15. Other environmental issues

This chapter provides an assessment of additional environmental issues not previously discussed in subsequent chapters but identified as requiring further assessment in the Minister's Conditions of Approval (MCoA) and the Statement of Commitments (SoC) for the Concept Plan. The chapter includes a discussion on potential impacts related to air quality and greenhouse gases, economic and business aspects, groundwater and salinity, geotechnical contaminated land and hazardous materials, public safety, waste disposal, services and utilities, groundwater and subsurface hydrology and bushfire risk. The chapter also provides a detailed discussion on the project's compliance with relevant additional assessment requirements specified in the Concept Plan, MCoA and SoC. The chapter concludes with a discussion on the cumulative impacts of the project.

15.1 Air quality and greenhouse gases

15.1.1 Assessment undertaken for the Concept Plan EA

The air quality assessment undertaken for the Concept Plan Environmental Assessment (EA) identified that dust and other emissions would be generated during construction. Dust generating activities would include:

- loading of aggregate material onto trucks
- operation of bulldozers, scrapers and excavators
- movement of vehicles on unsealed roads
- wind erosion from exposed surfaces.

The dust load generated would be unlikely to result in reduced local air quality at the nearest potentially affected receptors with the implementation of standard management and mitigation measures. Further, other emissions (primarily carbon dioxide) would be generated during construction from the operation of vehicles and site plant and machinery.

The Concept Plan EA stated that an Air Quality Sub-plan would be prepared as part of the Construction Environmental Management plan (CEMP).

In the long term compared to the do-nothing scenario, the operation of the project would benefit the local and regional air quality through the provision of public transport, generating a mode shift away from private cars. On a per capita basis, this would lead to reduced combustion of diesel and petrol fuels, consequently reducing the production of greenhouse gases.

15.1.2 Additional assessment requirements for project approval

No MCoA relate to the potential air quality and greenhouse gas impacts of the project. SoC B1 relates to minimising air quality and greenhouse gas impacts. Compliance with this SoC is discussed in Appendix D.

The project design has not changed significantly, so no quantifiable air quality impacts or greenhouse gas emissions additional to that described in the Concept Plan EA would be expected. As such, no further detailed monitoring or modelling of air quality impacts and greenhouse gas emissions was undertaken. Sections 15.1.3 and 15.1.4 provide more detail on the assessment undertaken. The mitigation measures that would be implemented are discussed in Section 15.1.5.

15.1.3 Construction impacts

Ambient air quality may be temporarily affected as a result of particulate (dust), exhaust emissions and greenhouse gas emissions during the construction of the project. These impacts are discussed in more detail in the sections below.

Dust generating operations

The amount of dust generated during the construction phase would depend on the soil properties (silt and moisture content) and the activities undertaken. Further, dust emissions would be higher during unfavourable weather conditions, such as dry weather and high wind. The triggers and procedures for dealing with these conditions would be detailed as part of the CEMP.

The types of construction machinery that could give rise to fugitive dust and combustion emissions include:

- wheel loaders
- dump trucks
- bulldozers
- diesel locomotives and generators
- transport vehicles.

The dust impacts at potentially affected receptors would decrease with increased distance from the dust generating sources. Receptors greater than 200 metres from construction works are anticipated to experience negligible dust impacts.

The dust load generated over a typical construction day would be low. The implementation of best practice management and mitigation measures, as discussed in Section 15.1.5, would minimise impacts on the local air quality and nearest potentially affected receptors.

Mobile vehicular emissions

Exhaust emissions during construction would be associated with the combustion of fuel in both diesel and petroleum-powered vehicles and diesel powered RailCorp maintenance trains. The operation of on-site machinery during the construction works and general site operations would generate carbon monoxide (CO), nitrous oxides (NO_x), sulfur dioxide (SO_2), PM_{10} (particles with a size of 10 micrometres or less), volatile organic compounds (VOCs), and polyaromatic hydrocarbon (PAH) compounds.

Poor maintenance of construction machinery and vehicles would result in inefficient fuel use and increased emissions, particularly of CO and particulate matter. The implementation of the mitigation measures discussed in Section 15.1.5 would minimise emissions from construction vehicles and plant and would not result in significant air quality impacts.

Greenhouse gas emissions

An increase in greenhouse gas emissions, primarily carbon dioxide, would be expected during construction of the Project. Greenhouse gas emissions may be emitted directly or indirectly. The main directly emitted greenhouse gas sources associated with construction activities would comprise transport of materials to site (vehicle emissions), fuel consumption associated with construction machinery (particularly from the movement of spoil by heavy vehicles) and the removal of vegetation. Indirect greenhouse gas emissions as a result of the Project would include emissions associated with the consumption of electricity within site compounds and construction equipment, extraction of diesel and the emissions embodied in the products used on-site, particularly steel and concrete.

With the application of standard mitigation and best practice construction methods, the greenhouse gas emissions generated over a typical construction day are not expected to result in reduced local air quality at the nearest potentially affected receptors.

Measures that would be implemented to manage air quality impacts during construction are discussed in Section 15.1.5.

15.1.4 Operational impacts

The operation of the project would generally benefit local and regional air quality. However, there would still be emissions to air associated with:

- operation of trains
- operation of the train stabling facility
- maintenance using diesel rail vehicles
- vehicle emissions.

Trains

Trains operating on the project would be electric multiple unit vehicles operating from a nominal 1500 volt DC overhead power reticulation system. As such, there would be no significant point source emissions from the trains themselves, with the exception of minor dust and particulate emissions from brake pads and lubricating oils. Therefore, as detailed in the Concept Plan EA, no significant air quality impacts are likely to result from the operation of the project.

The operation of additional train services on the upgraded rail line would result in increased greenhouse gas emissions through increased electricity use. However, this increase is expected to be small on a per capita basis (i.e. the amount of electricity consumed relative to the number of passengers using the project), and is likely to be offset by minimising increases in greenhouse gas emissions from private motor vehicles — on the basis that the project is expected to generate a mode shift from private cars to public transport (i.e. existing motorists use the train service instead of private vehicles). Such a mode shift in travel behaviour is likely to be facilitated by continuing increases in the cost of fuel as a result of global crude oil prices (Australasian Railway Association 2006). The average cost of unleaded fuel within Sydney increased by approximately 155% between October 2000 and October 2008 (Australian Automobile Association 2008a), while crude oil prices increased by approximately 190% between July 2002 and July 2008 (Australian Automobile Association 2008b).

Increasing fuel prices are likely to generate an increased demand for public transport as motorists seek alternative and more economical modes of transport (Australasian Railway Association 2006). Such a mode shift would reduce the amount of fuel consumed in private motor vehicles and thus would result in a relative reduction in associated greenhouse gas emissions.

The Bureau of Transport and Communication Economics estimates carbon dioxide emissions from a typical suburban train at 150 grams per passenger kilometre (including emissions from electricity generated to power trains), which is relatively less than the 210 grams per passenger kilometre emissions generated by private vehicles (State Rail Authority 1995). In addition, it is estimated that an eight-car Tangara train at full passenger capacity could replace up to 1,400 cars on the Sydney road network (DEC 1995).

In the long term, the project is expected to benefit local and regional air quality through the provision of more frequent public transport services into an area that would otherwise be heavily reliant on private vehicle use. The commencement of operation of the project is expected to generate a mode shift from private cars to public transport. This would result in substantially reduced combustion of diesel and petrol fuel in private vehicles, in comparison to the do-nothing scenario and, consequently, would reduce greenhouse gases emissions that would otherwise occur without the project.

Stabling facility

Minor air emissions would be generated from the operation of on-site machinery and vehicles at the Leppington Train Stabling Facility. These emissions would be of an intermittent nature, however, and would have minimal impact on air quality including greenhouse gases.

Maintenance using diesel rail vehicles

The project would also generate air pollution emissions during the maintenance of stations, track work and associated infrastructure through using diesel rail vehicles.

It is not expected that these activities would generate a significant increase in air quality impacts and emissions compared to existing rail operations and maintenance activities.

Vehicle emissions

Greenhouse gas emissions associated with rail patrons travelling to and from Leppington and Edmondson Station (commonly referred to as downstream emissions) would be minimised through integration of bus interchange facilities and bicycle facilities as well as provision of good pedestrian access to the station. This would minimise the need for people to travel by car and maximise opportunities for use of more sustainable modes of transport.

Vehicle exhaust emissions would be localised, and as such, would not affect sensitive receptors.

TIDC's role in the development of masterplanning of the area also provides an opportunity to advocate for an appropriate land use mix around the station, which would maximise the number of people able to walk and cycle to the station as well as maximising rail patronage in general.

15.1.5 Mitigation measures

Construction phase

Consultation with affected communities would be undertaken throughout the construction of the project. Newsletters and other communications tools would be used to distribute information to the community about work progress, consultation activities, upcoming works and all project contact points.

An Air Quality and Dust Management Sub-plan would be prepared prior to construction and would include the following mitigation measures to minimise the potential for dust migration from the site, emissions from on-site machinery and traffic, and from construction traffic using public roads:

- All equipment would be inspected before use to prevent against the release of smoke and contravention of the NSW *Protection of Environment Operations Act* 1997 and the *Protection of the Environment Operations (Clean Air) Regulation 2002*.
- The use of sealed surfaces on all construction sites would be maximised.

- Site speed limits would be implemented to prevent any unnecessary generation of fugitive dust emissions.
- Site movements would be kept to a minimum.
- All plant machinery would be regularly maintained and comply with all applicable standards and guidelines.
- All vehicles transporting material to and from sites would be covered immediately after loading to prevent wind blown dust emissions and spillages.
- Tailgates would be securely fixed prior to loading and immediately after unloading.
- Stockpiles would be located away from sensitive receptors where possible.
- Rumble grids would be installed at the main construction site exits to remove any dirt or dust from vehicles.
- Appropriate dust control measures would be implemented as required to minimise dispersion of dust from construction areas.
- The concurrent undertaking of multiple dust generating activities in proximity to each other would be minimised, except during rainfall events.
- Handling of dust generating materials would be minimised and drop heights to trucks and/or skips would be kept to a minimum.
- All on-site conveyors would be either enclosed or partially enclosed to reduce fugitive dust emissions.
- All site vehicles and machinery would be well maintained and switched off when not in use to eliminate the generation of any unnecessary emissions.
- On-site burning of waste at any of the construction sites, depots or pre-cast yards would not be permitted.
- All site generated waste would be disposed of at registered waste facilities.
- All odorous or potentially odorous materials would be removed off-site.

