

8 Construction of the Proposal

This chapter describes the construction aspects of the Proposal, including options for the contractual arrangements for project delivery, typical construction techniques, methodologies and timeframes, as well as material requirements and management. It also addresses construction traffic and access arrangements to the site during construction, particularly in relation to residents and businesses along the highway corridor. This chapter also identifies a range of ancillary infrastructure necessary to support the construction, the expected energy and fuel usage and proposals for waste minimisation and disposal.

8.1 Project delivery

Following completion of the approvals process for the Proposal, the most appropriate delivery method for the project would be identified by the NSW Roads and Traffic Authority (RTA). Delivery method options may include:

- A conventional design contract, followed by a separate construction contract. A competitive tendering process to select a suitable contractor would be undertaken for both the final design and subsequent construction phases.
- Design and construction awarded through a competitive tendering process to select a contractor and its nominated design team.
- Design, construct and maintain, where the construction contractor also maintains the completed project for a nominated period.
- An alliance contract where the RTA would formally partner with a selected contractor/s and design consultancy firm/s to be jointly responsible for design and construction of the project.

The timeframe for the construction of the Proposal would be subject to the ultimate staging approach and the delivery method selected but is anticipated to be in the order of two to three years.

8.2 Construction activities

A detailed construction methodology would be developed by the successful contractor(s) in accordance with the Conditions of Approval issued by the Minister for Planning. This section outlines a typical or routine construction methodology in sufficient detail to allow an assessment of the likely nature and extent of the environmental impacts during construction.

The actual staging and / or construction methodology selected by the successful contractor may vary from the description provided in this section. Community and / or stakeholder representations may influence the construction methodology selected.

8.2.1 Identification of typical works

Construction of the Proposal would require the following typical activities to be undertaken:

- Defining and confirming property boundaries and locations of sensitive environmental areas.
- Acquisition of land.
- Adjustment of existing public utilities.
- Implementation of planning and environmental safeguards in accordance with the conditions of approval, to ensure protection of sensitive areas within the alignment boundaries or downstream waterways in the case of drainage and water quality proposals.
- Establishing construction compounds and access roads for the major elements of construction.
- Establishment of asphalt and concrete batch plants (if required).
- Clearing and grubbing of vegetation and processing (including recycling) of various materials for reuse in landscaping activities.
- Construction of diversion drains and sedimentation basins.
- Construction of transverse drainage structures and fauna crossings.
- Construction of transverse and longitudinal bridge structures.
- Stripping of topsoil and placement into stockpiles for reuse.
- Some in-stream (channelisation) works at Arrawarra Creek.
- Earthworks, including movement of materials along the alignment from cuttings to fill embankment areas, including the provision of sub-surface drainage and a select material zone as a pavement foundation.
- Provision of noise barriers where required (where not dependent on the completion of earthworks and / or where they would be of benefit in reducing construction noise, noise mitigation measures would be installed early in the construction process).
- Pavement construction involving both natural materials (crushed rock) and manufactured materials (concrete and asphalt) including provision of low noise pavements in the nominated sections.
- Installation of roadside furniture, including traffic barriers such as guard fencing, as well as linemarking, signposting, interchange lighting and fauna fence installation.
- Landscaping activities.

The construction of the Proposal would be managed to minimise disruption to traffic using the existing Pacific Highway as well as traffic using the existing local access road network. There would be an increase in traffic movements as a result of construction that would be attributable to vehicles moving to, from and within the construction site(s).

Wherever feasible, haulage of materials between areas of cut and fill would take place off-road, primarily along the carriageway under construction adjacent the existing highway, or in the case of the bypass section, along the proposed corridor. Appropriate traffic management measures would be put into place to minimise any traffic related impacts from crossovers or access points to the construction sites.

Details regarding water quality control structures and the use of these structures during construction to ensure management of potential construction phase water quality impacts are discussed in Chapters 7 and 18 of this report. The control of water quality released downstream during construction is an important element in the design of water management structures, especially at those watercourses that form part of the Solitary Islands Marine area, namely Cunninghams Creek and Double Crossing Creek.

8.2.2 Construction working hours and workforce

Working hours

Construction would generally be undertaken Monday to Friday between 7am and 6pm and between 8am and 1pm on Saturdays. This would seek to minimise the disturbance to any surrounding residents. Unless approved otherwise, noisy and / or vibratory activities such as rock breaking / hammering would generally occur only between 9am and 12pm and between 2pm and 5pm Monday to Friday and between 9am and midday on Saturday.

Should work be undertaken outside normal construction hours, to ensure that the activity does not cause unreasonable nuisance to residents, works would be restricted to:

- Delivery of materials.
- Emergency work.
- Work that would not create traffic delays, traffic management problems or excessive noise.
- Other works for which a need would be demonstrated.

Should work need to be undertaken outside the identified standard working hours, consultation would occur with the Department of Environment and Climate Change and the local community prior to undertaking the works. Consultation requirements would be outlined in the consultation strategy developed by the successful contractor and would include public notification by way of advertising in local newspapers and on local radio.

Workforce

The extent and composition of the construction workforce would vary over the life of the project, depending on the location and nature of the construction activities.

