable wastes, including paper at site offices, would be stored separately from other wastes. Storage facilities would be secure and recyclables collected on a regular basis.
W8	Reusable materials would be stored separately, in secure facilities.
W9	Worksites would be free of litter and good housekeeping would be maintained.
W10	Vermin proof bins would be utilised onsite.
W11	Waste oil, other liquid wastes and spillages would be collected and stored in bunded areas.
W13	Waste truck loads would be covered, and tailgates secured prior to trucks leaving the worksite.
W14	Centralised reporting and auditing of waste volumes and disposal destinations would be employed.
W15	Construction waste would be minimised by accurately calculating materials brought to the site and limiting materials packaging.
W16	Materials such as (noise hoarding, site fencing, and so on) would be reused or shared, between sites and between construction contractors where feasible and reasonable.
Operation	
OpW1	Develop an Operational Environmental Management Plan including a section on Operational Waste and Resource Recovery Management. This would detail opportunities for avoiding waste generation and responsible disposal methods for different waste streams.

No.	Mitigation Measures
Hazardous Goods	
Construction	
DG1	All dangerous goods stored at the site would be below the screening thresholds set out in *Applying SEPP 33* for potentially hazardous development.
Operation	
OpDG1	All dangerous goods stored at the site would be below the screening thresholds set out in *Applying SEPP 33* for potentially hazardous development.

Note: Identifying codes for mitigation measures are taken, where possible, from EIS 1 and EIS 2 for NWRL to maximise consistency. As such, the codes are not always sequential.

5.0 Conclusion

The proposed RTRF is State significant infrastructure which will support the operation of the NWRL in the short to medium term, and further support the NSW Government's objectives as set out in the *Long Term Transport Masterplan* and *Sydney's Rail Future – Modernising Sydney's Trains.*

An EIS was prepared for the RTRF, and has been publicly exhibited, in accordance with the relevant provisions of the EP&A Act. Submissions have been received from NSW Government authorities, Blacktown City Council, and members of the local community, including one local community group.

This RTS Report responds to all of the issues made in the submissions. It provides further justification, explanation and clarification in order to address the issues raised in submissions. In the case of stormwater management, further modelling has been carried out to take into account local constraints in First Ponds Creek, and has provided a more accurate requirement for stormwater detention storage. The detailed parameters of the stormwater detention basins will be provided as part of the design development of the RTRF.

The RTS Report has determined that no changes to the RTRF are required. The undertakings made by TfNSW to manage and minimise potential impacts arising from the development as provided in the EIS remain appropriate.

Many of the submissions made by Government agencies include recommended conditions of approval. TfNSW generally accepts the premise and wording of most of these recommended conditions of approval. In some cases this RTS Report has suggested alternatives to the recommended conditions, predominantly to provide consistency with existing NWRL SSI approvals (SSI-5100 and SSI-5414).

Detailed Submissions Summary

JBA

Appendix A

Summary of Submissions and Responses

No	Submitter	Object/ Support	Comment	Response
1	**Department of Trade and Investment, Regional Infrastructure and Services**	Neither	Petroleum Exploration License 2 held by AGL Upstream Investments Pty Ltd exists over a broad regional area that includes the site.	Noted.
2 and 18	**Office of Environment & Heritage**	Neither	The proposed mitigation strategy to plant vegetation along the northern boundaries of the study site to ensure that Rouse Hill Site suffers no visual impact from the works is considered to be appropriate.	Noted.
3	**Anonymous**	Object	Stormwater and local flooding in First Ponds Creek: ▪ The culvert on Gordon Road is already constrained, and restricts flow in the creek such that localised flooding occurs upstream (i.e. in the First Ponds Creek corridor immediately to the west of the site). ▪ The RTRF will exacerbate this pre-existing constraint because it will increase base flows into the creek resulting "in a net doubling of annual stormwater runoff". ▪ Has not considered cumulative discharges from upstream of the culvert.	The presence of the Gordon Road culvert reduces the capacity of First Ponds Creek to convey stormwater. Additional stormwater modelling has been carried out to take this constraint into account. The additional stormwater modelling confirms that the RTRF can be constructed so as not to increase peak flow rates into First Ponds Creek for the 1, 2, 5, 20 and 100 year ARI events. An increase in the volume of stormwater detention has been determined to accommodate the culvert and various storm events such that the peak flow from the site post-development would not exceed the pre-development peak flow rates. The analysis demonstrates that the RTRF can be constructed and operated with minimal impact on the stormwater system and First Ponds Creek. The indicative design of stormwater management measures for the Facility has been only to manage flows from this site, and not from the broader catchment.
4	**Anonymous**	Object	Noise it will create, pollution to the area; meaning pollution from the trains, but also the building needed will ruin the area.	The noise assessment sets out a process for minimising noise impacts with application of reasonable and feasible noise mitigation measures.

No	Submitter	Object/ Support	Comment	Response
				The RTRF will be operated with the objective of meeting the Project Specific Noise Levels as established under the Industrial Noise Policy. Reasonable and feasible mitigation measures will be applied in relation to achieving this objective.
			The value of my house will decrease with a stabling yard and RTRF. Infrastructure changes to the area which are needed to support a RTRF will decrease the value of my house.	Property prices are a complex aggregation of a large number of factors. The RTRF is part of a public transport infrastructure project (the NWRL and the rapid transit rail system) which will contribute significantly to the amenity of the area by supporting public transport improvements. Based on experience around other rail stations within Sydney and elsewhere, the proximity of land around the RTRF to the passenger train network would be anticipated to have a positive impact on property prices over the long term. The EIS includes an assessment of the impact of the RTRF on existing and future infrastructure and finds that the RTRF can be supported by infrastructure in the area without impact on existing users.
			Should be a residential area, not an industrial area. The infrastructure needed will change the residential look and feel into an industrial look and feel.	The site is designated in relevant planning strategies as employment uses. The RTRF is therefore consistent with the expected land use at the Site.
5	**S. Edwards**	Object	Concerns about the design of the RTRF and location of the Site.	The RTRF has been designed to meet the functional requirements of the train stabling and maintenance operations, whilst also ensuring that appropriate visual mitigation measures are incorporated.
			Noise, pollution, graffiti, and of course the visual impact of RTRF will impact the long term property value of the suburb. The purchase price of land in The Ponds certainly does not match that of land next to such a facility.	Property prices are a complex aggregation of a large number of factors. The RTRF is part of a public transport infrastructure project (the NWRL and the rapid transit rail system) which will contribute significantly to the amenity of the area by supporting public transport improvements. Based on experience around other rail

No	Submitter	Object/ Support	Comment	Response
				stations within Sydney and elsewhere, the proximity of land around the RTRF to the passenger train network would be anticipated to have a positive impact on property prices over the long term..
			Positioned at the top of a hill, the RTRF will be seen from near and VERY afar. The structure will be enormous; 36 hectares, 30 metres high. It may block the view of the blue mountains. It is inconsistent with the idyllic setting of the The Ponds.	Most of the RTRF will have no permanent structures of substantial bulk and height. Workshops and sheds associated with building maintenance will generally be limited to 12-15m in height. The RTRF site is located within land which is designated for employment uses under the *Cudgegong Road Draft Structure Plan.* Buildings in industrial areas (and other employment use zones) are routinely in the order of 15m, and of a similar nature to the workshops and sheds proposed as part of the RTRF. Appropriate visual mitigation measures are identified in the EIS.
			24hrs noise and pollution – including screeching break sounds that are so common on trains. Restrictions could be lifted after the facility reaches capacity.	The noise assessment sets out a process for minimising noise impacts with application of reasonable and feasible noise mitigation measures. The RTRF will be operated with the objective of meeting the Project Specific Noise Levels as established under the Industrial Noise Policy. Reasonable and feasible mitigation measures will be applied in relation to achieving this objective.
			Security The RTRF needs to be very secure to prevent graffiti and vandalism in adjoining suburbs.	The RTRF would be a high security site with perimeter fencing and fencing of internal areas (where appropriate). Access to the Site would be strictly controlled. Security monitoring will be undertaken by physical security personnel and via CCTV.
			Boundary tree planting of one or two trees deep is not sufficient. All sides of the site should include additional landscaping, thickening trees, and noise barrier fencing.	The effectiveness (including technical effectiveness and cost effectiveness) of a noise barrier has been assessed in accordance with the RTA's *Environmental Noise Management Manual*, and is not considered to a

No	Submitter	Object/ Support	Comment	Response
				reasonable or feasible noise mitigation measure at this stage, as discussed in the RtS Report. The possible inclusion of a noise barrier will be further considered at the detailed design stage when on-site noise sources are better understood.
6	**Anonymous**	Object	Noise it will create, pollution to the area; meaning pollution from the trains, but also the building needed will ruin the area.	The noise assessment sets out a process for minimising noise impacts with application of reasonable and feasible noise mitigation measures. The RTRF will be operated with the objective of meeting the Project Specific Noise Levels as established under the Industrial Noise Policy. Reasonable and feasible mitigation measures will be applied in relation to achieving this objective.
			Local Amenity The value of my house will decrease with a stabling yard and RTRF. Infrastructure changes to the area which are needed to support a RTRF will decrease the value of my house.	Property prices are a complex aggregation of a large number of factors. The RTRF is part of a public transport infrastructure project (the NWRL and the rapid transit rail system) which will contribute significantly to the amenity of the area by supporting public transport improvements. Based on experience around other rail stations within Sydney and elsewhere, the proximity of land around the RTRF to the passenger train network would be anticipated to have a positive impact on property prices over the long term..
			Strategic Planning Should be a residential area, not an industrial area. The infrastructure needed will change the residential look and feel into an industrial look and feel.	The site and the immediately surrounding land has been designated in the Cudgegong Road Draft Structure Plan as employment / industrial uses. The RTRF use is consistent with the nature and character of development that would be expected to occur on land zoned for this purpose.
			There are no local shops, mail office or even a mailbox or a bus stop anywhere near my home, so I don't understand how someone got the idea to put in an industrial complex which uses heavy machinery in an	The site and the immediately surrounding land has been designated in the *Cudgegong Road Draft Structure Plan* as employment / industrial uses. The RTRF use is consistent with the nature and character of