Construction procedures would be modified during periods of high wind and in dry conditions. As such, local meteorological conditions would be observed on a daily basis during construction (this may include the establishment of a meteorological station or wind sock). Mitigation measures that would be implemented during adverse weather conditions include:

- A mobile dust suppression system would be used to dampen vehicle route ways and unpaved areas (the extent and number of times would depend on the prevailing weather conditions).
- Activities that potentially generate high levels of dust may be curtailed, suspended or postponed in situations where the wind direction and speed is causing adverse impacts on nearby sensitive receptors.
- All stockpiles would be covered, enclosed on three (3) sides or kept moist using rotary sprinklers, particularly during dry or windy conditions.

All construction sites and exposed areas would be appropriately rehabilitated once construction works are complete.

Management measures to reduce construction-related greenhouse gas emissions are limited. Notwithstanding this, the following measures would be implemented to minimise greenhouse gas emissions during construction:

- Energy (fuel/electrical) efficiency would be considered when selecting equipment.

- Equipment would be regularly maintained to retain fuel efficiency.
- Where feasible, biofuels would be used (biodiesel, ethanol, or blends such as E10 and B80), to reduce greenhouse gas emissions from construction plant and equipment.
- Vegetation clearance would be minimised and revegetation would be undertaken where feasible.
- Energy efficient work practices would be adopted to limit energy use, including conducting energy conservation awareness programs for all site personnel and undertaking energy audits to identify and address energy waste.
- Plant and office-based equipment (including lights and computers) would be operated in an efficient manner and would be regularly maintained.
- If available and feasible, electrical energy derived from a renewable energy source would be used to supplement the supply of the on-site electrical energy required during construction.
- Locally-sourced materials and staff would be used wherever possible, to reduce transport-related emissions.
- Recycled materials, such as replacement of cement with fly ash, recycled aggregate, and recycled content in steel, would be used to minimise the lifespan impact of greenhouse gas emissions in production.
- Low greenhouse-intensity materials would be substituted where appropriate.

15.2 Economic and business impacts

15.2.1 Assessment undertaken for the Concept Plan EA

The key potential impacts identified in the Concept Plan EA are summarised in Table 15-1.

Table 15-1 Identified key potential economic and business impacts

Identified key potential impact	Description
Regional economic benefits associated with increased accessibility across the region	The SWRL would facilitate economic development, investment and residential development. There would also be reduced socio-economic costs associated with reduced road congestion, air pollution and road accidents, and improved transport affordability.
Temporary construction impacts	Some businesses in the vicinity of work sites may experience temporary adverse impacts. Other businesses (e.g. construction contractors) would benefit from the project construction.
Positive and negative impacts on some businesses in the area	Impacts would depend on the circumstances of the business. The overall potential impact would be positive with any negative effects short-term and minor.

The following mitigation measures were proposed in the Concept Plan EA:

- undertake further assessment of the magnitude of the impacts of construction on adjacent businesses as part of the Community and Stakeholder Involvement Plan
- consult with business owners during construction planning to address their concerns, as part of the Community and Stakeholder Involvement Plan
- liaise with NSW Department of Planning (DoP) and Campbelltown City Council with regard to Glenfield Transport Interchange.

These mitigation measures would be implemented in the pre-construction stages of the project.

15.2.2 Additional assessment requirements for project approval

The Concept Plan SoC outlines the additional requirements that must be satisfied in order to obtain project approval. SoC B42 relates to economic and business impacts. Compliance with this SoC is discussed in Appendix D.

15.2.3 Assessment approach

The economic and business impact assessment was completed qualitatively and involved the following key components:

- an overview of the economic significance of the South West Rail Link (SWRL) on local businesses
- a description of the key economic benefits associated with the provision of the SWRL
- a business survey to identify those businesses affected by the construction and operation of the SWRL
- an assessment of the likely direct and indirect economic impacts on businesses in terms of viability, profitability, productivity and sustainability.

15.2.4 Economic significance of the SWRL

Although there is no direct study quantifying the SWRL's contribution to productivity, growth and economic prosperity, there is a large body of work indicating that the provision of this type of infrastructure has a positive effect on growth and standards of living. Taken together, the implications of previous studies for the development of the SWRL and the wider South West Growth Centres (SWGC) are as follows:

- public infrastructure provision is an important determinant for successful development in terms of productivity improvement and hence economic output and growth
- public infrastructure provision provides the foundations to attract private sector investment in the region
- high quality rail interchanges provide the conditions for economically vibrant commercial centres.

15.2.5 Economic benefits of the SWRL

The operation of the SWRL would bring about the following economic benefits:

- *Improved productivity and growth in the region* — Public transport access to areas not previously served by rail would help facilitate improved connectivity, investment and residential development along the new rail corridor. This impact is expected to be reflected by a positive change in output, gross regional product, personal income and employment in the region. The SWRL would also provide greater access to both the existing and future key employment centres of Liverpool and Leppington (as described in the *Sydney Metropolitan Strategy*) as well as create employment opportunities for contractors during the construction of the project.
- *Reduced socio-economic costs* — The SWRL would reduce reliance on private vehicles and the number of vehicles on roads, therefore, reducing the amount of congestion, local air pollution, greenhouse gas emissions and motor vehicle accidents compared to the do –nothing scenario. The SWRL would improve travel times, the productive capacity of the region, prospects for better gross regional product and the overall well-being of the community.

- *Improved public transport affordability* — The cost of using the SWRL is expected to be less than other modes of transport currently available in the planned SWGC. The improvement in transport affordability is also expected to translate into higher household incomes for communities in the region.

15.2.6 Business impacts

Construction impacts

The SWRL would take approximately five years to construct. This would involve a large investment by the NSW Government and is expected to generate considerable and positive initial and flow on economic impacts on local and regional businesses.

The project is also likely to result in minor adverse impacts on businesses located within and around the SWRL corridor during construction. The main issue would be the temporary loss of access to businesses during construction. Consultation with local businesses (including working farms) has been undertaken, and would continue to be undertaken, so that this impact is minimised. This impact is expected to be minor, with all main access routes to remain open as far as practicable. This temporary adverse impact is considered acceptable in consideration of the positive impacts that the SWRL would bring to local business during construction and operation.

Initial potential impacts relate to the value of goods and services required to construct the project. The following business types located in the south-west would generally be positively affected:

- construction contractors
- landscaping contractors
- civil engineering contractors
- suppliers.

Further, businesses would benefit from a direct increase in demand for goods and services resulting in an increase in sales turnover.

Operational impacts

The SWRL is expected to be operational by 2016. At this time, it is expected that the majority of businesses would be positively impacted by the operation of the SWRL.

The south-west region would experience a steady increase in patron movement and population growth. The resulting increase in demand would improve sales turnover and provide greater employment opportunities for existing businesses. However, the ability of existing businesses to meet the increase in demand is likely to exceed the available supply as the market expands. New opportunities for entrepreneurs would, therefore, emerge, along with inward investment into the region as new businesses are established to meet growing demand.

The improvement in transportation and access afforded by the SWRL would attract inward investment and demand for goods and services. As a result of this growth, businesses would most likely respond by changing type and composition to better meet consumer needs and preferences. Existing businesses would expand or new businesses would be established to meet demand for goods and services. This in turn would lead to regional economic growth.

The above factors, together with broader land and housing development, would lead to a steady increase in direct and indirect economic activity and demand for goods and services.

Direct impacts

Direct impacts would arise from the operation of the new Edmondson Park and Leppington Stations. For example, a direct increase in the number of park-and-ride station patrons in the vicinity would result in an increase in consumption of goods and services for nearby businesses.

Indirect impacts

Indirect impacts relate to the flow-on effects that arise from the operation of the SWRL. This would include the spill-over effects associated with the development of the SWRL, such as the associated population growth. The net effect would be an increase in the number of consumers in the local area, resulting in increased viability, profitability, productivity and sustainability of businesses.

The project would potentially have adverse impacts on working farms located in and around the SWRL. A direct impact would be the loss of land, through acquisition of some lots on which the project would be located. Figure 6-18 in Chapter 6, shows the land that is to be acquired as part of the SWRL. This land acquisition has been discussed with landowners both prior and subsequent to the Concept Plan Approval.

15.2.7 Summary

Overall, the key economic and business impacts of the SWRL would be as follows:

- increased number and type of businesses across new and existing development areas, reflecting increased demand for goods and services
- enhanced competition across new and existing development areas, reflecting growth in business activities, business expansion and new start-ups
- growth in profitability across new and existing development areas, reflecting increased commerce and demand for goods and services
- improved access to, and larger stock of labour and customers for, local and regional businesses, reflecting improved connectivity and movement of people across metropolitan Sydney
- potential for higher property values and rents for local and regional businesses, reflecting growth in the demand for real property as a result of rising population, income and business activity
- facilitation of improved connectivity, investment and residential development along the new rail corridor, which could result in a positive change in output, gross regional product, personal income and employment in the region
- provision of greater access to both existing and future key employment centres of Liverpool and Leppington
- creation of employment opportunities for contractors during the construction of the project
- improved travel times, productive capacity of the region, prospects for better gross regional product and the overall well-being of the community
- improved transport affordability which may translate into higher household incomes for communities in the region.

There are no additional mitigation measures that would be implemented for economic and/or business impacts. The current measures listed in Section 15.2.1 remain relevant.

15.3 Groundwater and subsurface hydrology

15.3.1 Assessment undertaken for the Concept Plan EA

Desktop assessment undertaken of the Concept Plan determined the following:

- Saline soil/groundwater conditions would be expected to be encountered at crossings of major creeks or in large cuttings.
- Saline groundwater can contribute to the corrosion of building materials.
- Given the low permeability of bedrock along the SWRL route, minimal saline groundwater would be expected in most cuttings.
- Creek and floodplain crossings would generally be on fill or structure, so no saline groundwater interaction would be expected.

