17 Other environmental considerations

Chapter 17 includes an assessment of the potential hazard and risk impacts associated with the construction and operation of the Proposal. In particular, it summarises an analysis undertaken of the risks associated with construction of the Proposal close to the existing high pressure ethane gas pipeline which is located along parts of the rail corridor. The chapter also considers energy consumption and resource use relating to the Proposal and the various measures included in it to minimise these impacts.

17.1 Hazard and risk

17.1.1 Impacts during construction

Risks can be estimated both by the way that the hazard would affect individuals and how they would affect society as a whole. Individual risk relates to an individual's concern for their own life or safety and is primarily dependent on whether the risk is from an isolated incident or a large-scale disaster. Society's perception of risk is influenced by the number of people involved in a multiple fatality or injury disaster. Contributing to the appropriate tolerance level are factors such as the nature of the industry, societal trends and the benefit that the activity provides to society as a whole.

The construction requirements of the Proposal are discussed in **Chapter 7.** There is a range of hazards and risks associated with these construction activities that have the potential to affect the community and environment. These hazards and risks could be categorised as:

- Environmental hazards - These could result from the construction of the Proposal and have the potential to affect the natural environment of the site and its surroundings;
- Occupational health and safety hazards - These could result from construction activities and affect the health and safety of the construction personnel and other persons visiting the site particularly when construction activities are undertaken adjacent to an operational electrified rail line;
- Construction hazards including construction plant operation – These would result from the materials required to complete construction; and
- Construction hazards associated with underground and above ground services including the ethane gas pipeline - These could affect the health and safety of site personnel and the natural environment and, in extreme cases, local residents.

Construction risks were assessed in accordance with the Department of Urban Affairs and Planning: *Applying State Environmental Planning Policy 33 Guidelines.* The assessment sought to establish whether the Proposal would be defined as potentially hazardous or potentially offensive under *State Environmental Planning Policy 33- Hazardous and Offensive development* and, therefore, whether a preliminary hazard analysis is needed to be prepared as part of the environmental assessment. Further risk assessment would be undertaken for the design, construction and operation of the Proposal.

A risk assessment was undertaken in relation to the probability of damage to the ethane gas pipeline during construction or operation of the Proposal. The assessment complied with the requirements of *State Environmental Planning Policy 33 Hazardous and Offensive Development* (SEPP 33) and included:

- Identification of enabling events to the occurrence of a release of gas due to the Proposal.
- Documentation of the control strategies in place to reduce the likelihood of the event occurring.
- Assessment of the relative probabilities of each initiating event.
- Evaluation of the overall likelihood of the unwanted occurrence.
- Determination of potential consequences of an unwanted event.
- Quantitative estimation of the individual risk exposure to a person within the neighbouring community associated with the potential release of gas from the pipeline.
- Identification of opportunities for further consideration as part of the Project risk management plan.

The risk assessment involved five stages:

Stage 1: Consequence analysis

A detailed quantitative analysis was conducted to determine the potential consequences of a release of ethane. The risk analysis incorporated comprehensive computer modelling and aimed to determine the individual risk exposure to a person within the neighbouring community as a result of such an incident.

Stage 2: Fault tree analysis

A fault tree was developed describing the root causes of an incident associated with the construction and operation of the Proposal. The diagram illustrated the various incident pathways that could lead to an event and included the combinations of circumstances necessary for an event to occur. Where necessary, current mitigation measures and controls were identified and documented.

Stage 3: Fault tree verification and quantification

The fault tree was quantified by estimating a probability for each fault mode. The adequacy and reliability of controls in these areas were considered in ascertaining the probabilities.

Stage 4: Sensitivity analysis

There is inevitable uncertainty attached to each estimation of probability. This uncertainty was incorporated in the model by applying credible variances for each input and deriving a distribution for each. A resulting confidence level was subsequently derived.

Stage 5: Analysis of individual risk

Based on the frequency (Fault Tree) and consequence analyses described above, the level of individual risk associated with the Proposal was evaluated. This evaluation considered both the existing (or background) risk level, as established at the time of the pipeline's construction, and the effect that the Proposal will have on this risk level. The estimated individual risk level was then compared with established risk acceptance criteria, to determine whether a tolerable risk level will be achieved.

The results of the risk assessment are summarised in **Section 17.1.3** and the proposed mitigation measures required are described in **Section 17.3**. The risk assessment is provided in **Technical Paper 7** in Volume Two.