No	Submitter	Object/ Support	Comment	Response
			area that will be surrounded by residential properties.	development that would be expected to occur on land zoned for this purpose.
7	**Anonymous**	Object	The RTRF fails to meet a number of statutory and planning requirements. Most of these relate to the fact that the preferred site is clearly not suitable for the proposed facility. It is clearly neither large enough nor sensibly sited.	The EIS takes into account all relevant statutory planning considerations, including an assessment of the site's suitability and an analysis of alternative options. The Tallawong Road site has been identified as the preferred site on the basis of an assessment against a range of environmental, economic and social factors.
			The site encroaches significantly into the vegetated floodplain of First Ponds Creek to the west.	The RTRF has been specifically designed to ensure all structures are outside of the 100 year ARI design flood extent, and to avoid the need for works in the First Ponds Creek non-bio-certified riparian area, in order to prevent impacts on this non-bio-certified vegetation.
			The location of future Hambledon Rd running along First Ponds Creek is inappropriate.	The extension of Hambledon Road is not the subject of this application, however, it is identified in the *Draft Cudgegong Road Structure Plan* and as such the RTRF has been designed so as not to impede the future alignment of this potential road.
			The RTRF abuts existing rural lands proposed for future residential use. There is less than 20 m buffer provided between this proposed major industrial facility and low density residential areas.	Land use within the North West Growth Centre is in a rapid state of change as the area transitions towards a more urbanised setting. The RTRF site is located on land identified as 'employment' under the *Cudgegong Road Draft Structure Plan*. TfNSW will liaise with DP&I to ensure that the final version of the structure plan appropriately reflects the location of the RTRF.
			Marsden Park is the most appropriate location, within a future industrial area (not a residential one), away from major creeks and so forth. Marsden Park Option is supported by Blacktown Council. The only reason against the Marsden Park Option is that DP&I have failed to reserve this option from development, making it expensive.	The EIS includes an assessment of the site's suitability and an analysis of alternative options. The Tallawong Road site has been identified as the preferred site on the basis of an assessment against a range of environmental, economic and social factors. Locating the RTRF at Marsden Park would require extension of

No	Submitter	Object/ Support	Comment	Response
				the railway line west of Cudgegong Road. At this time the NSW Government has identified a corridor west of Cudgegong Road Station, but no decision has been made as to the mode to be utilised. An extension of the transport corridor beyond the terminus of the NWRL is subject to separate study and beyond the scope of the assessment of the RTRF.
			Predicted noise levels for construction are for moderate to high exceedances of the NMLs, but more concerning for operational noise is that every time period exceeds the noise criteria - by as much as 10 dB. This is notwithstanding that the background noise level assessments were conducted while roadworks w ere operational - not a legitimate baseline for an assessment. No serious mitigation has been proposed. The site is not large enough to readily accommodate the proposed facility, let alone noise mitigation infrastructure. TfNSW therefore leave themselves no valid alternative than to acquire adjoining properties for provision of the necessary noise mitigation structures to bring noise levels to complying levels.	Background noise monitoring was undertaken at three locations surrounding the proposed facility with the data being processed in accordance with the procedures outlined in the NSW Industrial Noise Policy (INP). At one location (BG25), the background noise data appeared to be influenced by construction noise. As construction noise is considered to be 'extraneous noise' and not representative of the underlying ambient noise environment, time periods affected by construction noise were excluded from the analysis using engineering judgment. The RTRF will be operated with the objective of meeting the Project Specific Noise Levels as established under the INP.
8	**Anonymous**	Object	**Local Amenity and Security** The size of the train holding yard for the rail link. The visual presentation of the area in house sales publications does not match the visual outcome of the RTRF on top of a hill. The RTRF is a massive eyesore that can be seen from the entire suburb.	The train stabling yard will be constructed in a staged manner to meet the needs of the NWRL initially, and ultimately of single-deck trains on other portions of the network as identified in *Sydney's Rail Future*. Most of the RTRF will have no permanent structures of substantial bulk and height. Workshops and sheds associated with building maintenance will generally be limited to 12-15m in height. The RTRF site is located within land which is

No	Submitter	Object/ Support	Comment	Response
				designated for employment uses under the *Cudgegong Road Draft Structure Plan.* Buildings in industrial areas (and other employment use zones) are routinely in the order of 15m, and of a similar nature to the workshops and sheds proposed as part of the RTRF. Appropriate visual mitigation measures are identified in the EIS.
			The location of the RTRF should be re-considered.	The EIS includes an assessment of the site's suitability and an analysis of alternative options. The Tallawong Road site has been identified as the preferred site on the basis of an assessment against a range of environmental, economic and social factors.
			Security There should be a high level of security to protect the trains against graffiti artists and vandalism deter would be troublemakers, and reassure the local community.	The RTRF would be a high security site with perimeter fencing and fencing of internal areas (where appropriate). Access to the Site would be strictly controlled. Security monitoring will be undertaken by physical security personnel and via CCTV.
			Noise Noise and pollution impacts. The RTRF should be set back further from Schofields Road.	The noise assessment sets out a process for minimising noise impacts with application of reasonable and feasible noise mitigation measures. At its closest point, the RTRF stabling yards are set approximately 200m back from Schofields Road.
9	**Anonymous**	Object	Not told of the RTRF when house was purchased. The RTRF will attract crime and troublemakers, which will adversely affect the promised family safe environment crime and will bring down the value of our property. Will be forced to sell house at a lower market value and move back to where we came from.	A train stabling facility was included in the NWRL EIS1 and EIS2 applications and approvals. The RTRF is being planned now in order to provide certainty in regard to the future role and use of the site in light of the NSW Government's *Sydney's Rail Future* policy. The RTRF is part of a public transport infrastructure project (the NWRL and the rapid transit rail system) which will contribute significantly to the amenity of the area by supporting public transport improvements. Based on experience around other rail stations within Sydney and elsewhere, the proximity of land around the RTRF to the passenger train network would be

No	Submitter	Object/ Support	Comment	Response
				anticipated to have a positive impact on property prices over the long term.
10	**Anonymous**	Object	Please rethink the location of this project	The RTRF EIS included an assessment of the site's suitability and an analysis of alternative options. The Tallawong Road site has been identified as the preferred site on the basis of an assessment against a range of environmental, economic and social factors.
11	**V. Prager**	Object	**Amenity** This is a major industrial facility in a rural residential zoning area. While the nearby population density is increasing rapidly the corresponding recreational green space amenity is being reduced and replaced for all time with a 36ha major industrial facility.	Land use within the North West Growth Centre is in a rapid state of change as the area transitions towards a more urbanised setting. The RTRF site is located on land identified as 'employment' under the *Cudgegong Road Draft Structure Plan*. The RTRF does not impinge on any public or private open space or recreation areas in the vicinity of the site.

No	Submitter	Object/ Support	Comment	Response
			Ecology The site is within 300m of a protected recreation reserve consisting of Cumberland Plain Woodland (CPW) and less than 200m from my property that consists of 2.5ha of CPW. Critically endangered wildlife species exist in the immediate environment, including the critically endangered Cumberland Plain Land Snail. TfNSW has removed CPW since acquiring 2/3rds of the site	The whole of the RTRF site (excluding First Ponds Creek to the west of its western boundary) has been 'bio-certified' under the *Threatened Species Conservation Act 1995* pursuant to Growth Centres SEPP. Whilst the removal of Cumberland Plain Woodland and other vegetation at the RTRF site is acknowledged to have a biodiversity impact, this land is identified as "certified" land, and the loss of all vegetation from the RTRF site has therefore been taken into account in the 'Biodiversity Certification' process. The ecological assessment discussed at Section 13 of the EIS concludes that the proposed development will not adversely impact upon any significant species or ecosystems within the vicinity of the site.
			The Site is in the water catchment for the Hawkesbury River that eventually nurtures the mangrove forests that are just one of the breeding grounds for our coastal fisheries. It has not been demonstrated that a constant flow of excess water into First Ponds Creek will not have a detrimental effect on wildlife.	MUSIC modelling indicates that best-practice stormwater pollution reduction targets are likely to be met for the RTRF using standard WSUD technologies.
			Stormwater The creation of additional storm water together with the discharge of waste water into First Ponds Creek and the planned destruction of the existing riparian corridor will increase the risk of flooding and erosion of properties along the creek line.	Stormwater will be detained on-site prior to discharge to reduce the peak discharge flows so that the Site would not exceed the existing peak flow discharges for a range of storm events, mitigating against the potential impacts on First Ponds Creek during periods of intense rainfall.
			The RTRF has no apparent water recycling provision and there is no explanation of how the water treatment will be undertaken before release into First Ponds Creek.	As detailed in Section 12.6.2 of the EIS: ▪ An average of 90% of annual non-potable water demand is to be sourced from non-potable water sources at the depot; ▪ 85% of the water used in the train wash is to be