The assessment made the following recommendations for future stages of the project:

- Further investigation and characterisation of groundwater salinity levels and their extent would be undertaken along the corridor during the future design stage in order to allow for the use of salt resistant building materials and the design of structures with appropriate durability as required.
- In areas where saline groundwater is considered likely to affect structures and foundations associated with the SWRL, general construction measures (as outlined in Western Sydney Regional Organisation of Councils' (2004) Western Sydney Salinity Code of Practice and Department of Infrastructure, Planning and Natural Resource's (2003) Building in a Saline Environment) would be employed to assist construction design. These would be detailed in the Soil and Water Management Sub-plan to be incorporated into the overall CEMP prior to construction.
- The primary issues associated with groundwater would occur during construction. However, the design would need to make sure that the construction of structures would not have any potential ongoing impacts on groundwater. In conjunction with geotechnical investigations during the further design of the project, groundwater levels and quality would be assessed to determine the risk to groundwater resources and the proposed structures.

15.3.2 Additional assessment requirements for project approval

The Concept Plan EA noted that further investigation and characterisation of groundwater salinity levels and their extent would be undertaken during the future design stage. This would determine the requirement for salt-resistant building materials and enable structures to be designed with appropriate durability. Further, the Concept Plan EA notes that groundwater levels and quality would be assessed to determine the risk to groundwater resources and proposed structures.

The Concept Plan SoC outlines the additional requirements that must be satisfied. SoC B45 states that geotechnical investigations undertaken would assess groundwater levels and groundwater and soil quality to identify risks associated with saline groundwater and saline soils. Compliance with this SoC is discussed below and summarised in Appendix D.

15.3.3 Construction impacts

The potential impacts on elements that are buried or in contact with the ground and groundwater include:

- impacts on cement-like materials caused by acidic groundwater
- corrosion of building materials due to saline groundwater
- corrosion of steel in acidic groundwater
- corrosion of steel and steel reinforcement in ground/groundwater containing chloride and sulfates.

The uncovering of saline and/or contaminated groundwater, and its subsequent disposal, could affect water quality in nearby creeks and tributaries. In areas where the water table is high, groundwater may be encountered during excavation, requiring disposal during construction. It is likely that saline groundwater conditions exist within the project area due to the moderate to high salinity potential in the area. There is also the potential for contaminants to be present within groundwater; particularly in areas identified as having moderate to high potential for presence of contaminated materials. However, the design would be developed to minimise potential impacts from exposure of groundwater to the surrounding environment.

Any groundwater exposed during construction would have the potential to cause erosion and sedimentation, as well as instability of ground conditions, if not properly managed. As such, a review of groundwater conditions encountered during construction is required so that design measures are appropriate.

Temporary dewatering may be required at locations where deep cuttings are to be constructed or where other infrastructure is required to extend below the water table. A groundwater management plan would be required to outline the local groundwater conditions, dewatering methodology, water disposal options monitoring and protection measures to satisfy conditions imposed by the NSW Office of Water and Council. The groundwater management plan would address impacts to the local hydrological regime during and after construction. Drainage features may be required to minimise the impact of the project on long-term groundwater flow and reduce the likelihood of groundwater mounding.

15.3.4 Operational impacts

Saline conditions are known to exist in the vicinity of the site and the Map of Salinity Potential in Western Sydney (Department of Infrastructure, Planning and Natural Resources 2002) indicates that the proposed SWRL is typically located within areas of moderate salinity. Areas of high potential salinity are associated with creeks and low-lying land. It has been found that salinity increases with depth in this area. Potential salinity impacts include:

- Potential salinity impacts on the project, notably degradation of steel and concrete foundation structures over the operational life of the project.
- Wider environmental impacts (i.e. vegetation damage, death and salinisation of waterways) as a result of the project, through mobilisation of previously stable saline groundwater occurrences.

Furthermore, in some areas of cuttings, there is the potential for perched groundwater, including potentially saline groundwater (subject to further testing) to be exposed, which would require active ongoing management to prevent erosion and impacts of saline groundwater on the receiving environment.

The creation of areas of the project in cuttings, where below natural groundwater levels, could result in long-term groundwater flows that could potentially result in the need for active management. Design of drainage for slopes in cut is sensitive to changes in groundwater level, which may occur due to seasonal groundwater changes. Further investigations would be required during detailed design to minimise the potential impact on groundwater as a result of excavation below natural ground levels.

Additional geotechnical investigations undertaken following Concept Plan Approval were documented in the *Geotechnical Desk Study – South West Rail Link* (Global Arc August 2008). Areas of alluvial deposits, for example at the eastern end of the alignment near the southern flyover and at creek crossings, comprise areas of shallow groundwater, which in some areas would be above the depth of foundation structures. In such locations the presence of groundwater has the potential to create long term stability problems for submerged structures. This would therefore require further consideration during detailed design.

15.3.5 Mitigation

In order to minimise groundwater and sub-surface hydrology impacts during construction and throughout the operation of the project, the following mitigation measures would be implemented:

- Groundwater levels and quality would be assessed to determine the risk to groundwater resources and the proposed structures prior to construction.
- Detailed geotechnical investigation to guide the detailed design and construction of the project (this work has already commenced).
- Construction materials would be selected based on the likelihood of shallow groundwater and effects of salinity.
- Groundwater encountered during construction would be managed and disposed of in accordance with Department of Environment, Climate Change and Water requirements, including the *Waste Classification Guidelines* (Department of Environment and Climate Change 2008).
- Drainage blankets would be installed in locations where groundwater is to be intersected during construction to transport groundwater away from the infrastructure and prevent groundwater mounding.
- Contact between structures and groundwater would be minimised where possible.
- Further assessment of salinity conditions would be undertaken along the proposed SWRL alignment, including a desktop review, a site inspection and subsurface investigations, where required.
- A Salinity Management Sub-plan specific to the proposed development area would be provided for locations where salinity has the potential to pose a risk to infrastructure.
- The duration of exposure of sodic and saline soils would be minimised as far as possible throughout construction.
- Concrete that would be in contact with highly saline ground/groundwater would be blended with cement in order to provide better resistance against sulfate attack.

- General construction measures would be employed to assist construction design where saline groundwater has the potential to affect structures and foundations, such as those outlined in *Western Sydney Salinity Code of Practice* (Western Sydney Regional Organisation of Councils 2004) and *Building in a Saline Environment* (Department of Infrastructure, Planning and Natural Resources 2003).
- Where groundwater is above the level of the project foundations, detailed design must include measures to prevent the development of instability of foundation structures.
- For any areas in cut where perched groundwater is exposed, drainage at the toe of the slope and on the slope itself would be provided to protect the slope from erosion from surface flows of emerging groundwater. This would be considered further during detailed design.

The above mitigation measures would be implemented through a Construction Water and Soil Management Sub-plan to be incorporated into the overall CEMP prior to construction.

15.4 Geotechnical, contaminated land and hazardous materials

15.4.1 Assessment undertaken for the Concept Plan EA

The contaminated land and hazardous materials impact assessment undertaken as part of the EA and Concept Plan (Parsons Brinckerhoff 2006a) identified that the primary source of concern was the land formerly occupied by the Ingleburn Army Camp. There is potential for unexploded ordnance (UXO) (artillery) and contaminants to be present in this area.

No specific assessment of geotechnical conditions was undertaken as part of the Concept Plan EA.

The Concept Plan EA stated that TIDC would liaise with the Department of Defence, the current landholder of the former military land, to establish that site remediation works, if required, have been carried out prior to construction. Following remediation, a site validation report and/or a long-term Environmental Management Plan would be developed and implemented.

15.4.2 Additional assessment requirements for project approval

The Concept Plan SoC outlines the additional requirements that must be satisfied in order to obtain project approval. SoC B46 relates to soils, contaminated land and hazardous materials. Compliance with this SoC is discussed below and in Appendix D. Furthermore the concept plan outlined that additional geotechnical investigations would be undertaken as part of detailed design. These investigations are ongoing.

15.4.3 Additional assessments undertaken

As part of design development, a geotechnical desk-top study was undertaken by Aurecon/Aecom (AA) with the following objectives:

- to characterise the anticipated general surface and subsurface conditions
- to identify potential geotechnical issues that may constrain the concept design development of the project
- to assist in planning the geotechnical field investigations required to progress the design.

The aspects of the project that require geotechnical advice in design include:

- foundations and stability of major structures
- embankments
- cuttings
- sub-grade preparation.

15.4.4 Construction impacts

The main geotechnical issues that would affect the design and construction of the project are:

- anticipated ground conditions
- cuts
- embankments
- foundations
- slope stability
- reuse of materials
- contamination
- salinity (discussed in Section 15.3).

Each of these issues is discussed in the sections below. This assessment is based on preliminary information. Further detailed geotechnical investigations would be required during subsequent stages of the design to address the general geotechnical issues in the concept and detailed design phases.

Anticipated ground conditions

The soil profiles and their anticipated ground conditions are summarised in Table 15-2.

Table 15-2 Anticipated ground conditions

Soil profile	Details
Alluvium	Alluvial deposits are expected near creeks and the southern flyover. Areas of alluvial deposits require careful investigation for stability and foundation design purposes. Shallow groundwater is expected in the alluvial profile.
Residual clay	The residual soil profile is likely to consist of residual clays over weathered Ashfield and Bringelly shales and would be relatively shallow (approximately two metres deep).
Weathered shale	Weathered bedrock was identified at four locations in the vicinity of the proposed SWRL alignment. Bedrock would be encountered at relatively shallow depths (approximately two metres) along large sections of the alignment.

Cuts

The proposed shallow cuts (less than 15 metres) could encounter residual clays and silts over weathered bedrock of the Ashfield and Bringelly shale groups. As such, the cuts are likely to be susceptible to erosion.

Embankments

Relatively shallow embankments would be used (up to approximately ten metres high) for the project. Most of the proposed alignment comprises fine-grained residual soils of sufficient strength to support the embankment heights with little or no ground improvement. However, short lengths of embankment would be situated on alluvial deposits at creek crossings, and as such, would require ground improvements.

Foundations

The foundations for all major structures would be taken down to or connected to the underlying bedrock. Depths of competent rock (and hence suitable foundation systems) would, therefore, be assessed as part of the field investigations.

Foundations would be designed to address local conditions. This would be considered further during detailed design.

Slope stability

Construction of embankments would need to take into account the characteristics and strength of the ground upon which the filling is to take place. This would allow for, acceptable materials to be used and compaction to appropriate standards. As such, the presence of soft material near ground surfaces would have to be taken into account in embankment designs.

Embankment design would take into account local soil conditions. This would be considered further during detailed design.