Environmental hazards associated with the construction of the Proposal are discussed in **Chapters 12** to **15** of the Environmental Assessment and mitigation measures aimed at minimising or eliminating the identified hazards are included in the design of the Proposal. In addition, potential discharges to the environment during the construction phase would be eliminated or controlled through the implementation of environmental management measures together with any additional requirements imposed by the DECC via the Environment Protection Authority licensing process. The elimination and control of potential environmental hazards would ensure that the construction of the Proposal could not be considered to be a potentially offensive industry as defined in SEPP 33.

Risks to occupational health and safety would generally arise due to a failure of established procedures. A Health and Safety Plan would be required and developed prior to the start of construction on site. This would include appropriate training and supervision programs.

Construction hazards could result from materials required for construction purposes and the operation and maintenance of plant and machinery. Hazards related to the handling of hazardous materials may include loss of containment resulting in impacts on people and the environment.

The construction of the Proposal would involve the storage and use of hazardous materials. The hazardous materials expected to be used and stored on-site include diesel, lubrication oil, hydrating lime, oxy-acetylene and detonators. Concrete would be used for construction but it is anticipated that it would be used either in ready-mix or pre-cast form. The materials and expected quantities requiring storage and transportation during construction are summarised in **Table 17.1.**

The quantities of hazardous material required for the construction of the Proposal would be below the screening threshold nominated in the SEPP 33 and therefore no preliminary hazard analysis would be required.

Table 17.1 Hazardous materials or dangerous goods to be used, stored and transported during construction

Hazardous material	Dangerous goods class	Mode of storage	Maximum quantity	Weekly vehicle movements
Diesel	Not applicable C1 combustible liquid	Tank (bunded)	10,000 litres (estimate)	Not applicable
Lubricating oil	Not applicable C2 combustible liquid	Drums (400 litres)	<800 litres (estimate)	Not applicable
Oxy-acetylene	2.1–Flammable gases	Cylinders (55 kilograms)	Minor quantities stored for welding use	5 cubic metres
Hydrated lime	8- Corrosive substances	25 to 50 tonne movable silo	50 tonnes (estimate)	50 tonnes
Detonators	1.4S-Explosives	Designated storage area	20 kilograms (estimate)	Not applicable

Table 17.2 summarises the expected quantities of dangerous goods transported to and from construction compounds during construction.

Table 17.2 Quantities of hazardous materials or dangerous goods expected to be transported to and from construction compounds

Hazardous material	Dangerous goods class	Expected weekly vehicle movements	Screening threshold	
			Vehicle movement peak (weekly)	Minimum quantity per load
Diesel	Not applicable C1 combustible liquid	<60	>60	10 tonnes
Lubricating oil	Not applicable C2 combustible liquid	<60	>60	No limit (packaged)
Oxy-acetylene	2.1 – Flammable gases	<30	>30	5 tonnes (packaged)
Hydrated lime	8 - Corrosive substances	<30	<30	Maximum 10 tonnes (packaged)
Detonators	1.4S – Explosives	-	Not applicable	Not applicable

Diesel

Diesel is not classified as a dangerous good according to the ADG Code but is considered to be a C1 combustible liquid as defined in the Australian Standard: The storage and handling of flammable and combustible liquids (AS1940:2004).

It is expected that diesel would be stored at a minimum of two construction compounds for refuelling of diesel powered construction machinery. The maximum storage of diesel at any one site would be within one 10,000 litre tank but smaller quantities (300 litres) may be stored in suitably bunded compounds at various worksites. Diesel storage would comply with the requirements of AS1940:2004.

Refuelling of diesel powered construction plant such as road machinery would be conducted by mobile tankers at specific work sites. Refuelling of track machinery and locomotives would be conducted in accordance with RailCorp standard operating procedures.

Lubricating oil

Lubricating oil is not classified as a dangerous good according to the ADG Code but is considered to be a C2 combustible liquid as defined in AS1940:2004. Minor quantities of lubricating oil would be stored on-site for use in machinery maintenance and operation of construction plant.