No	Submitter	Object/ Support	Comment	Response
				collected, recycled and reused; and ▪ Harvested rainwater will be used for landscape irrigation, cooling towers, toilet flushing, spot cleaning and any other appropriate uses.
			Noise The baseline noise levels for the proposed site are meaningless because they relate to noise levels taken during the upgrade of Schofields Road that has continued day and night The predicted noise levels for the facility are w ell above acceptable levels in a residential and recreational area	Background noise monitoring was undertaken at three locations surrounding the proposed facility with the data being processed in accordance with the procedures outlined in the NSW Industrial Noise Policy (INP). At one location (BG25), the background noise data appeared to be influenced by construction noise. As construction noise is considered to be 'extraneous noise' and not representative of the underlying ambient noise environment, time periods affected by construction noise were excluded from the analysis using engineering judgment. The RTRF will be operated with the objective of meeting the Project Specific Noise Levels as established under the INP.
12	**B Mackenzie**	Object	The RTRF should not be located the middle of an expanding suburban area but within an established industrial area. The original routing through Riverstone to Vineyard would have enabled the site to be situated in an expanded industrial area rather than impinge on medium and high density housing.	The RTRF EIS included an assessment of the site's suitability and an analysis of alternative options, of which the Tallawong Road site has been identified as the most suitable. TfNSW will continue to liaise with the DP&I in order to ensure that strategic planning for adjoining lands reflects the presence of the RTRF. The RTRF has been sited in order to ensure that the facility is capable of connecting to the approved alignment of the NWRL.
13	**Roads and Maritime Services**	Neither	Conditions stipulated within the Infrastructure Approval (SSI-5100) would be equally applicable to the RTRF as follows: Schedule C – Environmental Performance: Condition numbers C23 through to C30. Schedule E – Construction Environmental Management: Condition	TfNSW do not object to the application of conditions of approval which are consistent with Infrastructure Approval SSI-5100.

No	Submitter	Object/ Support	Comment	Response
			Numbers E25, E31,E35, E39, E40, E45, E46c and E47	
			Section 138 concurrence The design and construction of any new construction site's or permanent vehicular access to any classified road shall be in accordance with Austroads, AS2890.1 – 2004, AS2890.2 - 2002 and the RMS's requirements.	Noted.
			Any proposed road infrastructure works, road restoration works, vehicular accesses or signalised intersections located along the state classified road system, and any new signalised intersections and/or other modifications to existing signals located on the local road system shall be designed to meet RMS requirements. The design requirements shall be in accordance with Austroads, RMS supplements and technical directions and other Australian Codes of Practice. The certified copies of the civil, structural and traffic signal design plans shall be submitted to RMS for consideration and acceptance prior to commencement of RTRF EIS works.	Noted.
			General conditions The RTRF work site is affected by Schofield Road upgrade. RTRF buildings, structures or detention basin(s) should be located clear of the land required for road upgrades.	The RTRF buildings, structures or detention basin can be constructed on land outside of the land required for Schofield Road upgrade.
			The location of the Construction site access point along Tallawong Road must be generally in accordance with the EIS.	Noted.
			Where reasonable and feasible, spoil movements leaving the RTRF construction site must not occur until the signalisation of the intersection of Schofields Road / Tallawong Road associated with the Stage 1 – Schofields Road upgrade is commissioned.	TfNSW object to the condition which relates to the use of Tallawong Road being avoided until the Tallawong Road / Schofields Road intersection has been upgraded to signals and is operational. Whilst it is likely that the signalisation of Tallawong Road / Schofields Road intersection will be complete prior to the generation of spoil at the RTRFD Site, TFNSW object to this proposed condition as the future signalisation of the intersection is outside of TfNSW control. Refer to Section 3.5.6 of RtS.

No	Submitter	Object/ Support	Comment	Response
			To avoid, manage and reduce identified potential impacts associated with construction and operational traffic, the proponent must implement the proposed mitigation measures.	Noted.
14	**Rouse Hill Heights Action Group (RHHAG)**	**Object**	The site of the proposed RTRF is prime land, suitable for high-medium density commercial/industrial or housing. It is close to 2 major roads, two stations, a major transit way, two rail lines, a major Regional Centre and a Regional Park. It is a poor planning decision to take 36ha of this land for a facility which will only provide permanent employment for 300 people; which will negatively impact on the quality of life for all surrounding residents; and which negates the DP&I plan for high density living close to all new stations on the NWRL. Virtually all of the land set aside for employment in the Draft Cudgegong Road Precinct Plan has been taken by the RTRF, so there will be no commercial/industrial land or less housing. If this proposal goes ahead, RHHAG supports zoning additional industrial land to the north, and urges that medium/high density housing be allowed in land zoned Very Low Density to compensate for the loss of housing.	TfNSW will continue to liaise with the DP&I in order to ensure that the RTRF is integrated into the local land-use planning framework for the area, including in the finalisation of the *Cudgegong Road Draft Structure Plan* and future environmental planning instruments. DP&I will be responsible for ensuring that housing and employment targets are achieved.
			Noise impact is unacceptable. The Draft Cudgegong Road Station Precinct plan shows 30% of homes within 800m of the station will be affected by noise as will adjoining area of the Ponds.	The RTRF will be operated with the objective of meeting the Project Specific Noise Levels as established under the INP.
			RHHAG also seeks to lodge our complaint that most of our members, who live near the proposed site, were not informed of the EIS being on exhibition.	Refer to Section 1.3 of the RtS Report. TfNSW undertook an extensive community information notification process prior to the EIS exhibition. This included: - Advertisements in the local. - 1,750 copies of an A4 format, four page colour information newsletter were distributed to all households in the vicinity of the Site. - Information was also placed on the project website, www.northwestrail.com.au. - The NWRL Place Manager made direct contact with households directly surrounding the Site.

No	Submitter	Object/ Support	Comment	Response
				- A DL sized invitation was distributed to attend the community information session conducted at the Rouse Hill Community Centre on 10 August 2013. - An email notification was sent to all people who have previously registered interest in the NWRL project with the project team.
			Strongly object to land along Schofields Rd which was taken from landowners against their wishes, is now shown on the EIS maps as "Future Industrial". The NSW Government is fighting hard not to give those landowners a fair price, but will benefit financially in the future when the Government sells the excess land off as valuable industrial land. Those landowners should be allowed to buy the land back at the value they were given, or given the profits when that land is sold at a fair and reasonable value.	All land within the RTRF site is required for construction including the land fronting Schofields Road. The affected properties have been, or are in the process of being, acquired at market value in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*. TfNSW appoints an independent valuer to assess the market value of affected properties and invites affected land owners to engage expert valuation and legal representation. TfNSW reimburses reasonable legal and valuation costs. Areas identified in the EIS as "Subject to Future Master Planning" will be subject to the Riverstone East Precinct planning process to be undertaken by the Department of Planning and Infrastructure. The draft NWRL Corridor Strategy, exhibited for public comment earlier in 2013, indicates employment uses in the location of the RTRF.
			The location of the RTRF next to The Ponds will decimate both the popularity and the happiness of the area. The RTRF will be surrounded by houses, and house and land values will be affected.	The RTRF is part of a public transport infrastructure project (the NWRL and the rapid transit rail system) which will contribute significantly to the amenity of the area by supporting public transport improvements. Based on experience around other rail stations within Sydney and elsewhere, the proximity of land around the RTRF to the passenger train network would be anticipated to have a positive impact on property prices over the long term.

No	Submitter	Object/ Support	Comment	Response
			There is no guarantee of another Harbour crossing to allow continuation of the Rapid Transit network, so a facility this large may not be needed. A site can be set aside in Marsden Park/ Marsden Park North or Shanes Park for this facility, so it is not in a popular high density residential area, and will be closer to the main Western rail line, to further provide for the future.	It is NSW Government Policy, as set out in the *Long Term Transport Masterplan* and *Sydney's Rail Future – Modernising Sydney's Trains*, to construct a Second Sydney Harbour Crossing and convert selected southern lines to rapid transit trains. The RTRF has been designed to accommodate this ultimate outcome, however it is proposed for the RTRF to be progressively developed in accordance with the demand for stabling and maintenance requirements.
			Adverse impact on air quality due to the nature of the proposed operations, on a 24 /7 basis and poor air circulation in summer.	Operational activities of the RTRF will have minimal impact on local air quality as diesel powered trains would not be stabled or maintained at the Site. Maintenance activities that are carried out at the RTRF would occur within the enclosed maintenance workshop and generally these activities have low potential for any significant off-site emissions or odours to arise as they will occur within a building. It is not expected that the proposed structures would significantly impact upon local air circulation beyond the site boundaries.
15	**Environment Protection Authority (EPA)**	Neither	**Noise** The acceptability of exceedances of the PSNLs have not been considered in accordance with Chapters 8 and 9 of the INP. The EIS has not demonstrated that all reasonable and feasible noise mitigation measures will be implemented. An Operational Noise and Vibration Review should be provided in order to confirm the final package of noise mitigation measures which are to be applied. Further consideration should be made by TfNSW and DP&I to rezoning of land adjacent to the RTRF to less sensitive land uses to provide a buffer.	The RTRF will be operated with the objective of meeting the Project Specific Noise Levels as established under the INP. Mitigation measures will be analysed and all reasonable and feasible mitigation measures will be implemented in relation to achieving this objective. TfNSW will continue to liaise with DP&I in order to ensure that land use planning for the site's surrounds takes into account the presence and operation of the RTRF.