Reuse of materials

Ripped shale, sandstone and laminate would be generated from the lower levels of cut excavations. This material would be suitable for reuse as general fill material in embankment construction.

The residual soils generated from cut excavations, however, are likely to be of an expansive clay nature. Reuse as engineered fill material would, therefore, be limited to non-structural elements of embankments and landscaping.

Contamination

The uncovering of contaminants could pose health risks to construction workers, and prevent the reuse of spoil for other works within the project area. Contaminants could also result in off-site impacts associated with the mobilisation of onsite contamination, particularly via stormwater systems, and during the process of transportation and disposal of contaminated soil.

The main land uses along the project are agricultural and pastoral, with smaller areas of market gardens, low density residential and commercial/retail. The alignment also passes through a former military training area — Ingleburn Army Camp. The potential contamination sources in this location include:

- grenade UXO and munitions
- lead particulates associated with small arms and ammunition
- stockpiled bonded asbestos material
- filled areas potentially including building rubble and/or rubbish
- a large coal stockpile.

The rural and semi-rural areas may also present a moderate risk of contamination associated with herbicide and pesticide use, site filling, demolition of structures, fuel and lubricant storage and localised areas of chemical storage.

Materials handling and storage

The transportation and storage of dangerous goods and hazardous materials during the construction phase both to and from the main construction compounds poses a potential risk to the environment and people in the event of loss of containment.

It is likely that some dangerous goods and/or hazardous materials required for construction would be stored at construction sites (refer Table 15-3). The storage, handling and use of these materials would be undertaken in accordance with all relevant guidelines.

While the exact quantities and materials to be used during construction would be determined by the construction contractor following completion of the detailed design and construction program, it is likely that the materials detailed in Table 15-3 would be used.

Table 15-3 Dangerous goods and hazardous materials likely to be used and stored during construction

Material	Dangerous goods class	Likely use during construction	Mode of storage on-site (package size)
Diesel fuel	Not applicable[1] C1 combustible liquid	Refuelling of construction machinery and vehicles	Tank (bunded)
Oils, greases and lubricants	Not applicable[1] C2 combustible liquid	Maintenance and operation of construction machinery and vehicles	Drums (400 litre)
Petrol	3 – Flammable liquid	Refuelling of construction machinery and vehicles	Tanks (bunded)
Oxy-Acetylene	2.1 – Flammable gases	Welding	Cylinder (55 kilograms)
Cement	Not applicable	Construction material	Silos
Paint and epoxies	3 – Flammable liquid	Construction material	Containers (20 litres, bunded)
Hydrated lime	8 – Corrosive substance	Construction material	50 tonne moveable silos
Coldmix asphalt	Not applicable	Car parks	Bags/pallets (in container)

Note 1: Not listed as a 'dangerous good'; however, is listed as a 'hazardous material'.

Potential risks associated with the use, storage and transport of these materials during construction would be further mitigated by placing restrictions on their storage, and situating construction sites in accordance with site compound location criteria.

15.4.5 Operational impacts

Soils

Erosion and sedimentation may occur during the operation of the SWRL due to increased run-off from newly sealed surfaces (such as the new stations and car parks) and/or as a result of the presence of any exposed surfaces. Potential impacts of erosion and sedimentation include reduced air quality and sedimentation and increased turbidity levels in waterways and/or the local stormwater system. Air and water quality impacts are discussed in Section 15.1 and Chapter 10 respectively.

Contaminated Land

There is potential for contamination of land during the operation of the project through the disposal and handling of materials. Chemicals used in the operation of the track, stations and the train stabling facility could result in contamination of the corridor over time if not handled, disposed of or treated correctly.

Materials handling and storage

During operation, the handling and storage of dangerous goods and hazardous materials is likely to include:

- handling and storage of gases during the maintenance of rolling stock
- handling and storage of cleaning products, such as detergents and paint removal products, during train and building maintenance
- handling and storage of pesticides during landscape maintenance.

The storage of these materials is likely to be focused at the depot; however, some small quantities of chemicals, such as cleaning agents, would be stored in station buildings.

Spills and leaks associated with the transportation, use and storage of dangerous and hazardous materials could impact on and potentially contaminate the surrounding environment.

15.4.6 Mitigation

Construction

The following mitigation measures would be implemented to minimise potential soil impacts:

- Ground condition:
  - Ground improvement and/or deeper foundation systems would be undertaken where weaker alluvial layers are present.
  - Depth and degree of weathering would be assessed through subsurface investigation to assess excavatability, batter slopes and founding characteristics.
  - Heavily loaded structures would be founded on the weathered bedrock or better.
  - Lightly loaded structures would be founded at shallow depth.
  - Further assessment of the reactivity of clays would be undertaken.
- Cuts:
  - Vegetation of cut barriers would be required.
  - Cut slopes would be excavated at 1V:2.5H, space permitting.
  - Surface drains would be provided at the crest and toe of cuttings.
  - Further investigation of deeper cuts would be undertaken to assess the potential to stand up the lower sections of the cuts if required.
- Embankments:
  - Where soft soil is encountered, the surface would be excavated and replaced with engineered fill.
  - If the soft soil profile is deep, preloaded or piled embankments would be used.

- Foundations:
  - Bored or driven piled foundations would be used for heavy load structures and where there is very soft soil within alluvial deposits.
  - Piled or shallow footings would be used for structures founded on residual soil, depending on the anticipated loads and bearing pressures of the soil encountered.
  - Piled or shallow footings would be used for structures founded on rock, depending on the strength and characteristics of the encountered rock.
- Slope stability:
  - Methods for dealing with soft ground would be implemented during construction of embankments where alluvial deposits are expected so that ground settlement is not excessive and that embankment slopes are stable.
  - Design considerations would include drainage measures, where groundwater is above the proposed formation level.
  - Groundwater conditions encountered during construction would be reviewed so that design measures are appropriate.
  - Re-use of residual soils as engineered fill material would be limited to non-structural elements of embankments and landscaping.

As there is potential for contamination during construction of the proposed SWRL, an assessment would be undertaken at the detailed design phase to assess the risks and identify any potential areas of concern across the proposed rail corridor.

Operation

Potential erosion and sedimentation issues associated with project operation would be avoided to the greatest extent possible through project design. Remaining erosion and sedimentation risks would be managed through RailCorp's standard operational and maintenance procedures. Measures to manage water quality impacts are discussed further in Section 10.7.

Where possible, the quantity of hazardous materials stored would be minimised.

Any accidental spillages could lead to potential contamination of ground and surface water. All hazardous materials storage facilities would be bunded so that any spillages are contained within a confined area, particularly during construction.

15.5 Public safety

15.5.1 Assessment undertaken for the Concept Plan EA

The public safety impact assessment undertaken as part of the Concept Plan EA (PB 2006) identified the potential for security and public safety issues, particularly at night and during off-peak periods. It also identified the potential for safety issues during construction and committed to the fencing of all work areas and relocation of public facilities, where necessary. Further, the Upper Canal was identified as a potential risk to public safety and would need to be secured to reduce trespass and maximise safety.

The Concept Plan EA stated that standard environmental mitigation measures would be included in the CEMP.

15.5.2 Additional assessment requirements for project approval

The Concept Plan SoC outlines the additional requirements that must be satisfied in order to obtain project approval. SoC B43 relates to public safety. Compliance with this is discussed below and summarised in Appendix D.

15.5.3 Construction impacts

The construction of the project has the potential to present risks to public safety, particularly during excavation and electricity works. Residents and the general public in proximity to construction sites would be notified at the start of construction and provided information on minimising potential risks. Further, a CEMP would be prepared to address any potential risks to public safety prior to construction.

Key land uses at risk along the alignment include residential areas and sensitive receptors in proximity to construction worksites (e.g. Hurlstone Agricultural High School).

15.5.4 Operational impacts

The operation of the proposed SWRL would present only low-level risks to the community. Particularly considering that the alignment would be securely fenced and would operate with strict security procedures. Key hazards would relate to potential damage, injury or loss of life caused by interaction with electricity or illegal access to the rail corridor and depot/stabling facilities.

15.5.5 Mitigation measures

Construction

All construction compounds and work areas would be fenced and secured when not in use to limit public access during construction. Potential pedestrian and traffic safety issues would also be addressed by way of traffic management measures. These measures would be detailed in the Construction Traffic Management Sub-plan that would be prepared as part of the CEMP.

Operation

In order to manage potential safety and security issues, crime prevention through environmental design (CPTED) principles would be applied to all elements of the project. Such measures would include appropriate lighting, fencing of the rail corridor, and installation of surveillance cameras and help points at stations. These measures would be developed during the detailed design phase of the project. Other measures may include implementing hazard signs to alert rail workers and commuters of potential hazards.

15.6 Disposal of waste

15.6.1 Assessment undertaken for the Concept Plan EA

The waste, energy and demand on resources impact assessment in the Concept Plan EA noted that the proposed SWRL would generate various types of construction waste.

The Concept Plan EA stated that standard environmental mitigation measures would be included in the CEMP and any wastewater would be treated before being discharged.

15.6.2 Additional assessment requirements for project approval

The Concept Plan SoC did not contain any additional assessment requirements for the disposal of waste that need to be satisfied. Notwithstanding this, waste disposal should be considered so that such impacts are appropriately addressed.

15.6.3 Construction impacts

Waste generating activities during construction of the project would include earthworks, tunnelling, wash-down and maintenance of equipment and on-site office activities. The key waste streams generated during these activities would include:

- excess concrete
- contaminated/unsuitable spoil material
- excavated soil where cut/fill balance may not be achieved
- rock fragments from tunnelling activities
- scrap metal
- general construction waste (e.g. litter)
- fuels, oils, liquids and chemicals
- wastewater (e.g. sewage and groundwater dewatering).

The construction of the project is likely to result in substantial movements of spoil. As far as practicable, earthworks material would be reused on-site. Where excavated material is unable to be reused due to contamination, spoil would be disposed of to registered waste facilities. An assessment of contaminated land would be undertaken prior to construction to determine the suitability of spoil material for reuse on site and to identify potential risks associated with land contamination. Where the presence of contaminants is confirmed to be in concentrations above the intended land use criteria, the assessment will identify opportunities for remediation and/or disposal of affected spoil.

As far as practicable, wastewater generated from the wash-down of plant and equipment would be collected, treated and disposed of to the stormwater system on-site. Opportunities for onsite water reuse during construction would be explored and employed where appropriate.