Oxy-acetylene

Oxy-acetylene would be used for welding required during the construction phase. The gas would be stored in cylinders which would be kept at a minimum of two main construction sites. Appropriate safety measures would be enforced to minimise the quantities required in storage, minimise access to the storage areas and ensure that these are well ventilated in compliance with WorkCover NSW (2005) *Storage and Handling of Dangerous Goods: Code of Practice 2005.*

Agricultural/hydrated lime

Lime would be used as a neutralising agent for the management of acid sulphate soils or as a soil additive. It is expected that a maximum of 50 tonnes of lime would be stored at the construction compound closest to Salt Pan Creek. Lime is classified as a Class 8 corrosive substance as defined in the ADG Code and would be obtained and stored in packaged form rather than in bulk. As part of the Construction Environmental Management Plan, area specific management plans/protocols would be prepared to document the approach to management of acid sulphate soils including details of the lime storage areas.

Detonators

Detonators would be used as safety warning devices on the operational railway during construction work. They would be used by rail safety staff to warn train drivers and site workers of any hazards when working on the operating lines. Only small quantities would be required and would be stored in a secure, cool place with restricted access. Railway detonators are classified as Class 1.4S as defined in the ADG Code and would be stored, handled and used in accordance with existing RailCorp rail safety procedures.

The quantities of hazardous materials stored at the construction compounds for use during construction of the Proposal would be below the screening threshold nominated in SEPP 33.

In addition, expected traffic movements generated by the transport of hazardous materials during construction would be below the screening thresholds.

Consequently, the proposed construction of the Proposal is considered unlikely to constitute a potentially hazardous and/or offensive industry and there would be no significant off-site risks. A preliminary hazard analysis or hazard transportation study in relation to the storage and use of dangerous goods is not therefore required for the Proposal. Potential risks associated with the use, storage and transport of hazardous goods during construction would be further mitigated through the development and implementation of the Construction Environmental Management Plan.

17.1.2 Impacts during operation

Operational risks would normally be assessed in relation to the potential hazards and risks associated with the transport of dangerous goods in accordance with Australian Standard *AS.NZS 4360:2004 Risk Management.* This would not be applicable to the East Hills Line which is not normally used by freight trains. As a result the risk profile, even with the forecast growth in train movements, can be considered to be negligible.

Current measures to avoid residual risk through rigorous risk identification and management protocols have reduced current operational risk levels on the East Hills line to as low as reasonably practicable. The predicted increase in train movements from 2010 to 2021 would also be adequately managed by a combination of existing safety protocols and any area specific Incident Management Plans necessary to reduce risks to as low as reasonably practicable.

17.1.3 Ethane gas pipeline

A major high-pressure ethane gas pipeline traverses part of the rail corridor on both sides, with crossings at a number of locations. This pipeline extends from Moomba in South Australia to the Orica site in Botany and was commissioned in 1996. The pipeline design includes measures for earthquake loading. The ethane gas pipeline would require protection during both the construction and operation phase of the Proposal. It provides a high risk element within the work zone and the detailed design would need to avoid direct impacts on it.

Relocation of the pipeline is not feasible as there is a very high cost and impacts associated with shutting it down. Therefore, an accurate survey of the location and position of the pipeline would be undertaken prior to the detailed design of the Project. The location of the pipeline would affect all the proposed works in the vicinity of the earthworks, retaining walls, bridge works and services cable routes. Works in the vicinity of the pipeline would need to be handled with care and comply with the pipeline owner's clearance and other requirements.

Due to the inherent risks associated with it, the hazard of the pipeline would be present during both the construction and operation phase of the Proposal. A risk assessment, described in **Section 17.1.1** was carried out to determine the likelihood of an ethane pipeline incident associated with the Proposal.

The results of the risk assessment indicate that the incremental risk associated with the potential impact of a release from the pipeline, as a result of the Proposal, does not lead to an increase in the current (or background) risk level. The background level of individual risk associated with the ethane pipeline was calculated, prior to its construction, as one in one million years, over the life of the pipeline. This figure includes an allowance for incidents resulting from external works, which is not exceeded by the Proposal. The highly controlled environment in which construction works would occur, may result in a marginally lower risk during the construction phase (approximately 0.84 in one million years), due to the reduced likelihood of accidental pipeline damage by unrelated third parties. It is therefore concluded that the individual risk associated with the pipeline would not exceed one in one million years, which equates to a tolerable level of individual risk.

Nevertheless, historical causation data for pipeline failure highlights the need for continual review of existing controls for all contributing factors, especially for potential causes that are associated with outside forces. The historic causation data for pipeline failure from the United States over a 15 year period reports that over half of all incidents are caused by outside forces, with two-thirds of these outside forces caused by equipment used by external parties.