No	Submitter	Object/ Support	Comment	Response
			Contamination and Waste Further contamination testing is required to determine the extent of any contamination and to assess the amount of material that may need to disposed off-site.	TfNSW requests that conditions proposed by the EPA be modified so that they are consistent with corresponding conditions in approval SSI-5000.
			Air Quality Clearing of the site should be staged and vegetation retained for as long as possible so that the likelihood of soil erosion by wind and water is minimised. Exposed areas should be progressively and quickly restabilised and stockpiles of materials managed to minimise the generation of dust.	The methods to be implemented to minimise dust emissions should be determined by the Proponent, such that the works can comply with the outcome specified. A Construction Air Quality Management Plan will be prepared and this plan will set out all of the measures to be implemented to minimise dust emissions, including the feasible and reasonable dust mitigation measures which will be implemented such that visible dust emissions cease. These measures are considered sufficient and so proposed condition C9 is requested to be not included in the approval for the RTRF.
16	**NSW Office of Water**	Neither	**Riparian** The western boundary of the site should be planted with native plant species from the local vegetation community because the boundary is in such close proximity to First Ponds Creek.	TfNSW has committed to using endemic species for landscape treatments, particularly along the western boundary.
			Groundwater The construction dewatering proposed for the project is an aquifer interference activity in accordance with the definition in the *Water Management Act 2000*. Excavation and construction should be in accordance with the principles of the *Aquifer Interference Policy.* Groundwater monitoring should be carried out prior to and during construction, and post construction monitoring for five years. The Office of Water requests that the baseline groundwater monitoring data be provided as a supplement to the EIS to confirm that the baseline monitoring period is sufficient and whether the proposed mitigation measures are adequate. Post construction monitoring is recommended to demonstrate that: - the predictions in relation to potential groundwater impacts	The excavation and construction at the Site can be carried out in accordance with the principals of the Aquifer Interference Policy (AIP). Groundwater monitoring will be undertaken for the duration of the construction period in accordance with Mitigation Measure SG17, including monitoring post-construction as is determined to be appropriate in consultation with the NSW Office of Water.

No	Submitter	Object/ Support	Comment	Response
			are minimal in relation to the local groundwater table, groundwater recharge, groundwater quality and GDEs - the mitigation measures proposed are adequate. The proposed groundwater monitoring and management plan needs to be prepared to the satisfaction of the Office of Water. The Plan needs to compile all of the groundwater protection elements into a guidance document for the project.	
			Clarify whether the soils in the vicinity of First Ponds Creek have moderate or high salinity potential	Soils in the vicinity of First Ponds Creek have been identified as having a high salinity potential. This area is generally limited to the riparian corridor of First Ponds Creek. The construction of the retaining structures is likely occur in close proximity to soils with high soil salinity. As such, it is proposed to implement appropriate soil salinity mitigation measures in accordance with Western Sydney Regional Organisation of Council's *Draft Salinity Code of Practice* and the former Department of Infrastructure, Planning and Natural Resources' *Guidelines to Accompany Map of Salinity Potential in Western Sydney*.
17	**Blacktown City Council**	Neither	**Traffic** Council should be included in consultation relating to the management of traffic incidents or undue congestion. Council should be included in consultation relating to the management of cumulative traffic issues during construction.	The RMS's Traffic Management Centre (TMC) is the appropriate body to coordinate traffic incidents or undue congestion. Appropriate liaison between the TMC and Council would be expected to occur as necessary, but is outside the scope of assessment for the RTRF. Where appropriate, Council would be consulted in relation to traffic issues.
			Stormwater Stormwater modelling has not been provided. The specified detention storage volume appears low and should be checked during detailed design. Basin outlets should be designed to the NOW requirements.	Additional stormwater modelling has been carried out to provide for this constraint. The additional stormwater modelling confirms that the RTRF can be constructed so as not to increase peak flow rates and an increased volume of stormwater

No	Submitter	Object/ Support	Comment	Response
			A target should be provided for hydrocarbon removal.	detention has been determined. Any outlet into the riparian corridor would be constructed in accordance with NOW requirements. A hydrocarbon removal target of 90% is achievable through an oil grit separator in maintenance areas combined with the proposed bioretention system.
			Heritage Council recommends that further surveys are carried out in relation to the parts of the Site not yet surveyed, including appropriate consultation with local Aboriginal representatives.	As specified in the EIS, further ground verification of Indigenous cultural and archaeological heritage will be carried out prior to the commencement of construction on the six northern properties for which access was not attained in the preparation of the Aboriginal Cultural Heritage Report prepared by Artefact.

Supplementary Stormwater Modelling

SLR Consulting

Appendix B

global environmental solutions

Tallawong Road Stabling Facility

Surface Water Hydrology and Soils

Addendum 1 - Hydrologic Modelling

Report Number 610.12637-A1

26 September 2013

Version: Revision 1

Tallawong Road Stabling Facility

Surface Water Hydrology and Soils

Addendum 1 - Hydrologic Modelling

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610.12637-A1	Revision 1	26 September 2013	Will Legg	Andrew Behrens	Andrew Behrens
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1 BACKGROUND

SLR Consulting Australia Pty Ltd (SLR) were engaged by JBA Urban Planning Consultants Pty Ltd (JBA) on behalf of Transport for New South Wales (TfNSW) to provide Hydrological Input and a soil and water impact assessment of the Rapid Transit Rail Facility (RTRF) proposal on land between Tallawong Road, Schofields Road and First Ponds Creek, Schofields (the proposed RTRF site).

Following the submission of SLRs Soil, Surface Water and Hydrology Impact Assessment (SLR ref. 610.12637_R1R1), JBA requested that SLR carry out some additional hydrologic modelling in order to demonstrate the capacity of the storage basins to maintain pre-development peak flows discharging to First Ponds Creek, upstream of the Gordon Road culvert.

This report provides a summary of the hydrologic modelling undertaken and constitutes an addendum to SLR's impact assessment (610.12637_R1R1).

2 METHODOLOGY

2.1 Catchment Area

In order to maintain peak flows to the Gordon Road culvert, the pre-development catchment area was assumed to consist only of land which currently drains to the south of Gordon Road. The pre-development catchment breakdown is shown in Figure 1.

The catchment assumptions applied within the hydrologic modelling are listed in Table 1 below.

Table 1 Catchment Assumptions

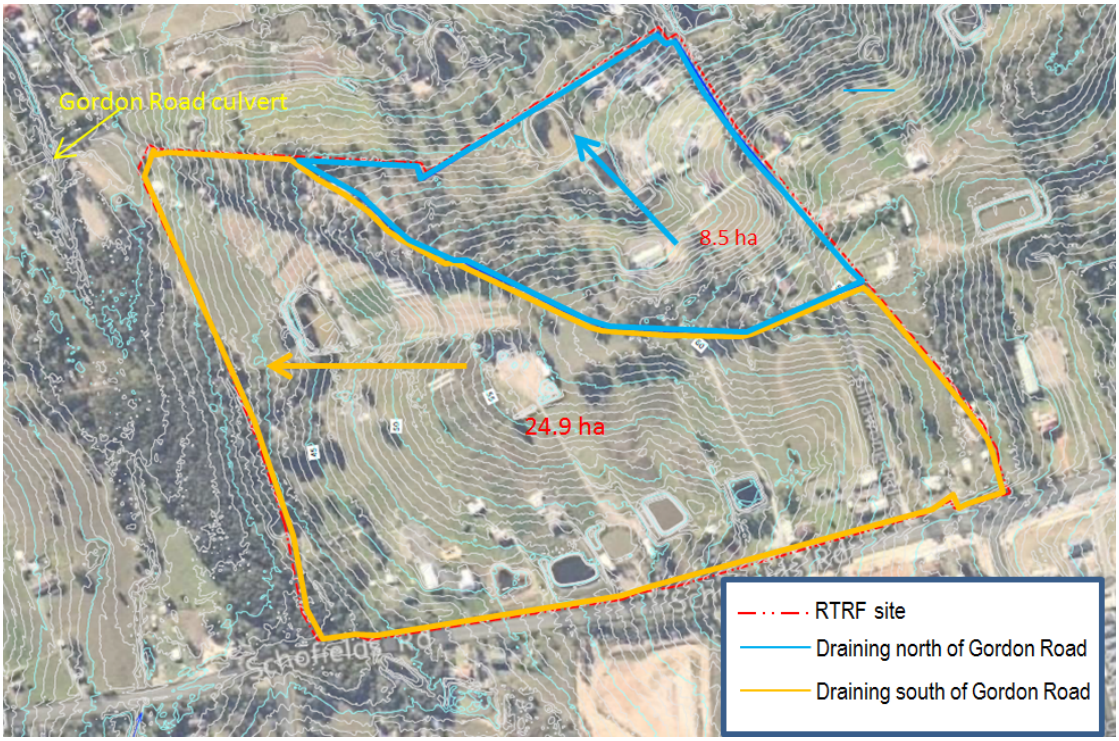
Site	Modelled Catchment Area (ha)	Percentage Impervious (%)
Pre-Development	24.9	5
Post-Development	33.4	77

2.2 IFD Parameters

IFD parameters were obtained from the Blacktown City Council Engineering Guide for Development (BCC, 2005).

The basin storage was modelled in RORB using multiple outlets in order to mimic pre-development flows for the 1, 2, 5, 20 and 100 year ARI events.

Figure 1 Pre-development catchment map



2.3 Hydrologic Model Development

SLR developed a hydrologic model of the RTRF site using the RORB modelling software.

The critical peak flow hydrographs generated in RORB were cross-checked against peak flow hydrographs generated in DRAINS using the Blacktown City Council specified input parameters (BCC, 2005). RORB parameters were adjusted to modify the RORB peak flows in line with the peak flows predicted in DRAINS.