All other waste streams, including construction waste, would be removed and disposed of in accordance with the relevant guidelines. All sewage generated from site compounds would be collected in septic tanks and transported to a registered waste facility for treatment.

15.6.4 Operational impacts

Waste generating activities during the operation of the project would include maintenance of trains and the rail alignment and the use of station facilities.

Maintenance waste streams would include:

- oils, grease and other chemicals from the servicing of trains at the depot maintenance workshop
- oils and greases from maintenance vehicles along the proposed project alignment
- scrap materials.

Station facility waste streams would include sewage, wastewater and rubbish from commuters as well as general office waste from station offices.

In relation to wastewater generated by the washing of trains and staff amenities, at the time of opening the area would not be sewered so there would need to be either a waste water treatment facility or facilities/procedures to tanker wastewater away from the stabling facility for treatment elsewhere. Once the area is sewered, options for connecting to the Sydney Water sewer under a trade waste licence would be reviewed. The details of wastewater treatment facilities and processes would be developed during the detailed design phase of the project.

The management of wastes during the operation of the project is not considered to be a key issue provided that standard mitigating measures are implemented.

15.6.5 Mitigation measures

Construction

Waste would be managed and disposed of in accordance with the requirements of the *Waste Classification Guidelines* (DEC 2008). Standard environmental mitigation measures to manage construction waste would be detailed in a Waste Management Sub-plan which would be prepared as part of the CEMP prior to construction. These measures would include:

- ensuring that any wastewater collected is appropriately treated prior to discharge in accordance with current standards
- exploration of opportunities for onsite water reuse during construction and employment on site where appropriate
- investigating opportunities to maximise re-use of construction spoil, including cut/fill balance during design
- investigating opportunities for potential reuse or recycling of other construction and demolition waste
- chipping leaf material and small branches of native vegetation should be considered for use as mulch in revegetation or landscaping works
- disposing of all other green waste from vegetation removal to a green waste recycling facility
- maintaining a tidy work site and ensuring that all general litter (such as food scraps) is disposed of appropriately.

Operation

Mitigation measures to manage operational waste produced on-site would include:

- providing rubbish bins with lockable lids to prevent animals accessing the bins.

15.7 Services and utilities

15.7.1 Assessment undertaken for the Concept Plan EA

The Concept Plan EA (Parsons Brinckerhoff 2006a) identified that the following may be affected by the project:

- a number of above and below ground services and utilities
- proposed new facilities
- Upper Canal.

In order to minimise any damage, disruptions or potentially hazardous situations, the following mitigation measures were proposed:

- utility owners would be consulted prior to construction
- access to the Upper Canal would be maintained at all times
- on-site sewerage facilities would be investigated for the proposed Leppington Station and train stabling facility.

15.7.2 Additional assessment requirements for project approval

The Concept Plan SoC outlines the additional requirements that must be satisfied. SoC B44 relates to services and utilities. Compliance with this SoC is discussed below and summarised in Appendix D.

15.7.3 Existing services and utilities

Existing services that cross the rail corridor for the length of the project were identified through a 'Dial Before You Dig' search and consultation with relevant authorities. The services, the responsible authorities and their locations are outlined in Table 15-4.

Table 15-4 Existing services and utilities

Utility	Authority	Location
Gas[1]		
Ethane gas pipeline DN110 high pressure	APA Group	Eastern side of Camden Valley Way
Eastern gas pipeline DN457 high pressure	Alinta Asset Management	Eastern side of Upper Canal
AGN central trunk DN864 high pressure		Eastern side of Upper Canal
Gas main DN110 low pressure		Along Campbelltown Road
Gas main DN110 low pressure		Hume Highway and Campbelltown Road
Gas main DN150 low pressure		Along Cowpasture Road
Water and sewer		
Proposed DN100 water main[2]	Sydney Water Corporation (SWC)	Between Hume Highway and Campbelltown Road
DN300 water main		Campbelltown Road
DN200 water main		Between Jardine Drive and Cassidy Place
DN375 water main		Cowpasture Road
DN1250 water main		Rickard Road
DN 100 water main		Dickson Road
DN150 water main		Eastwood Road
Upper Canal	Sydney Catchment Authority (SCA)	Crosses proposed rail line at chainage 49.700 km

Utility	Authority	Location
Telstra		
Telstra line	Telstra	Quarter Session Road (43.790 km)
Telstra line		Quarter Session Road (43.815 km)
DN50 line		Hume Highway (44.050 km)
DN100 line		Between Hume Highway and Campbelltown Road (44.280 km)
Telstra line		Campbelltown Road (44.620 km)
Optical fibre cable		Camden valley Way (48.370 km)
Telstra line		Camden Valley Way
DN100 line		Old Cowpasture Road
DN100 line		Cowpasture Road
DN100 line		Rickard Road
Eight DN100 optical fibre cables		Western side of Dickson Road
Two DN100 optical fibre cables		Eastern side of Dickson Road
DN40 line		Eastwood Road
Sydney Melbourne optic fibre cables		Alignment to be confirmed during detailed design
Overhead power transmission lines		
132kV line	Integral Energy	Chainage 47.705 km
Two 132kV lines		Chainage 52.650 km
Two 330 kV lines	Transgrid	Chainage 52.630 km

[1] The total number of gas pipeline crossings would be confirmed in future design phases.

[2] Sydney Water would provide details of planned new pipeline. TIDC would liaise with Sydney Water so that the SWRL does not preclude its future construction.

15.7.4 Construction impacts

The proposed works could result in disruption to utility services during construction of the project. Users may experience short disruptions to telecommunication connections and street lighting when these are relocated as part of the proposed works.

Construction impacts with respect to services and utilities include potential for damage to services and utilities, and plant and/or equipment; as well as injury to persons should cables, mains or pipelines be accidentally damaged during excavation or plant movement. Transmission of large electrical currents through the ground surface (known as earth potential rise) could occur as a result of damaged power cables and mains, and has the potential to injure construction workers and members of the community standing close to the damaged power utility. Investigations would be carried out during the detailed design phase of the project so that appropriate measures are in place to minimise the risk of earth potential rise.

The potential for disturbance to the Upper Canal during construction would be assessed in further detail and minimised during detailed design.

An ethane gas pipeline east of Camden Valley Way would be crossed by the project. Consultation with asset owners APA would be required during detailed design so that measures are provided to protect the pipeline.

The locations of current and planned utility infrastructure would be determined during detailed design in consultation with relevant utility agencies.

15.7.5 Operational impacts

Gas

The operation of the project is not expected to affect existing gas pipelines.

Water and sewer

The Upper Canal would need to be accessible for inspection at all times. Access to the west side of the canal would be via Cowpasture Road. Access to the east side of the canal would be under the rail bridge. Works adjacent to the Upper Canal would be undertaken in accordance with SCA requirements.

Telstra

The maintenance of the Telstra line along the western side of Camden Valley Way may have the potential to disturb future railway operations. If disturbance was likely, the line would be modified to a maintenance-free line. This would be addressed further during detailed design.

Overhead power transmission lines

The Transgrid 132 kV lines would be clear of the rail line in accordance with RailCorp standards. The 33 kV lines, however, would be relocated underground and would cross below the proposed rail line.

15.7.6 Mitigation measures

The locations of current and planned utility infrastructure would be determined during detailed design in consultation with relevant utility agencies.

The construction contractor would confirm the locations of existing underground utilities and services prior to commencing works. Construction works would be carried out in accordance with the following guidelines:

- AS 4799-2000 Installation of underground utility services and pipelines within the railway boundaries
- RailCorp Standard G5000-G5007-2001 Management Systems for Pipe, Electrical Telephone Crossings Under and Over Railway Property
- RailCorp Standard ESC540 v1.1 Utility Service Crossings.

Gas

Alinta and the APA group would be provided with the concept description of the work and construction process to obtain advanced approvals. Should any handling or modification to the gas pipeline be required, the relevant authority would carry out the proposed works. TIDC is currently working with Alinta to provide protection of the Alinta gas pipeline near the Upper Canal. Alinta would be responsible for ensuring that this gas pipeline is protected during construction of the project.

The following mitigation measures would be implemented to minimise potential impact to gas pipelines:

- all work in the vicinity of the gas pipeline would be undertaken in accordance with specific safe work methods
- work permits would be obtained prior to any construction around pipelines
- vehicle access would be provided to the pipeline provider

- pipelines would be covered using reinforced concrete slabs, approximately two metres wider than the pipeline in both directions
- the relevant authority would be notified four weeks prior to construction commencing, allowing time to service the pipeline prior to burial.

Water and sewer

Works to water and sewer mains would be undertaken in accordance with the Water Supply Code of Australia WS-A-03, Sydney Water Standard WAT-1213-V and Sewerage Code of Australia WSA-02. The following mitigation measures would be implemented:

- water and sewer mains affected by the proposed work would be checked for the minimum cover requirements
- a Water Servicing Coordinator (WSC) would be employed to handle all correspondence to SWC and supervise construction work
- SWC would be notified of all proposed works
- all works would be undertaken in accordance with the SWC 'notice of requirements'
- any water or sewer main modifications would be approved by SWC
- approved modifications would be undertaken by SWC contractors.

Impacts to the Upper Canal, in particular, would be minimised by implementing the following measures:

- access to the Upper Canal would be provided at all times (via Cowpasture Road), to allow for daily inspections by SCA
- the proposed rail bridge over the Upper Canal would have walkway access down each side. Details of the walkways and associated infrastructure such as anti-throw screens would be assessed at detailed design.
- drainage from the project would be designed so that run-off diverts to either side of the canal and is not deposited into the canal.

Telstra

Maintenance of the Telstra lines could disturb future SWRL operations. Where this is the case, modifications would be required to make the line maintenance free. In addition, the following mitigation measures would be implemented:

- Telstra would be notified of proposed works and construction timing
- conceptual description of the works and construction processes that may impact transmission lines would be provided to Telstra
- the required modification and a quotation for the works would be provided by Telstra
- modification would be carried out by Telstra, in coordination with the SWRL construction contractor.