The sensitivity analysis determined the factors with the most influence on the overall probability of a pipeline incident resulting from the Proposal. This allows for mitigation measures to be prioritised accordingly. The most sensitive factors are:

- force from an impact that could damage the pipeline;
- unauthorised digging with sufficient force to damage the pipeline;
- vibration from construction and operation of the Project; and
- a heavy load that could crush the pipe.

Mitigation measures aimed at minimising the risk associated with the ethane gas pipeline are outlined in **Section 17.3.1**.

17.2 Sustainability initiatives

17.2.1 Impacts during construction

The planning phase provides an opportunity for inclusion of environmental, social and economic sustainability initiatives in the design, construction and operation of the Proposal.

A preliminary review of potential energy and resource use issues associated with construction and operation of the Proposal was undertaken for the Environmental Assessment. This included consideration of:

- energy required for construction of the Proposal and energy expected to be consumed during its operation and maintenance;

- possible greenhouse emissions, including potential greenhouse savings from the operation of the Proposal;
- energy conservation measures;
- materials and resources required for construction and operation of the Proposal; and
- resource conservation measures.

Energy and resource use during construction and operation were estimated using information in the preliminary concept design. The figures derived are broad estimates based on data currently available and provide the basis for identifying the potential impacts of energy and resource consumption in order to develop mitigation measures.

Energy use and potential greenhouse gas emissions during operation of the quadruplication were estimated by predicting the likely change in fuel/energy usage resulting from the reduction in road vehicle mileage travelled. Calculations relied on estimates of train frequency, average loadings and fuel and electricity consumption rates for road and rail travel. Estimates of greenhouse gas emissions used rates derived from the Australian Greenhouse Office (2005), *Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2003, Energy (Transport).*

Energy consuming activities during construction would include:

- procurement and transportation of materials to the site;
- site establishment;
- relocation and protection of services;
- isolation of the construction zone from the operating rail tracks;
- earthworks including cuttings and retaining walls;
- construction of bridges and other major structures;
- construction of drainage structures; and
- track work including ballast and track laying, overhead traction power system, signalling, testing and commissioning.

Plant and equipment use

Plant and equipment for use in the construction of the Proposal would be selected by ensuring that it is operating efficiently and undergoing regular maintenance. It is expected that construction would be completed over a period of 32 months although there would be a significant demand for plant and equipment use over this period.

Electricity consumption

Electricity would be required for the following activities during construction:

- power supply for the Project office and site compounds for air conditioning, operation of office and other equipment and external lighting; and
- lighting during night-time works.

Energy saving measures would be employed during construction to minimise energy consumption, including;

- ensuring that all electricity consuming equipment is switched off when not required;
- regular maintenance to ensure that all electrical equipment operates at maximum efficiency; and
- minimising night-time works where practical.

Fuel consumption

Construction would require the simultaneous operation of a significant number of plant and equipment along the rail corridor. As a result, a substantial volume of diesel and petrol would be consumed for the following activities:

- operation of site plant and equipment;
- delivery of construction materials by road and rail;
- operation of track machinery; and
- transport of waste material from the site for disposal or reuse.

In addition, quantities of gases such as acetylene would be used for welding.

Increases in fuel consumption could also result from the temporary changes in traffic movements required during construction work on road bridges. There would be some disruption to traffic flows caused by road closures and traffic diversions associated with the works. These may lengthen journey times and result in increases in fuel consumption. Journey length increases as a result of construction vehicles are likely to be minor and any increases in fuel consumption negligible.

Water consumption

Water would be used during construction for dust control, washing plant and machinery, sewerage and drinking. Water would also be required in the preparation of some construction materials such as concrete.

It is expected that water would be derived from the town supply. This would be confirmed during the detailed design stage when estimates of water consumption would be made.

Consumption of materials

Consumption of materials during construction would include:

- sleepers (26,000 units);
- rail track (30,000 metres);
- ballast (50,000 tonnes); and
- overhead electrical wiring (approximately 50,000 metres).

Much of this material could be transported to site using the existing tracks during possessions. Other material would require the use of trucks, concrete mixers and excavators.

Approximately 290,000 cubic metres of material would need to be excavated to widen the cuttings along the rail corridor. There would also be the requirement for approximately 250,000 cubic metres of material for fill, part of which could be derived from the excavated material on site where this is suitable for reuse. However, in order to estimate the volume of material that may need to be transported to and from the rail corridor, it has been assumed that all material would need to be exported from or imported to the work sites.