Basin and outlet properties were adjusted to provide a best fit to the predicted pre-development flows for the 1, 2, 5, 20 and 100 year Average Recurrence Interval (ARI) events. Various storm durations were analysed and the critical duration was determined to be 2 hours.

3 RESULTS

The total storage requirement for the basin was calculated to be 12,750 m^3 including a minimum of 150 mm freeboard above the 100 year water level.

Modelled peak flows for the pre-development and post-development (with 12,750m^3 storage basin) discharges from the RTRF site are provided in Table 2.

Table 2 Modelled Flows

Storm Event (ARI)	Peak Pre-Development Flow (m^3/s)	Peak Post-Development Discharge from Basin (m^3/s)
1	0.928	0.922
2	2.307	1.651
5	4.120	3.179
20	5.949	5.426
100	7.680	7.680

In accordance with Blacktown City Council requirements (BCC, 2005) the post-development basin discharge did not exceed the corresponding pre-development peak flow for all storm events.

A sketch of how the storage basin was modelled in RORB is presented in Figure 1. The model included multiple outlets and a spillway. The stage discharge relationship for the model is provided in Table 3.

The detailed design of each basin's footprint and its outlet and overflow structures will be confirmed during the detailed design.

Figure 2 Sketch of basin arrangement modelled in RORB

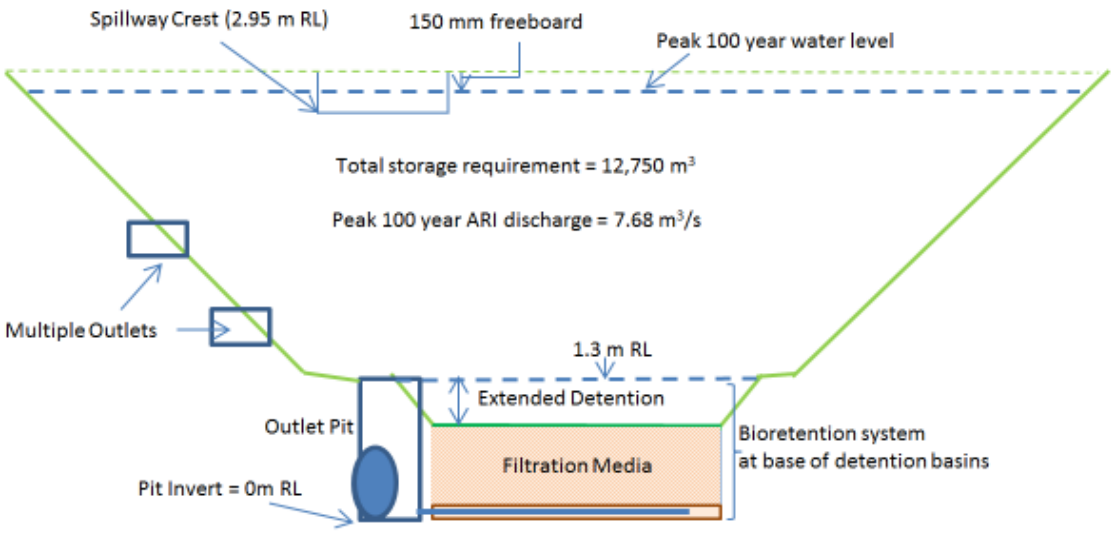


Table 3 RORB Model Stage vs Discharge

Stage (m)	Total Discharge from basins (m^3/s)
0	0
1.5	0.37
1.75	0.47
2.00	1.02
2.25	2.24
2.50	3.89
2.90	6.74
3.00	7.58
3.10	8.39

4 SUMMARY

The 100 year ARI storage requirement was calculated using RORB modelling software. The basin was sized to ensure peak post-development discharges did not exceed pre-development peak flows from the portion of the RTRF site area which drains to the Gordon Road culvert, for the 1, 2, 5 20 and 100 year ARI storm events.

The total basin storage requirement (including freeboard) was calculated to be 12,750 m^3.

Borehole Log

Coffey Geotechnics

Appendix C

coffey geotechnics

Engineering Log - Borehole

Borehole ID.	***NWR-BH084***		
sheet:	1 of 4		
project no.	***GEOTLCOV24333AC***		
client:	***Transport for New South Wales***	date started:	***13 Sep 2011***
principal:		date completed:	***13 Sep 2011***
project:	***North West Rail Link Geotechnical Investigation***	logged by:	***AC***
location:	***Cudgegong Road, Rouse Hill***	checked by:	***AJH***

position: E: 306025; N: 6270102 (MGA94 Zone 56) surface elevation : 51.88m (AHD) angle from horizontal: 90°

drill model: Edson 3000 mounting: Truck Casing Diameter : HW

drilling information | **material substance**

method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer kPa	structure and additional observations
AD/V; HW Casing	1 2 3	0 mbgl , 30/03/12 , Artesian groundwater	E E E					**(FILL) ASPHALT**: dark grey.	<Wp			**FILL**
								(FILL) CLAY: low plasticity, red brown, with some fine grained sand, trace of fine to medium grained gravel.				
			E	51	1		CI	**SILTY CLAY**: medium plasticity, red brown mottled brown.		VSt		**RESIDUAL SOIL**
			E SPT 7, 8, 8 N*=16	50	2		CH	**GRAVELLY CLAY**: high plasticity, red brown mottled grey, fine to coarse grained angular gravel. 1.8m - Becoming medium plasticity, pale grey mottled red and pale brown.			100 200 300 400	**EXTREMELY WEATHERED ROCK** 1.65: HP Samp =190 kPa 1.70: HP Samp =220 kPa
			SPT 5, 12, 16 N*=28	49	3							3.00: HP Samp >300 kPa 3.20: HP Samp >300 kPa
								Borehole NWR-BH084 continued as cored hole				
				48	4							
				47	5							
				46	6							
				45	7							
				44								

CDF_0_9_03AA.GLB Log COF NON CORED BOREHOLE GEOTLCOV24333AC.GPJ -108/06/2012 15:52

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. AD/T

support

M mud N nil
C casing

penetration

1 2 3 — no resistance ranging to refusal

water

10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests

U##	undisturbed sample ##mm diameter
D	disturbed sample
B	bulk disturbed sample
E	environmental sample
HP	hand penetrometer (kPa)
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
VS	vane shear peak/remouded (uncorrected kPa)
R	refusal

classification symbol & soil description based on Unified Classification System

moisture

D	dry
M	moist
W	wet
W_P	plastic limit
W_L	liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey geotechnics

Engineering Log - Cored Borehole

Borehole ID.	**NWR-BH084**		
sheet:	2 of 4		
project no.	**GEOTLCOV24333AC**		
client:	***Transport for New South Wales***	date started:	***13 Sep 2011***
principal:		date completed:	***13 Sep 2011***
project:	***North West Rail Link Geotechnical Investigation***	logged by:	***AC***
location:	***Cudgegong Road, Rouse Hill***	checked by:	***AJH***

position: E: 306025; N: 6270102 (MGA94 Zone 56) surface elevation : 51.88m (AHD) angle from horizontal: 90°

drill model: Edson 3000 mounting: Truck Casing Diameter : HW

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description (ROCK TYPE: grain characterisics, colour, structure, minor components)	weathering & alteration	estimated strength & Is(50) (X = Axial; O = Dimetral)	samples, field tests & Is(50) (MPa) (a = Axial; d = Dimetral)	core run & RQD	defect spacing (mm)	defect description (type, inclination, planarity, roughness, coating, thickness, other)
	0 mbgl , 30/03/12 , Artesian groundwater	51	1								
		50	2								
		49	3		start coring at 3.50m						
HQ3		48	4		**SILTSTONE**: pale grey and grey brown, remoulds to a silty clay, high plasticity.	XW					3.5m to 4.0m - Core is extremely weathered rock with soil properties, remoulds to a clay with some seams of fragmented highly weathered rock
					SILTSTONE: grey and orange brown, distinctly laminated at 0° to 5°, with some fine grained sandstone laminations (<5%)	HW - MW					4.0m to 4.5m - Core is highly weathered with fragmented gravel zones and clay seams SM, 0°, PL, SO, Clay, 10 mm
		47	5		**SILTSTONE**: dark grey, distinctly laminated at 0° to 5°, with some pale grey fine grained sandstone laminations (<5%)	FR			53%		PT, Fe SN PT, Fe SN
		46	6					a=1.13 d=0.56			NOTE: 6.0m to 9.0m core barrel was dropped, defects may be drilling induced
		45	7					a=1.22 d=0.91 a=1.33 d=0.64	100%		JT, 50°, UN, VR, CN JT, 5°, UN, RO, CN
		44									

Defects are PT, 0° to 10°, PL, RO, CN-CLAY CO unless noted otherwise

method & support

DT	diatube
AS	auger screwing
AD	auger drilling
RR	roller/tricone
CB	claw or blade bit
NMLC	NMLC core
NQ	wireline core (47.6mm)
HQ	wireline core (63.5mm)
PQ	wireline core (85.0mm)
SPT	standard penetration test

water

10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery

core recovered (graphic symbols indicate material)
no core recovered

core run & RQD

barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*

RS	residual soil
XW	extremely weathered
HW	highly weathered
MW	moderately weathered
DW	distinctly weathered
SW	slightly weathered
FR	fresh