Overhead power transmission lines

The 33 kV lines would be placed underground, beneath the railway. This would prevent contact with the wires. In addition, the following mitigation measures would be implemented:

- Integral Energy would be notified of the proposed works and construction timing
- conceptual description of the works and construction processes that may impact transmission lines would be provided to Integral Energy
- the required modification and a quotation for the works would be provided by Integral Energy

- modification would be carried out by Integral Energy, in coordination with the SWRL construction contractor.

15.8 Bushfire risk

15.8.1 Assessment undertaken for the Concept Plan EA

Natural events such as bushfires were identified as a potential hazard and risk specific to the operation of the project. The Concept Plan EA identified that this operational hazard would be managed/mitigated through RailCorp's standard procedures for hazard and risk that are in place across the entire rail network.

15.8.2 Additional assessment requirements for project approval

The Concept Plan SoC did not contain any additional assessment requirements for bushfire risk assessment that need to be satisfied in order to obtain project approval. Notwithstanding this, bushfire risk assessment should be considered so that such impacts are appropriately addressed to allow for a sustainable project.

15.8.3 Additional assessments undertaken

The bush fire prone land map included as Figure 15-1 below is based on the basic principles of vegetation mapping. It identifies vegetation categories which are generally classified as follows:

- Vegetation Category 1 = vegetation group 1 (forest) and vegetation group 2 (woodlands, heaths and wetlands) greater than one hectare. This category requires a vegetation buffer zone of 100 metres applied to its boundary.
- Vegetation Category 2 = vegetation group 3 (moist rainforests, shrubland, open woodlands, mallee and grasslands) greater than one hectare. This category requires a vegetation buffer zone of 30 metres applied to its boundary.

Some exclusions and exceptions to these classifications are provided in the NSW Rural Fire Service *Guideline for Bushfire Prone Land Mapping Version 2.2 15 April 2005.*

Vegetation Category 1 areas are classified as the most hazardous vegetation category with Vegetation Category 2 representing smaller more isolated pockets of vegetation which are of a lesser hazard.

15.8.4 Construction impacts

The construction of the project has the potential to present bushfire risks, particularly during electricity works. A Hazard and Risk Management Sub-plan would be prepared by the construction contractor as part of the CEMP prior to construction to address any potential bushfire risks. The potential for bushfire risk to impact on the construction of the project has not specifically been assessed, however the areas of highest risk would be those identified as Vegetation Category 1 followed by Vegetation Category 2 in Figure 15-1 (bushfire prone lands).

15.8.5 Operational impacts

The operation of the project is unlikely to contribute to bushfire risk.

The project, in particular the two stations and stabling facility, would be considered to be in areas of low bushfire risk following clearing of vegetation within the identified clearing footprint as shown on Figure 15-1. The risk would diminish with the development of the future town centres around the two stations, and which in any case could be adequately managed through RailCorp's standard procedures for hazard and risk that are in place across the entire rail network. However, in order to confirm the level of bushfire risk associated with the operation of the project a Bushfire Risk Assessment would be undertaken during the detailed design phase to identify the risks, potential impacts and associated management requirements.

15.8.6 Mitigation measures

Construction

Potential bushfire risks would be addressed by way of a Hazard and Risk Management Sub-plan which would be prepared by the construction contractor as part of the CEMP prior to construction.

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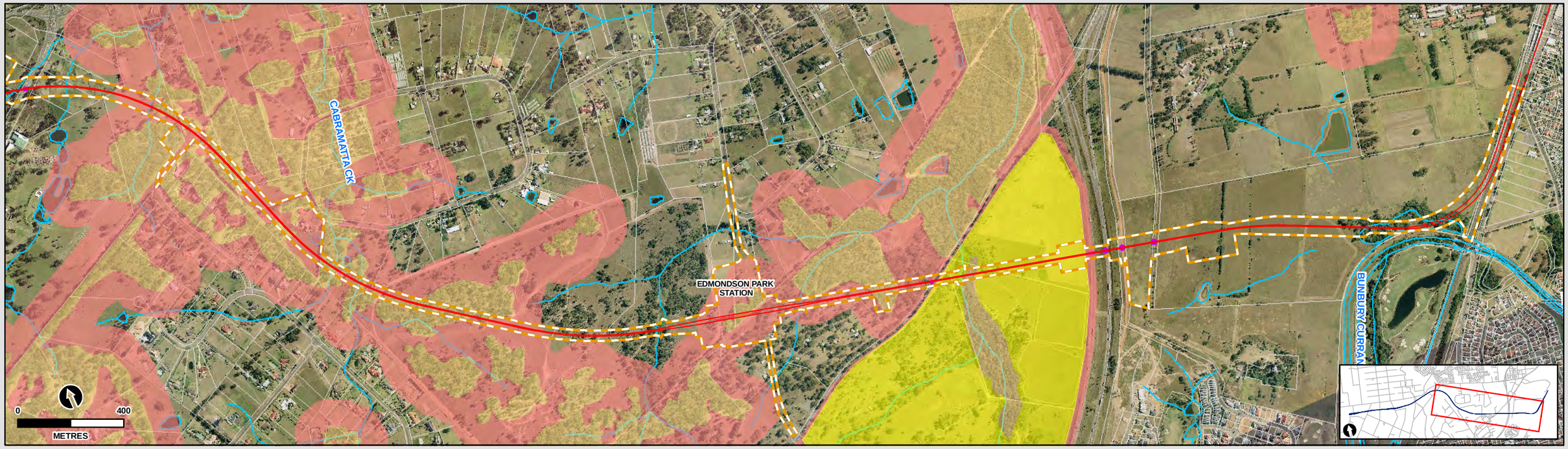

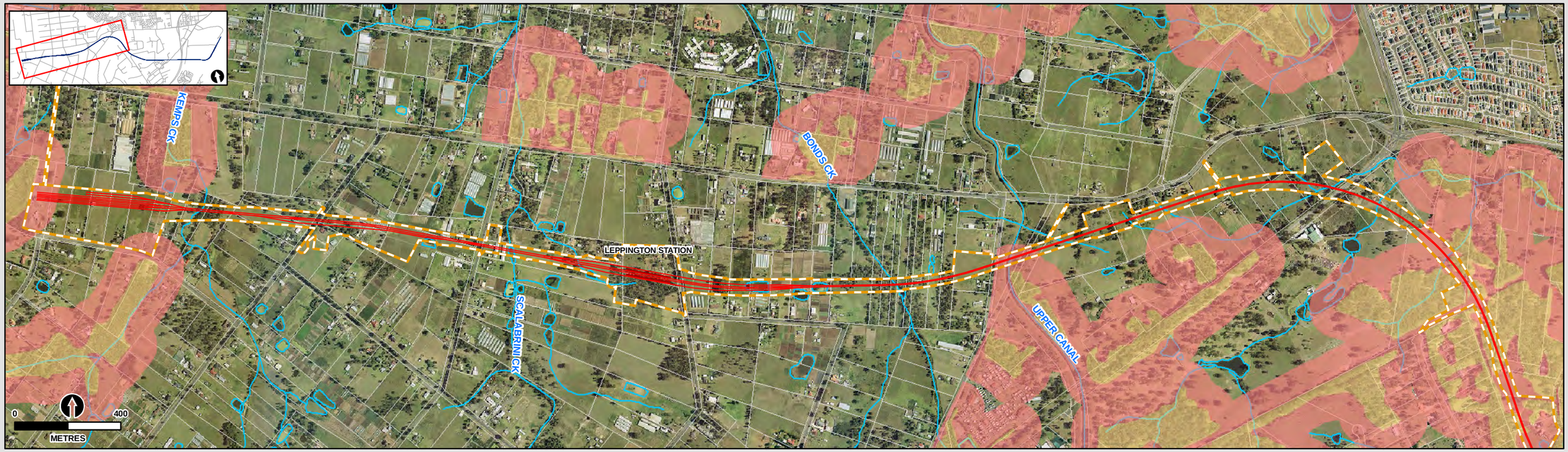

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Cadastre
Rail stations
Drainage
Proposed Track
Clearing Footprint *

Bush Fire Prone Land Category

Buffer
Vegetation Category 1
Vegetation Category 2

Figure 15-1: Bush Fire Prone Lands

* Note: Clearing footprint includes likely stockpiles and construction compounds

Operation

If required, a Bushfire Risk Assessment would be undertaken during the detailed design phase to identify the risks and associated management requirements.

15.9 Cumulative impacts

Cumulative impacts may occur if the construction or operation of the project coincides with the construction or operation of other local developments, such as road upgrades or residential development. The project is expected to be completed by 2016. As the project falls almost entirely within the boundaries of the SWGC, there is potential for cumulative impacts to occur as a result of planned precinct development.

The sections below discuss the cumulative impact assessment undertaken for the Concept Plan EA, the additional assessment requirements for project approval, and identify the potential for cumulative impacts to occur during construction and operation.

15.9.1 Assessment undertaken for the Concept Plan EA

The cumulative impacts assessment undertaken for the Concept Plan EA (PB, 2006) identified that a large number of projects are proposed in the vicinity of the SWRL. The timing of these developments had yet to be determined.

15.9.2 Additional assessment requirements for project approval

There are no MCoA or SoC that relate to the general cumulative impacts of the project.

15.9.3 Analysis of potential developments

In order to assess the potential for cumulative effects, it is necessary to define the potential location and timing of nearby developments. The sections below define the potential transport infrastructure and land development projects that may occur in the vicinity of the project.

The construction of the SWRL is likely to coincide with the construction of other adjoining major developments such as the Glenfield Transport Interchange. The occurrence of simultaneous construction activities associated with a number of developments would result in a greater impact on the surrounding environment than would occur if the project was developed in isolation. A list of other development projects taking place in the vicinity of the project at the expected time of construction is provided in Table 15-5.