The location of the supply of imported material would be determined during the detailed design. However, it is assumed that fill material would be obtained from sources within the Sydney basin located as close as possible to the construction works. Such sources would involve construction works that generate excess fill and, if required, quarries.

Accurate estimates of the quantities of materials required for construction would be made during the detailed design stage of the Project.

Construction workforce

The construction of the Kingsgrove to Revesby Quadruplication is expected to require a workforce of approximately 450 staff. The personnel would be distributed along the alignment with several work compounds established at Beverly Hills, Narwee, Riverwood (Salt Pan Creek), Padstow and Revesby.

Greenhouse gas emissions

The principle greenhouse gas emissions emitted during construction would be carbon dioxide from road vehicles transporting and removing materials from the site and operation of the site plant and machinery. Greenhouse gas emissions would be managed and minimised during construction through the implementation of the energy and resource saving measures summarised above.

Where feasible, the construction footprint required for the works would be limited to that of the Proposal itself, especially at Salt Pan Creek where impacts on mangroves and endangered ecological communities has been minimised.

17.2.2 Impacts during operation

Energy consumption during operation of the Proposal would be associated with increased rail movements relating to the lines and vehicles and equipment used for their maintenance.

The Proposal could be expected to result in energy savings by shifting passenger movements from road to rail, offset to some extent by the increased generation of electricity required to power the trains. This expected shift would result in reductions in fuel consumption.

Weekday patronage on the East Hills Line generated approximately 57,700 person trips in 2005 with some two-thirds (38,500 trips) taking place during the two peak periods (RailCorp 2005). This level of demand is predicted to increase to approximately 71,000 person trips by 2021 (47,000 during the peak hours).

Estimates of the potential savings in non-renewable resources (mainly petrol) are derived by comparing the situation at 2021 with and without the Proposal. They are based on the following assumptions.

- Growth in patronage will comply with the estimates outlined in **Section 4.6.2**.
- If the Proposal is not implemented (the base case) a proportion of the predicted growth in patronage resulting from population increases could be accommodated by taking up any spare capacity in the existing services.
- There would be a 20 percent reduction in airborne emissions from cars by 2021.
- The average distance travelled by potential passengers who were unable to use existing services in the base case is 15 kilometres per trip.

Each of these assumptions is deliberately conservative.

Patronage on the East Hills Line by 2021 is predicted to be 22.2 million person trips per year (14.8 million during the peak periods). In the absence of the Proposal, increases in patronage would be limited, mainly accommodated by the lengthening of the peak periods but services would also deteriorate reducing their attraction further. Most of the growth in potential patronage would seek alternative means of reaching their destination, mainly by car but also by bus.

The improved services could be expected to accommodate an additional 3.5 million person trips per year averaging 15 kilometres which would not have to be undertaken in a road vehicle. Savings would therefore equate to 42.7 million kilometres or 4.7 million litres of fuel at an average of nine litres per 100 kilometres.

Savings in greenhouse gas emissions were calculated based on these estimated fuel savings resulting from the ability of the improved services on the East Hills Line to accommodate the predicted increased demand. Carbon dioxide emissions were calculated using the *AGO Factors and Methods Workbook* (Australian Greenhouse Office 2004). The calculation is based on one litre of petrol used in a family sized car emitting approximately 2.3 kilograms of carbon dioxide. Assuming that this rate is reduced by 20 percent by 2021 as the result of more effective controls, annual carbon dioxide savings would equal 8,650 tonnes. This does not take account of the related increase in emissions if the Proposal is not implemented resulting from increased congestion and longer journey times.

17.3 Management measures

17.3.1 Hazard and risk

Current risks associated with the operation of the East Hills Line are managed adequately through a program of established procedures. Despite the increase in services resulting from the implementation of the Proposal, no significant change in the level of individual or environmental risk would be expected given the introduction of changes in protocols required for the more intensive operation of the line once the new infrastructure is in place.

Mitigation measures associated with the protection of the ethane gas pipeline outlined below are categorised for each of the four most sensitive factors.

Mitigation measures that would minimise the potential for force to damage the pipeline include:

- investigation of the integrity of the pipeline and surrounding protective coating prior to the start of any digging;
- undertaking specific risk assessment for any digging or piling activity based on the area of excavation, equipment to be used, ground conditions and weather;
- production of a Safe Work Method Statements (SWMS) and conducting a briefing session before commencing work;
- all works within two metres of the pipeline would be overseen by an Agility pipeline protection officer;
- monitoring excavation, including post-activity ground review to ensure that no pipeline damage or gas leak has occured; and
- provision of feedback to project management in order to update any future SWMS.