* W replaced with A for alteration

strength

VL	very low
L	low
M	medium
H	high
VH	very high
EH	extremely high

defect type

PT	parting
JT	joint
SZ	sheared zone
SS	sheared surface
CS	crushed seam
SM	seam

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	irregular

roughness

VR	very rough
RO	rough
SO	smooth
POL	polished
SL	slickensided

coating

CN	clean
SN	stained
VN	veneer
CO	coating

coffey geotechnics

Engineering Log - Cored Borehole

client:	*Transport for New South Wales*	Borehole ID.	***NWR-BH084***
principal:		sheet:	3 of 4
project:	***North West Rail Link Geotechnical Investigation***	project no.	***GEOTLCOV24333AC***
location:	***Cudgegong Road, Rouse Hill***	date started:	***13 Sep 2011***
		date completed:	***13 Sep 2011***
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position: E: 306025; N: 6270102 (MGA94 Zone 56) surface elevation : 51.88m (AHD) angle from horizontal: 90°

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drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50) (X = Axial; O = Dimetral)	samples, field tests & Is(50) (MPa) (a = Axial; d = Dimetral)	core run & RQD	defect spacing (mm)	defect description type, inclination, planarity, roughness, coating, thickness, other (particular / general)
HQ3		43	9		**SILTSTONE**: dark grey, distinctly laminated at 0° to 5°, with some pale grey fine grained sandstone laminations (<5%) *(continued)*	FR		a=1.37 d=0.16	100%		JT, 85°, PL, SO, CN JT, 30°, CU, RO, CN JT, 45°, PL, SO, CN
		42	10					a=0.47 d=0.59			JT, 30°, PL, SO, Clay CO
		41	11					a=0.86 d=0.12	93%		JT, 35°, PL, VR, Gravel, 4 mm JT, 88°, CU, RO, CN JT, 30°, PL, SO, Clay CO
		40	12					a=0.77 d=0.66			JT, 15°, PL, SO, CN JT, 60°, PL, SO, CN JT, 40°, PL, SO, CN
		39	13					a=0.56 d=0.71			JT, 45°, PL, SO, CN JT, 30 - 40°, PL, RO - SO, CN
		38	14					a=0.62 d=0.76	98%		JT, 45°, PL, SO, CN JT, 30°, PL, SO, CN
		37	15					a=1.33 d=0.52			JT, 20°, PL, SO, CN JT, 30°, PL, SO, CN
		36						a=0.72 d=0.78	62%		

Defects are PT, 0° to 10°, PL, RO, CN-CLAY CO unless noted otherwise

method & support

DT	diatube
AS	auger screwing
AD	auger drilling
RR	roller/tricone
CB	claw or blade bit
NMLC	NMLC core
NQ	wireline core (47.6mm)
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10/10/12, water level on date shown
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barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*

RS	residual soil
XW	extremely weathered
HW	highly weathered
MW	moderately weathered
DW	distinctly weathered
SW	slightly weathered
FR	fresh

* W replaced with A for alteration

strength

VL	very low
L	low
M	medium
H	high
VH	very high
EH	extremely high

defect type

PT	parting
JT	joint
SZ	sheared zone
SS	sheared surface
CS	crushed seam
SM	seam

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	irregular

roughness

VR	very rough
RO	rough
SO	smooth
POL	polished
SL	slickensided

coating

CN	clean
SN	stained
VN	veneer
CO	coating

coffey geotechnics

Engineering Log - Cored Borehole

Borehole ID.	***NWR-BH084***		
sheet:	4 of 4		
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HQ3		35	17		**SILTSTONE**: dark grey, distinctly laminated at 0° to 5°, with some pale grey fine grained sandstone laminations (<5%) *(continued)*	FR		a=0.63 d=0.61	62%		SM, Clay, 20 mm JT, 55°, PL, SO JT, 40°, PL, RO JT, 40°, PL, RO JT, 35°, PL, SO, CN
		34	18		17.26m to 17.33m - Fractured zone between parallel joints			a=0.5 d=0.74			JT, 30°, PL, SO, Clay CO JT, 51°, ST, SO, CN
		33	19					a=0.61 d=0.42	92%		SM, Clay, 40 mm SM, Clay, 30 mm SM, Gravel, 10 mm JT, 45°, PL, SO, Clay CO JT, 80°, IR, VR, CN SZ, 10°, PL, CN
		32	20					a=0.59 d=0.48			19.74m to 19.81m - Highly fractured zone of JTs, PTs and clay SMs
					Borehole NWR-BH084 terminated at 20.30 m Target depth STANDPIPE PIEZOMETER INSTALLED.			a=0.9 d=0.26			
		31	21								
		30	22								
		29	23								
		28									

Defects are PT, 0° to 10°, PL, RO, CN-CLAY CO unless noted otherwise

method & support

DT	diatube
AS	auger screwing
AD	auger drilling
RR	roller/tricone
CB	claw or blade bit
NMLC	NMLC core
NQ	wireline core (47.6mm)
HQ	wireline core (63.5mm)
PQ	wireline core (85.0mm)
SPT	standard penetration test

water

- 10/10/12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery

- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD

- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*

RS	residual soil
XW	extremely weathered
HW	highly weathered
MW	moderately weathered
DW	distinctly weathered
SW	slightly weathered
FR	fresh

* W replaced with A for alteration

strength

VL	very low
L	low
M	medium
H	high
VH	very high
EH	extremely high

defect type

PT	parting
JT	joint
SZ	sheared zone
SS	sheared surface
CS	crushed seam
SM	seam

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	irregular

roughness

VR	very rough
RO	rough
SO	smooth
POL	polished
SL	slickensided

coating

CN	clean
SN	stained
VN	veneer
CO	coating

coffey geotechnics

Engineering Log - Borehole

Borehole ID.	***NWR-BH088***		
sheet:	1 of 4		
project no.	***GEOTLCOV24333AC***		
client:	***Transport for New South Wales***	date started:	***14 Dec 2011***
principal:		date completed:	***21 Dec 2011***
project:	***North West Rail Link Geotechnical Investigation***	logged by:	***KP/AA***
location:	***Tallawong Road; Rouse Hill***	checked by:	***AJH***

position: E: 305486; N: 6269903 (MGA94 Zone 56) surface elevation : 64.14m (AHD) angle from horizontal: 90°

drill model: Explorer/Geoprobe mounting: Track Casing Diameter : HW

drilling information | **material substance**

method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer kPa	structure and additional observations
HW Casing, AD/T			E	64				**(FILL) CLAY**: dark brown, with some organic material and some fine grained, sub-rounded ironstone gravel. 0.30m - becoming pale brown.				**FILL**
					1		CH	**SILTY CLAY**: high plasticity, mottled red and grey, with some sub-angular fine to medium grained gravel.	<Wp	H		**RESIDUAL SOIL**
				63				**SILTSTONE**: extremely weathered, mottled red/grey, estimated to be very low strength, recovered as silt.				**EXTREMELY WEATHERED ROCK**
								Borehole NWR-BH088 continued as cored hole				
				62	2							
				61	3							
				60	4							
				59	5							
				58	6							
				57	7							

CDF_0_9_03AA.GLB Log COF NON CORED BOREHOLE GEOTLCOV24333AC.GPJ -108/06/2012 15:52

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. AD/T

support

M mud N nil
C casing

penetration

1 2 3 — no resistance ranging to refusal

water

10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests

U##	undisturbed sample ##mm diameter
D	disturbed sample
B	bulk disturbed sample
E	environmental sample
HP	hand penetrometer (kPa)
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
VS	vane shear peak/remouded (uncorrected kPa)
R	refusal

classification symbol & soil description based on Unified Classification System

moisture

D	dry
M	moist
W	wet
W_P	plastic limit
W_L	liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey geotechnics

Engineering Log - Cored Borehole

Borehole ID.	***NWR-BH088***		
sheet:	2 of 4		
project no.	***GEOTLCOV24333AC***		
client:	***Transport for New South Wales***	date started:	***14 Dec 2011***
principal:		date completed:	***21 Dec 2011***
project:	***North West Rail Link Geotechnical Investigation***	logged by:	***KP/AA***
location:	***Tallawong Road; Rouse Hill***	checked by:	***AJH***

position: E: 305486; N: 6269903 (MGA94 Zone 56) surface elevation : 64.14m (AHD) angle from horizontal: 90°

drill model: Explorer/Geoprobe mounting: Track Casing Diameter : HW

drilling information | **material substance** | **rock mass defects**

RL (m)	depth (m)	material description (ROCK TYPE: grain characterisics, colour, structure, minor components)	weathering & alteration	estimated strength & Is(50) (X = Axial; O = Dimetral)	samples, field tests & Is(50) (MPa) (a = Axial; d = Dimetral)	core run & RQD	defect spacing (mm)	defect description (type, inclination, planarity, roughness, coating, thickness, other)
64								
63	1	start coring at 1.20m						
		SILTSTONE: red-brown/grey, indistinctly bedded at 0°, with some iron staining and extremely weathered zones, can be remoulded to a silty gravel.	XW			0%		1.20m to 1.85m - Extremely weathered core
			XW - HW					
	2	NO CORE 0.20 m						
62		**SILTSTONE**: red-brown/grey, indistinctly bedded at 0°, with some iron staining and extremely weathered zones, can be remoulded to a silty gravel.	XW - HW			8%		2.00m to 2.50m - Extremely weathered core
		SANDY SILTSTONE: fine grained, black/dark grey, indistinctly bedded at 0°, with some iron staining. 2.85m to 3.00m -rounded iron stained concretion Gradational boundary with:	HW					2.50m to 2.75m - Highly fractured core
	3		MW					2.86m to 3.00m - Highly fractured core; PT, 0°, UN, VR, CN; PT, 0°, PL, RO, CN; SM, 0°, UN, RO, Fe Clay filled; PT, 0°, PL, RO, Fe SN; VN
61		NO CORE 0.15 m						
		SILTY SANDSTONE: fine grained, grey, distinctly bedded at 0°-5°, with some iron staining and thin carbonaceous laminae.	SW		a=2.2 d=3.1	85%		
	4							
60		4.23m - planar iron stained boundary at 65°.			a=4 d=2.8			JT, 75°, UN, VR, Fe SN
	5							
59		5m - laminated/interbedded silty sandstone with siltstone bands.			a=2.1 d=1.7	61%		
	6							
58		6.10m - iron staining is absent.	FR					
	7				a=2.3 d=1.3	80%		
57								JT, 25°, RO, VN
					a=3.2 d=3.1	100%		