Table 15-5 Transport and development projects in the vicinity of the project

Project	Relevant project information	Dates of construction	Distance from SWRL at closest point
SSFL	The SSFL will comprise a single dedicated rail freight track, 30 kilometres in length extending from south of Macarthur to east of the Sefton Park Junction. It will be non-electrified and operate in a bi-directional mode. The new track will be located on the western side of the existing RailCorp passenger lines between Macarthur and the junction with the East Hills Line at Glenfield. At Glenfield it will cross over via a new overpass, known as the Glenfield flyover, and continue through to Sefton on the eastern and southern side of the passenger lines.	2008–2011	0 kilometres, ties in directly at Glenfield.
South West Growth Centre	The SWGC's would accommodate at least 15–20% of Sydney's new housing over the course of the land release program. This would result in the redevelopment and masterplanning of major precincts such as Edmondson Park, Leppington and Leppington East, through which the SWRL alignment would travel. Development within the SWGC is planned to initially focus on the Edmondson Park Town Centre, while development of Rossmore will occur in the longer term (i.e. commencing in over 10 years).	Ongoing	0 kilometres, development would occur directly adjacent to the SWRL route.
Hy-Tec Concrete Batching Plant, Smeaton Grange	Construction and operation of 243,600 tonne per year concrete batching plant, office and amenities. It will operate 24-hours a day, seven days a week. It would include an office, sand storage bins, four 120-tonne silos, truck washout pits and parking for 13 cars and eight trucks. The nearest residential property is 450 metres away.	Completed	11 kilometres
Rail Clearways Program	The Rail Clearways Program is an initiative of the NSW Government to improve capacity and reliability on RailCorp's Sydney suburban passenger network. As part of the Rail Clearways Program, the stabling facilities at Liverpool, Campbelltown Railway and Macarthur Stations are proposed to be upgraded, as well as the Kingsgrove to Revesby Quadruplication project. This program would increase passenger service frequencies on the Main South Line from these locations.	2011-2014	N/A
SWC Expansion Plans (water, sewer and recycled water)	An integrated water, recycled water and wastewater servicing strategy for the SWGC has been prepared by SWC. Construction of water related infrastructure will be in line with the Strategic Land Release Project Office of DoP's land release timetable and will likely take place as each precinct is developed.	Various from around 2010.	Various

Project	Relevant project information	Dates of construction	Distance from SWRL at closest point
Hoxton Park Recycled Water Scheme	The Hoxton Park Recycled Water Scheme in south-western Sydney will supply about 900 million litres of recycled water to businesses and about 7,000 homes by 2015. This major recycled water scheme will be commissioned in two stages from 2013 and will eventually serve Edmondson Park, Middleton Grange, Ingleburn Gardens, Yarrunga Industrial Area and the Panorama Estate. Construction of the recycled water pipelines started in May 2008. Much of this work is now complete. Three new recycled water reservoirs will be built as part of the scheme. Two reservoirs will be located at Edmondson Park, and another at South Hoxton Park.	2008-2015	0 kilometres (SWRL traverses the recycled water pipeline at Campbelltown Road and near Edmondson Park Station)
Renewable Energy Generation (REG) Program - Glenfield Sewage Treatment Plant	Sydney Water is implementing a Renewable Energy Generation (REG) Program as part of its recent pledge to be carbon neutral by 2020. The program aims to reduce greenhouse gas emissions by approximately 54,000 tonnes per year; this is equivalent to 12.5 % of Sydney Water's total emissions. As part of this program a cogeneration plant will be installed at Glenfield Sewage Treatment Plant to convert biogas, a product of the wastewater treatment process, into electricity.	Unknown	1.8 kilometres
South West First Release Precincts	Sydney Water is planning the water related infrastructure for drinking water, recycled water and wastewater services for NSW Government's First Release Precincts (Edmondson Park, Oran Park and Turner Road) and adjoining areas. Additionally, they are considering providing services to the Camden development area of Central Hills and two other SWGC precincts including Marylands and Lowes Creek. The proposal would involve the construction of the following infrastructure: ▪ drinking water mains and reservoirs ▪ recycled water mains and reservoirs ▪ wastewater rising mains ▪ recycled water, drinking water and sewage (wastewater) pumping stations ▪ ancillary components including work compounds, maintenance structures, overflow structures, vent shafts, scour valves, scour lines, air valves and hydrants.	2009-2015	7.7 kilometres
South West Remaining Precincts	Sydney Water is preparing an environmental assessment that considers the impacts of providing water-related services to the remaining precincts of the SWGC. The Environmental Assessment for the remaining precincts will be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979*. Extensive new regional infrastructure is required to service the remaining precincts beyond the first stage of release within the	Unknown (will coincide with the development of the SWGC)	0 kilometres (SWRL traverses some of the proposed pipelines)

Project	Relevant project information	Dates of construction	Distance from SWRL at closest point
	Growth Centres. In general, the proposal comprises the construction, operation and maintenance of drinking water, recycled water and wastewater infrastructure for the SWGC, including: ▪ pipelines ▪ pumping stations ▪ reservoirs ▪ recycled water plants.		
Ingleburn Gardens Estate	The Ingleburn Gardens Estate is a residential development located west of the Hume Highway and south of Campbelltown Road. The estate will be approximately 38 hectares in size and will comprise 257 residential properties, an early education and long day care centre, the proposed Edmondson Park Anglican College and the Anglicare Chesalon Aged Care Facility. The estate is being developed in a number of stages. Development lots located within the Stage 1 and 2 release areas were released for sale in 2008, while Stage 3 lots are currently on sale. The Glenfield to Leppington Rail Line would bisect the Ingleburn Gardens Estate.	2008-unknown	0 kilometres (the SWRL would traverse the Ingleburn Gardens Estate)
Redevelopment in the Leppington North precinct	The Leppington North precinct is a second release precinct of the SWGC, which is anticipated to accommodate approximately 12,000 dwellings and 30,000 new residents. The Leppington North precinct is planned to establish a major town centre in the south-eastern section of the precinct, which would be centred around the proposed Leppington Station. Precinct planning for Leppington North is planned to commence in stages during 2009/2010.	Unknown – likely to be in the proximity of the project	0 kilometres (the SWRL traverses the Leppington North precinct)
Talana – Edmondson Park	The Talana – Edmondson Park development is being progressed by Landcom and forms part of the broader development of the Edmondson Park precinct of the SWGC. The development will accommodate 150 lots, with the first lots anticipated to be made available for sale in 2010.	Unknown – likely to be in the proximity of the project	< 1 km
Development of Edmondson Park Town Centre	Planning for the Edmondson Park Precinct is ongoing in accordance with Liverpool City Council's Edmondson Park Local Environmental Plan and Development Control Plan and Section 94 plan. Planning of the Edmondson Park town centre is currently in progress. The development of the town centre in conjunction with the project would result in significant cumulative impacts on the Ingleburn Army Camp.	Unknown, masterplan currently being finalised (subject to sale of Department of Defence land)	0 kilometres (subject to purchase of Department of Defence land)

Project	Relevant project information	Dates of construction	Distance from SWRL at closest point
Widening of the Hume Highway	This project will widen the F5 between Ingleburn and Campbelltown. The project will expand the Brooks Road to Raby Road section of the Hume Highway from four lanes to eight lanes and expand the Raby Road to Narellan Road section from four lanes to six lanes.	Already in progress, due for completion in 2010	6 kilometres
Widening of Camden Valley Way	The project involves the widening of Camden Valley Way to four-lanes between Bernera Road, Prestons and Narellan Road, Narellan.	2009–2012	0 kilometres, SWRL crosses this road
Widening of Campbelltown Road	The proposed widening works would widen Campbelltown Road to a dual carriageway with shoulders, a median strip and paths on both sides of the road.	Not currently planned to be constructed in the next five years	0 kilometres SWRL crosses this road
Widening of Cowpasture Road	The proposed widening works at Cowpasture Road include: ▪ upgrade to four lanes between The Horsley Drive and Elizabeth Drive ▪ upgrade to four lanes between Elizabeth Drive and North Liverpool Road ▪ upgrade to four lanes between Hoxton Park Road and Main Street, including upgrading the intersection of Cowpasture Road, Mannow Avenue and Tibooburra Road ▪ shared pedestrian and cyclist paths adjacent to the upgraded four lane sections of Cowpasture Road ▪ an interchange providing access from Cowpasture Road and the M7. Works in the vicinity of the project are already completed.	1995–2011	0 kilometres SWRL crosses this road
Bringelly Road	A number of upgrades have been proposed including the section from Cowpasture Road to The Northern Road.	Not currently planned to be constructed in the next five years	< 1 kilometre, road runs very close to SWRL

Construction-specific cumulative effects

During construction of the project, the locations at most risk from cumulative effects are those in proximity to construction activities. Cumulative effects arising from construction phase activities are likely to relate to visual intrusion, dust, noise and vibration.

The severity of cumulative effects would depend on the:

- type of works being undertaken
- duration of the works
- number of possessions
- distance between the works and their respective proximity to the receptor
- sensitivity of the receptor
- visible presence of the works.

There would also be environmental impacts as a result of the temporary land-take required for ancillary works. These are likely to include compounds, diversions or working space and material storage.

Indirect impacts can also arise during the construction phase of a project. To avoid the associated changes to traffic flow caused by construction vehicles and construction compounds located adjacent to major transportation routes, drivers often choose to travel through adjacent networks rather than along the section of road or highway experiencing the disruption. This may result in other indirect impacts on receptors, namely air quality and noise and vibration impacts on the environment and communities in these local road networks. The construction strategy for the proposed SWRL restricts the haulage routes to the proposed alignment, as far as possible.

Although projects may not necessarily overlap in terms of construction programs there may still be a cumulative effect resulting from an overall increased duration of disturbance, which in the long term could have an adverse cumulative effect. This effect is often termed 'construction fatigue' and is common is communities where long-term or multiple construction projects are underway.

Strategic assessment

In order to determine the comprehensive cumulative impact of a variety of projects that are taking place in the same area or at the same time, it is important that the interactions of the social, economic and biophysical factors have been derived from the environmental assessment process. These factors have been explored in a strategic assessment of the likely cumulative impacts of the SWRL in Table 15-6.

Table 15-6 Strategic assessment of overall cumulative impacts

Interaction	Assessment
Social environment ▪ public access and severance ▪ distribution of benefits ▪ changes to noise and visual amenity ▪ public safety ▪ Aboriginal and historic heritage.	The cumulative impact of development within southern Sydney would result in changes to the social amenity of the region, such as increased noise and altered local and regional landscape character (from the implementation of embankments, flyovers and noise mitigation measures). Development in southern Sydney is also likely to result in cumulative loss of historical and Aboriginal heritage. However, the SWRL's likely contribution to this cumulative impact would be small. Proposed improvements to freight and passenger transport infrastructure within southern Sydney would lead to cumulative, improvement in regional access and may contribute to an improvement in some other aspects (e.g. regional air quality). The SWRL would be expected to improve amenity and public safety as a result of reduced vehicle usage. In terms of cumulative construction effects, activities undertaken at bridges may cause short-term disruption to local access across the rail corridor. After construction, local access to and through stations would generally be improved. The overall cumulative impact on the social environmental is expected to be beneficial.