The following mitigation measures would be implemented to prevent or minimise the potential for unauthorised digging:

- a risk assessment of site security to identify potential unauthorised digging or related activities;
- liaison with third parties to identify future works, access control and timelines during critical work;
- consolidation of work areas to well defined locations that are readily secured;
- use and review *the dial before you dig* hotline;

- implementation of work orders for any third party work including a risk assessment, site briefing and review of their work to achieve pipeline and rail integrity;
- implementation of the contractor risk management program; and
- routine patrols of the pipeline to identify any unauthorised activities.

Mitigation measures to minimise the impact of vibration on the pipeline include:

- restrictions on the use of vibration compacting equipment within two metres of the pipeline (to be reviewed on an as-needed basis);
- implementation of a vibration monitoring program in areas where this is required;
- identification of equipment with excessive vibratory effects and a potential impact on pipeline integrity;
- undertaking sufficient monitoring and review of any activity that creates excessive vibration;
- identification of areas of potential ground movement and subsidence and review of controls to ensure they are sufficient for ground conditions; and
- increase in excavation distances where possible to reduce vibration effects.

To prevent the occurrence of heavy loading that could potentially crush the pipeline, the following mitigation measures would be implemented:

- determination and review of the maximum load permissible in and around the site;
- undertake pigging to determine the exact depth of pipe in areas where excessive loads are in operation;
- implementation of barricading around areas where pipe is exposed or where pipe depth is less than the minimum depth for load;
- implementation of signage around areas with known voids or potential subsidence;
- implementation of restricted access to site for excessive loads;
- marshalling of excessive loads on site;
- identification of areas for storing excessive loads; and
- reviewing area of excessive load at completion of work to determine if any damage has occurred.

17.3.2 Sustainability program

A Sustainability Program would be developed for the Proposal to guide the integration of appropriate measures in each phase of the process of implementation. The program would outline key performance indicators which would be employed to measure social, environmental and economic outcomes. Assessment of the life cycles of the key operational and maintenance requirements of the Proposal would be an important component of the program.

Potential energy savings could be achieved during construction by adopting efficient work practices, implementing procedures to minimise material and energy wastage and ensuring that all workers are appropriately trained in the implementation of the required measures.

Energy saving measures would be employed during construction to minimise energy consumption, including:

- use of energy efficient lighting in project and site offices;
- providing solar heating at project and site offices;
- switching off air conditioning, lights and office equipment when not required;
- regular maintenance of all electrical equipment to achieve optimum efficiency;
- minimising night time work, where practicable; and
- switching off idle equipment and operating it in an efficient manner;

In addition, the purchasing of a portion of green power would be considered for the Project office.

A Sustainability Plan would be developed prior to the start of construction to document detailed measures to be implemented to maximise energy conservation and determine indicators for the measurement of energy consumption across the Project.

The consumption of fuel during construction would be minimised where practicable by deriving materials from locations as close to the site as possible. In addition, cut and fill material would be balanced where possible and reused on site to minimise the transportation of spoil. The extent to which reuse of material derived from the site is possible would depend on its suitability. This would be determined during the geotechnical investigations.

Other energy saving measures to be implemented during the operation of construction plant and equipment would include:

- switching off idle equipment and operating it in the most efficient manner; and
- conducting regular maintenance of plant and equipment to ensure that all machinery operates efficiently.

Environmental management measures would be implemented during construction to enhance water conservation and minimise wastewater production, including:

- minimising water use during dust suppression including the investigation of street sweepers which do not require water to operate or clean road surfaces;
- implementation of recycling systems where appropriate for construction plant and machinery washing operations; and
- installation of water saving devices in amenities provided for construction workers.

Detailed measures to maximise water conservation would be included in the Sustainability Plan.

Where possible, resource requirements would be minimised by the application of a range of management measures:

- programming construction works to minimise handling of construction materials;
- salvaging suitable excavated material for re-use;
- using recycled and/or reprocessed materials;
- ordering calculated quantities of materials required and limiting use of packaging;
- storing excess construction materials for later recycling or re-use; and
- establishment of a logistics yard in a suitable area where materials can be stored centrally and delivered to specific work sites as required.

Consideration would also be given to the use of composite materials where these are feasible and acceptable to RailCorp. The increased use of these materials for structural applications offers significant reductions in energy use and carbon dioxide emissions.