HQ3

6.5 mbgl , 20/12/11

Defects are PT, 0°-5° PL-UN, RO, CN-FeSN unless otherwise described

CDF_0_9_03AA.GLB Log COF CORED BOREHOLE GEOTLCOV24333AC.GPJ -112/06/2012 10:14

method & support

DT	diatube
AS	auger screwing
AD	auger drilling
RR	roller/tricone
CB	claw or blade bit
NMLC	NMLC core
NQ	wireline core (47.6mm)
HQ	wireline core (63.5mm)
PQ	wireline core (85.0mm)
SPT	standard penetration test

water

10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery

core recovered (graphic symbols indicate material)
no core recovered

core run & RQD

barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*

RS	residual soil
XW	extremely weathered
HW	highly weathered
MW	moderately weathered
DW	distinctly weathered
SW	slightly weathered
FR	fresh

* W replaced with A for alteration

strength

VL	very low
L	low
M	medium
H	high
VH	very high
EH	extremely high

defect type

PT	parting
JT	joint
SZ	sheared zone
SS	sheared surface
CS	crushed seam
SM	seam

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	irregular

roughness

VR	very rough
RO	rough
SO	smooth
POL	polished
SL	slickensided

coating

CN	clean
SN	stained
VN	veneer
CO	coating

coffey geotechnics

Engineering Log - Cored Borehole

client:	*Transport for New South Wales*	Borehole ID.	***NWR-BH088***
principal:		sheet:	3 of 4
project:	***North West Rail Link Geotechnical Investigation***	project no.	***GEOTLCOV24333AC***
location:	***Tallawong Road; Rouse Hill***	date started:	***14 Dec 2011***
		date completed:	***21 Dec 2011***
		logged by:	***KP/AA***
		checked by:	***AJH***

position: E: 305486; N: 6269903 (MGA94 Zone 56) surface elevation : 64.14m (AHD) angle from horizontal: 90°

drill model: Explorer/Geoprobe mounting: Track Casing Diameter : HW

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description (ROCK TYPE: grain characterisics, colour, structure, minor components)	weathering & alteration	estimated strength & Is(50) (X = Axial; O = Dimetral)	samples, field tests & Is(50) (MPa) (a = Axial; d = Dimetral)	core run & RQD	defect spacing (mm)	defect description (type, inclination, planarity, roughness, coating, thickness, other)
HQ3		56			**SILTY SANDSTONE**: fine grained, grey, indistinctly bedded at 0° to 5°, with some zones of indistinctly cross bedding. 8.35m - distinct silty bedding contact at 5°, sandstone becoming increasingly silty.	FR			100%		
			9					a=3.6 d=2.6			
		55									
								a=2 d=1.4			
			10		Contact at 0° with:				85%		
		54			**LAMINITE**: siltstone 50% and silty sandstone 50%, grey, dark grey, distinct thin bedding at 0° to 5°, with zones of disturbed and burrowed bedding.			a=1.5 d=0.43			
			11								
		53									
								a=0.95 d=0.19	69%		
			12		12m to 13.1m - zone of siltstone 60% and sandstone 40%, fine grained, thin lenticular bedding. Gradational boundary with:			a=1.1 d=0.18			
		52			**LAMINITE**: siltstone 70% and sandstone 30%, dark grey siltstone, fine grained grey sandstone, distinctly, thinly laminated at 0° to 5°, beds are often lenticular.						
			13						100%		
		51						a=2.2 d=0.72			
			14								
		50									
								a=2.1 d=0.16	100%		
			15								
		49									
								a=2.5 d=1	93%		

Defects are PT, 0°-5°, PL-VN, RO, CN unless otherwise described

method & support

DT	diatube
AS	auger screwing
AD	auger drilling
RR	roller/tricone
CB	claw or blade bit
NMLC	NMLC core
NQ	wireline core (47.6mm)
HQ	wireline core (63.5mm)
PQ	wireline core (85.0mm)
SPT	standard penetration test

water

10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery

core recovered (graphic symbols indicate material)
no core recovered

core run & RQD

barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*

RS	residual soil
XW	extremely weathered
HW	highly weathered
MW	moderately weathered
DW	distinctly weathered
SW	slightly weathered
FR	fresh

* W replaced with A for alteration

strength

VL	very low
L	low
M	medium
H	high
VH	very high
EH	extremely high

defect type

PT	parting
JT	joint
SZ	sheared zone
SS	sheared surface
CS	crushed seam
SM	seam

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	irregular

roughness

VR	very rough
RO	rough
SO	smooth
POL	polished
SL	slickensided

coating

CN	clean
SN	stained
VN	veneer
CO	coating

coffey geotechnics

Engineering Log - Cored Borehole

Borehole ID.	***NWR-BH088***		
sheet:	4 of 4		
project no.	***GEOTLCOV24333AC***		
client:	***Transport for New South Wales***	date started:	***14 Dec 2011***
principal:		date completed:	***21 Dec 2011***
project:	***North West Rail Link Geotechnical Investigation***	logged by:	***KP/AA***
location:	***Tallawong Road; Rouse Hill***	checked by:	***AJH***

position: E: 305486; N: 6269903 (MGA94 Zone 56) surface elevation : 64.14m (AHD) angle from horizontal: 90°

drill model: Explorer/Geoprobe mounting: Track Casing Diameter : HW

drilling information				material substance					rock mass defects		
method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50) (X = Axial; O = Dimetral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = Axial; d = Dimetral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	defect description type, inclination, planarity, roughness, coating, thickness, other particular — general
HQ3	17.6 mbgl , 30/03/12	48 47 46 45 44 43 42 41	17 18 19 20 21 22 23		**LAMINITE**: siltstone 70% and sandstone 30%, dark grey siltstone, fine grained grey sandstone, distinctly, thinly laminated at 0° to 5°, beds are often lenticular. *(continued)* 16.15m - siltstone 60% and sandstone 40%, fine grained. 18.30m - siltstone 70% and sandstone 30%, fine grained. Borehole NWR-BH088 terminated at 20.00 m Target depth STANDPIPE PIEZOMETER INSTALLED.	FR		a=1.8 d=0.5 a=1.8 d=1.1 a=2.1 d=1 a=2 d=1.4	93% 97% 100% 100%		Defects are PT, 0°-5°, PL-VN, RO, CN unless otherwise described

method & support

DT	diatube
AS	auger screwing
AD	auger drilling
RR	roller/tricone
CB	claw or blade bit
NMLC	NMLC core
NQ	wireline core (47.6mm)
HQ	wireline core (63.5mm)
PQ	wireline core (85.0mm)
SPT	standard penetration test

water

10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery

core recovered (graphic symbols indicate material)
no core recovered

core run & RQD

barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*

RS	residual soil
XW	extremely weathered
HW	highly weathered
MW	moderately weathered
DW	distinctly weathered
SW	slightly weathered
FR	fresh

* W replaced with A for alteration

strength

VL	very low
L	low
M	medium
H	high
VH	very high
EH	extremely high

defect type

PT	parting
JT	joint
SZ	sheared zone
SS	sheared surface
CS	crushed seam
SM	seam

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	irregular

roughness

VR	very rough
RO	rough
SO	smooth
POL	polished
SL	slickensided

coating

CN	clean
SN	stained
VN	veneer
CO	coating

coffey geotechnics

Engineering Log - Borehole

Borehole ID.	**NWR-BH134**		
sheet:	1 of 4		
project no.	**GEOTLCOV24333AC**		
client:	***Transport for New South Wales***	date started:	***02 Feb 2012***
principal:		date completed:	***02 Feb 2012***
project:	***North West Rail Link Geotechnical Investigation***	logged by:	***RH***
location:	***Tallawong Road***	checked by:	***AJH***

position: E: 305516; N: 6269806 (MGA94 Zone 56) surface elevation : 59.16m (AHD) angle from horizontal: 90°

drill model: Hydrapower Scout mounting: Truck Casing Diameter : HW

drilling information | **material substance**

method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer kPa	structure and additional observations
AD/V, HW Casing	1 2 3	0.5 mbgl , 02/02/12 , (perched)	E, E, E	59				**(TOPSOIL) SILTY CLAY**: pale brown, with some organic material.	<Wp			**FILL**
								(FILL) CLAY: pale brown, trace of organic material.				
				58	1		CH	**SILTY CLAY**: high plasticity, mottled red-grey, with some sub-angular medium grained siltstone gravel.		VSt		**RESIDUAL SOIL**
							MH	**CLAYEY SILT**: high liquid limit, pale brown.		S		
AD/T				57	2			**SILTSTONE**: extremely weathered, pale grey, with orange-brown, iron staining relict laminations remoulds to a clayey silt, low plasticity				**EXTREMELY WEATHERED ROCK**
				56	3			Borehole NWR-BH134 continued as cored hole				
				55	4							
				54	5							
				53	6							
				52	7							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. AD/T

support

M mud N nil
C casing

penetration

1 2 3 — no resistance ranging to refusal

water

10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests

U##	undisturbed sample ##mm diameter
D	disturbed sample
B	bulk disturbed sample
E	environmental sample
HP	hand penetrometer (kPa)
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
VS	vane shear peak/remouded (uncorrected kPa)
R	refusal

classification symbol & soil description based on Unified Classification System

moisture

D	dry
M	moist
W	wet
W_P	plastic limit
W_L	liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey geotechnics