Interaction	Assessment
Economic environment ▪ direct user savings (reduction in transport costs) ▪ employment ▪ induced development/ change in land use ▪ demand for materials ▪ cost of infrastructure development and maintenance.	The cumulative impact of development within southern Sydney that is taking place in combination with the development of the SWRL would lead to an increase in demand for resources, energy and land use. The overall environmental impact of this additional resource and land use demand is adverse. However, the contribution that SWRL makes to resource depletion would be relatively small, as fuel use (per gross tonne kilometre) during operations is expected to be less than would occur if each passenger were to travel in a private vehicle. Additionally, the improvement of rail and other infrastructure would lead to cumulative economic benefits both regionally and nationally. Growth and infrastructure development would also improve local, regional and national employment opportunities, and encourage further development and changes in land uses. Overall, the cost of infrastructure and maintenance can be offset by the economic benefits that accrue and the cumulative economic impacts are expected to be beneficial.
Biophysical environment ▪ loss of biodiversity ▪ effects on water quality and supply ▪ increase in greenhouse gas emissions from rail operations and maintenance ▪ opportunity to reduce road related greenhouse gas emissions (relative to the do-nothing scenario) ▪ change in scenic quality.	Development in southern Sydney that is taking place in combination with the SWRL would lead to cumulative loss of biodiversity and a change in scenic quality. There would also be adverse cumulative impacts on water demand/supply from the substantial residential development within southern Sydney. However, with the application of mitigation measures, the SWRL would not result in significant changes to water quality. While the SWRL would result in a cumulative increase in greenhouse gas emissions during construction, the project is expected to generate a mode shift from private cars to public transport, which would reduce greenhouse gases emissions in comparison to the do-nothing scenario (i.e. greenhouse gas emissions that would otherwise occur without the project). The overall cumulative impact on the biophysical environmental is expected to be adverse.

Summary of cumulative effects

There would be a variety of beneficial and adverse cumulative impacts as a result of the development of the SWRL and a number of transportation and development projects that are/will be occurring in the same area. In order to maintain a precautionary approach to environmental assessment, an overall 'worst-case' scenario for cumulative assessment has been adopted. As a result, it has been determined that simultaneous construction of development within the corridor and the wider region of south-west Sydney would result in the following potential adverse cumulative impacts:

- increased amenity-related impacts such as noise and vibration, greenhouse gas emissions and visual obtrusion
- increased road traffic and road traffic diversions causing increased congestion, accidents and journey times during construction
- increased demand on local and regional physical and human resources
- creation of large volumes of waste
- increased impacts on the physical environment, particularly biodiversity and water supply.

Table 15-7 provides an overview of each identified project and the associated overall cumulative impact on the SWRL.

Table 15-7 Summary of cumulative environmental effects of the identified projects

Overview of projects		Cumulative environmental effects	
Name	**Status**	**Construction**	**Operation**
SSFL	Cumulative impacts are likely to arise from the interaction of the construction and operation of the SSFL and other proposed activities, locally and regionally. It is likely that construction of the SSFL would coincide with the construction of the SWRL; this would inevitably lead to increased adverse cumulative impacts from disruption, congestion, impacts to amenity and land use. However, the contribution that the SSFL would make to the cumulative impact of this development is relatively small. The construction contractor would take account of this development and likely timing during development of the detailed construction planning in order to manage and minimise potential cumulative impacts. In terms of operational impacts, the SSFL would reduce cumulative impacts, by providing improved access, economic development and employment, and reduced greenhouse gas emissions (as a result of lower reliance on personal vehicles).	Adverse multiple effects.	Beneficial
SWGC	Southern Sydney is forecast to have a high rate of population growth and development. This includes urban and industrial development and associated road and rail infrastructure development. This would result in a multitude of cumulative social, economic and biophysical impacts during the operation and construction phases of the SWGC and the SWRL. Overall adverse cumulative impacts would arise from construction disruption, congestion, impacts to amenity and land use. Overall beneficial cumulative impacts would arise from economic and social benefits of the development and reduction in transportation greenhouse gas emissions.	Adverse multiple and incremental effects.	Beneficial
Hy-Tec Concrete Batching Plant, Smeaton Grange	This project is at a sufficient distance from the SWRL, such that significant cumulative environmental impacts are unlikely to occur.	Neutral	Neutral
Rail Clearways Program	This program would not result in significant cumulative impacts in combination with SWRL. The Rail Clearways Program would increase passenger service frequencies on the Main South Line from these locations, thereby potentially reducing dependence on personal vehicles and benefiting regional and local air quality and amenity. An overall neutral cumulative impact is anticipated.	Neutral	Neutral
SWC Expansion Plans (water, sewer and recycled water)	This program would result in minor cumulative impacts in combination with SWRL.	Neutral	Neutral

Overview of projects		Cumulative environmental effects	
Name	**Status**	**Construction**	**Operation**
Hoxton Park Recycled Water Scheme	This project would potentially have adverse cumulative construction impacts on local amenity (such as noise, air and visual amenity) as a result of simultaneous construction works and construction traffic travelling on the road network for both projects. Cumulative construction impacts would be expected to be greatest at locations where the SWRL traverses the proposed pipeline for the Hoxton Park Recycled Water Scheme (i.e. at Campbelltown Road and near Edmondson Park Station). However, significant cumulative environmental impacts are unlikely to occur.	Adverse	Neutral
Renewable Energy Generation (REG) Program - Glenfield Sewage Treatment Plant	This project is at a sufficient distance from the SWRL, such that significant cumulative environmental impacts are unlikely to occur.	Neutral	Neutral
South West First Release Precincts	This project is at a sufficient distance from the SWRL, such that significant cumulative environmental impacts are unlikely to occur.	Neutral	Neutral
South West Remaining Precincts	This project would potentially have adverse cumulative construction impacts on local amenity (such as noise, air and visual amenity) as a result of simultaneous construction works and construction traffic travelling on the road network for both projects. Cumulative construction impacts would be expected to be greatest at locations where the SWRL traverses proposed water supply, recycled water and/or wastewater pipelines. However, significant cumulative environmental impacts are unlikely to occur.	Adverse	Neutral
Ingleburn Gardens Estate	The Talana – Edmondson Park development would potentially have adverse cumulative impacts on amenity (such as noise, air and visual amenity) as a result of simultaneous construction works and construction traffic travelling on the road network for both projects. Overall adverse cumulative impacts would arise from construction disruption, congestion, impacts to amenity and land use. Overall beneficial cumulative impacts would arise from economic and social benefits of the development and reduction in transportation greenhouse gas emissions.	Adverse	Beneficial
Redevelopment in the Leppington North precinct	The redevelopment of the Leppington North precinct and in particular the Leppington town centre, would result in a range of cumulative social, economic and biophysical impacts during the construction and operational phases of both the Leppington North precinct and the SWRL. Overall adverse cumulative impacts would arise from construction disruption, congestion,	Adverse	Beneficial

Overview of projects		Cumulative environmental effects	
Name	**Status**	**Construction**	**Operation**
	impacts to amenity and land use. Overall beneficial cumulative impacts would arise from economic and social benefits of the development and reduction in transportation greenhouse gas emissions.		
Talana – Edmondson Park	The Talana – Edmondson Park development would potentially have adverse cumulative impacts on amenity (such as noise, air and visual amenity) as a result of simultaneous construction works and construction traffic travelling on the road network for both projects. There is also the potential for cumulative impacts on the Cumberland Plain Woodland Endangered Ecological Community, as described below for the development of the Edmondson Park town centre. Overall beneficial cumulative impacts would arise from economic and social benefits of the development and reduction in transportation greenhouse gas emissions.	Adverse	Beneficial
Development of Edmondson Park Town Centre	The development of the Edmondson Park town centre would potentially have adverse impacts on the Cumberland Plain Woodland Endangered Ecological Community within the Ingleburn Army Camp, as well as potential heritage sites. Development of the Edmondson Park Precinct (including the Ingleburn Army Camp) has been considered in the Growth Centres SEPP. The Edmondson Park Conservation Agreement has been made between the state and federal governments. This agreement highlights areas proposed for development and potential biodiversity mitigation measures. Overall beneficial cumulative impacts would arise from economic and social benefits of the development and reduction in transportation greenhouse gas emissions.	Adverse	Beneficial
Widening of the Hume Highway	Construction of the project is likely to be completed prior to the commencement of construction of the SWRL. Furthermore the widening project is sufficiently distanced from the SWRL to not introduce significant cumulative impacts.	Neutral	Neutral
Camden Valley Way	Cumulative impacts are likely as a result of construction trucks traffic travelling on the road network for both projects. Significant cumulative environmental impacts are however unlikely to occur.	Adverse	Neutral
Bringelly Road	Cumulative impacts are likely as a result of construction trucks traffic travelling on the road network for both projects. Significant cumulative environmental impacts are however unlikely to occur.	Adverse	Neutral

When considering the summary in Table 15-7, it is evident that the cumulative impacts for both transport projects and land developments are generally neutral to adverse, especially during the construction phase. However, cumulative effects are anticipated to diminish in the

longer term (post-construction). Additionally, as local residents or receptors become accustomed to post-construction conditions the impact may become measurably less significant (for example the recovery of ecological areas after the effects of multiple projects), or may be perceived to be less significant, for example acclimatisation to noise levels/visual landscape changes.

15.9.4 Mitigation measures

Construction

The potential cumulative construction impacts associated with the project would be further considered as the design develops and as further information regarding development plans for the SWGC are released. Mitigation measures would be developed and implemented as appropriate.

It is expected that RailCorp would work closely with TIDC so that essential non-project related maintenance work could be undertaken by RailCorp with minimal disruption to the rail network at Glenfield during the construction phase of the project. TIDC would also liaise with asset owners and service providers during the development of the detailed design and CEMP to determine whether scheduled project works coincide with other non-project related works. In such circumstances, measures would be developed to minimise cumulative construction impacts.

Operation

The potential adverse cumulative impacts associated with the operation of the SWRL are expected to be manageable, as the SWRL would continue to be considered in future planning for the area. The delivery of the SWRL at the early development stages of the SWGC would maximise the opportunity for such future planning to be undertaken.