Engineering Log - Cored Borehole

Borehole ID.	***NWR-BH134***		
sheet:	2 of 4		
project no.	***GEOTLCOV24333AC***		
client:	***Transport for New South Wales***	date started:	***02 Feb 2012***
principal:		date completed:	***02 Feb 2012***
project:	***North West Rail Link Geotechnical Investigation***	logged by:	***RH***
location:	***Tallawong Road***	checked by:	***AJH***

position: E: 305516; N: 6269806 (MGA94 Zone 56) surface elevation : 59.16m (AHD) angle from horizontal: 90°

drill model: Hydrapower Scout mounting: Truck Casing Diameter : HW

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50) (X = Axial; O = Dimetral)	samples, field tests & Is(50) (MPa) (a = Axial; d = Dimetral)	core run & RQD	defect spacing (mm)	defect description type, inclination, planarity, roughness, coating, thickness, other
	0.5 mbgl , 02/02/12 , (perched)	59									
			1								
		58									
			2								
		57			start coring at 2.50m						
HQ3					NO CORE 0.19 m						
			3		**SILTY SANDSTONE**: fine grained, pale grey, indistinctly bedded at 0°-5°, with some orange brown iron staining <30mm	HW			0%		Highly fractured zone of PT, FeSN and JT, 50°-70°, PL, RO, FeSN SM, 0 - 5°, Clay FILLED, 60 mm Highly fractured zone of PT, FeSN and JT, 50°-70°, PL, RO, FeSN
		56			3.35m- becoming dark grey with distinct, fine laminations at 0°-10°	HW - MW					
			4						36%		
		55			4.42m-4.28m- with some wavy bedding, tuffaceous band (?) <1mm			a=0.33 d=0.43			Highly fractured zone of JT, 90°, PL, RO, FeSN CS, 0 - 5°, PL
			5								
		54			5.05m- becoming dark grey with some dark red brown iron stained alteration about defects (to 40mm)	MW		a=0.68 d=0.49			SM, 0 - 5°, Clay FILLED, 1 mm JT, 25°, PL, RO, Fe SN CS, 0 - 5°, PL, 30 mm
			6		6.05m- with some fine grained, pale grey sandstone laminations	MW - SW					
		53			6.18m- no more dark red brown iron stained alterations	SW		a=1.3 d=1			
					Gradational boundary with:	FR			97%		
			7		**LAMINITE**: siltstone 70% and sandstone 30%, siltstone is dark grey, pale grey fine grained sandstone, distinct planar and lenticular interlaminations at 0°-5°						
		52									CS, 0 - 5°, PL, 2 mm Highly fractured zone of PTs
					7.43m- laminations becoming planar			a=2.4 d=0.77			

Defects are PT, 0°-5°, PL, RO, CO-FeSN unless noted otherwise

CDF_0_9_03AA.GLB Log COF CORED BOREHOLE GEOTLCOV24333AC.GPJ -112/06/2012 10:44

method & support

DT	diatube
AS	auger screwing
AD	auger drilling
RR	roller/tricone
CB	claw or blade bit
NMLC	NMLC core
NQ	wireline core (47.6mm)
HQ	wireline core (63.5mm)
PQ	wireline core (85.0mm)
SPT	standard penetration test

water

10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery

core recovered (graphic symbols indicate material)
no core recovered

core run & RQD

barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*

RS	residual soil
XW	extremely weathered
HW	highly weathered
MW	moderately weathered
DW	distinctly weathered
SW	slightly weathered
FR	fresh

* W replaced with A for alteration

strength

VL	very low
L	low
M	medium
H	high
VH	very high
EH	extremely high

defect type

PT	parting
JT	joint
SZ	sheared zone
SS	sheared surface
CS	crushed seam
SM	seam

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	irregular

roughness

VR	very rough
RO	rough
SO	smooth
POL	polished
SL	slickensided

coating

CN	clean
SN	stained
VN	veneer
CO	coating

coffey geotechnics

Engineering Log - Cored Borehole

Borehole ID.	***NWR-BH134***		
sheet:	3 of 4		
project no.	***GEOTLCOV24333AC***		
client:	***Transport for New South Wales***	date started:	***02 Feb 2012***
principal:		date completed:	***02 Feb 2012***
project:	***North West Rail Link Geotechnical Investigation***	logged by:	***RH***
location:	***Tallawong Road***	checked by:	***AJH***

position: E: 305516; N: 6269806 (MGA94 Zone 56) surface elevation : 59.16m (AHD) angle from horizontal: 90°

drill model: Hydrapower Scout mounting: Truck Casing Diameter : HW

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	material description (ROCK TYPE: grain characterisics, colour, structure, minor components)	weathering & alteration	estimated strength & Is(50) (X = Axial; O = Dimetral)	samples, field tests & Is(50) (MPa) (a = Axial; d = Dimetral)	core run & RQD	defect spacing (mm)	defect description (type, inclination, planarity, roughness, coating, thickness, other)
HQ3		51		7.95m- laminations becoming planar and lenticular	FR					
				LAMINITE: siltstone 70% and sandstone 30%, siltstone is dark grey, pale grey fine grained sandstone, distinct planar and lenticular interlaminations at 0°-5°			a=1.8 d=1.3	97%		PT, 0 - 5°, UN, RO, CN
			9							
		50		9.19m- with some fine grained pale grey and white sandstone bands to 30mm, approx. 40% sandstone						
				9.80m- laminations predominately planar			a=1.8 d=1.5			
			10							
		49					a=1.3 d=1.2			
				LAMINITE: siltstone 40% and sandstone 60%, dark grey siltstone, fine grained, pale grey sandstone, distinct planar interlamination and interbeds to 20mm at 0°-10°				100%		JT, 85°, PL, RO, CN, 160 mm
			11							
		48		11.18m- increasing siltstone content to approx. 60%			a=1.5 d=1.1			
				11.65m- increasing sandstone content to approx. 60%-70%	SW - FR					
			12	11.75m- trace of dark red iron staining						
		47					a=1.5 d=1.4			
			13		FR					
		46					a=2.3 d=1.5	100%		
				13.40m- trace of lenticular laminations						
			14							
		45		14.00m increasing siltstone content to approx. 60%-70%						
				14.27m- with some lenticular laminations			a=1.5 d=1.4			
			15							
		44								
				15.40m- increasing sandstone content to approx. 70%				100%		
							a=3.2			

Defects are PT, 0°-5°, PL, RO, CN unless noted otherwise

CDF_0_9_03AA.GLB Log COF CORED BOREHOLE GEOTLCOV24333AC.GPJ -112/06/2012 10:44

method & support

DT	diatube
AS	auger screwing
AD	auger drilling
RR	roller/tricone
CB	claw or blade bit
NMLC	NMLC core
NQ	wireline core (47.6mm)
HQ	wireline core (63.5mm)
PQ	wireline core (85.0mm)
SPT	standard penetration test

water

10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery

core recovered (graphic symbols indicate material)
no core recovered

core run & RQD

barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*

RS	residual soil
XW	extremely weathered
HW	highly weathered
MW	moderately weathered
DW	distinctly weathered
SW	slightly weathered
FR	fresh

* W replaced with A for alteration

strength

VL	very low
L	low
M	medium
H	high
VH	very high
EH	extremely high

defect type

PT	parting
JT	joint
SZ	sheared zone
SS	sheared surface
CS	crushed seam
SM	seam

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	irregular

roughness

VR	very rough
RO	rough
SO	smooth
POL	polished
SL	slickensided

coating

CN	clean
SN	stained
VN	veneer
CO	coating

coffey geotechnics

Engineering Log - Cored Borehole

client:	*Transport for New South Wales*	Borehole ID.	***NWR-BH134***
principal:		sheet:	4 of 4
project:	***North West Rail Link Geotechnical Investigation***	project no.	***GEOTLCOV24333AC***
location:	***Tallawong Road***	date started:	***02 Feb 2012***
		date completed:	***02 Feb 2012***
		logged by:	***RH***
		checked by:	***AJH***

position: E: 305516; N: 6269806 (MGA94 Zone 56) surface elevation : 59.16m (AHD) angle from horizontal: 90°

drill model: Hydrapower Scout mounting: Truck Casing Diameter : HW

drilling information				material substance						rock mass defects		
method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50) (X = Axial; O = Dimetral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = Axial; d = Dimetral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	defect description type, inclination, planarity, roughness, coating, thickness, other particular general
HQ3		43			**LAMINITE**: siltstone 30% and sandstone 70%, siltstone is dark grey, pale grey fine grained sandstone, distinct planar and lenticular interlaminations at 0°-5° 16.30m- increasing siltstone content to approx. 50%	FR		d=1.8 a=1.9 d=1.3			Defects are PT, 0°-5°, PL, RO, CN unless noted otherwise
		42	17					a=1.2 d=1.5	100%		
		41	18		18.22m-18.54m- trace of dark red brown iron stained bands to 35mm	SW - FR FR		a=1.7 d=1.3	100%		
		40	19					a=1.4 d=0.93			
		39	20		Borehole NWR-BH134 terminated at 20.00 m Target depth Borehole grouted to surface.						
		38	21								
		37	22								
		36	23								

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