Construction sites along the alignment would require specialist crews depending on the particular type of activity. These crews would include equipment and plant operators, form workers, steel fixers, concreters, labourers, tradespersons and truck drivers. An on-site workforce of up to 300 people could be engaged during the construction period. Over the anticipated construction period, approximately 2.2 million person hours (or 11,000 person months) would be required for the on-site workforce.

8.2.3 Construction traffic and temporary access arrangements

Pacific Highway

Local and through traffic would continue to use the existing highway during the construction phase. Therefore, emphasis would be given to carefully managing the mix of construction and through traffic.

Some sections of the Proposal would require construction works in close proximity to the existing highway and the traffic on it. Areas where such works would occur include:

- The southern tie-in with the existing highway at Sapphire.
- Modifications to Campbell Close, Sapphire.
- Locations where the new carriageway (including the local access road) switches from one side of the existing highway to the other side, including north of Gaudrons Road, north of Moonee Beach, near Smiths Road and north of Fiddaman Road, Emerald Beach.
- Connections to the existing highway, to the north of Graham Drive North, at south Woolgoolga and at Arrawarra Creek.

The majority of the upgrade section would be constructed independently from existing highway traffic due to the proposed separation of the individual highway carriageways and the local access

road network. At completion of the duplicated carriageway, traffic could be transferred to that carriageway while work is undertaken to upgrade the existing carriageway where necessary.

During the times when there would be potential conflicts with existing traffic, specific traffic management procedures would be implemented. These procedures would be based on information provided in the construction environmental management plan for the Proposal, referred to in the draft Statement of Commitments (Appendix A). The plan would address issues including speed restrictions, traffic controls and out of hours work.

The bypass section of the Proposal would be constructed independent of traffic using the existing highway. Other than light vehicles for employees, connection to the existing local road network in Woolgoolga would be undesirable and focus would be given to restricting all construction access via the bypass corridor.

Temporary access for businesses and residents

Access for residents and business would be maintained at all times during construction, although short periods of disrupted access may be necessary during some construction activities in the immediate vicinity of driveways and property accesses. This would be particularly necessary on the upgrade section of the Proposal where access to existing properties is to be managed in conjunction with concrete paving operations. This would also be the case on the bypass section but early provision of permanent access arrangements would be more readily achieved.

The successful contractor would be required to consult with all business and property owners to establish access requirements and frequency of use. Any access restrictions to businesses located adjacent to the existing highway within the upgrade section would be minimised during the construction phase. Temporary signposting and access provisions would be provided for those businesses reliant on passing trade.

Access to work sites

In a majority of cases, access to the various work sites would be along the proposed highway corridor, whether the construction is located adjacent the existing highway or on the bypass section of the Proposal.

There would be a number of dedicated access points chosen as part of the contractor's construction environmental management plan for access to work sites including the delivery of plant, equipment and material supplies to various compounds.

These dedicated access points would consist of a series of gates or nominated control points that would be managed by a combination of fencing, traffic barriers and construction staff. Access points would be placed for safe access / egress of construction vehicles that would have minimal impact on the existing highway or local connecting roads.

8.3 Earthworks materials, quantities and sources

8.3.1 General, select and fill materials

As illustrated in Table 8.1, the Proposal would generate a total of approximately 2.44 million m³ of cut material, but would require 2.35 million m³ of fill material, giving an excess of approximately 90,000 m³. Table 8.1 identifies cut and fill (and surplus or deficit) quantities for three discrete sections of the Proposal.

TABLE 8.1 CONCEPT DESIGN EARTHWORKS QUANTITIES ¹

SECTION	CUT	FILL	SURPLUS (DEFICIT)
Sapphire to Moonee Beach	940,000 m ³	560,000 m ³	380,000 m ³
Moonee Beach to South Woolgoolga	180,000 m ³	610,000 m ³	(430,000 m ³)
Woolgoolga Bypass	1.32 million m ³	1.18 million m ³	140,000 m ³
Totals (rounded)	2.44 million m³	2.35 million m³	90,000 m³

¹ The quantities of materials would be further refined during the detailed design of the project.

Material removed from cuttings would be used to construct fill embankments unless it is found to be unsuitable for that purpose. If cut material is deemed unsuitable, it would be stockpiled until needed as part of the landscaping design or possibly used as visual screening or noise mounding during the construction phase. Unsuitable material would not be used for embankment construction and, as such, any unsuitable material in excess of 90,000 m³ would need to be replaced by material sourced from off site.

The Proposal has been designed to achieve an approximate balance of cut and fill material, including allowances for topsoil and some unsuitable material. However, subject to the actual volumes of topsoil and unsuitable materials encountered, up to 100,000 m³ of material may need to be imported onto the site to complete these earthworks operations. As there may be some changes to the design after the environmental assessment phase, a full review of the earthworks and material quantities balance would be undertaken during the detailed design phase of the project. At that time there would be opportunities to achieve a more detailed earthworks balance. Alternatives for sourcing additional material as part of the Proposal may include:

- Changing the vertical alignment of the Proposal to increase cut and reduce fill in areas.
- Flatten cut batters to provide more excavated material and gentler slopes for landscaping.
- Widen cut batters to provide wider verges and clear areas adjacent the carriageway.
- Lower some sections of the new local access road to reduce the cut to fill discrepancy between Moonee Beach and south Woolgoolga.

These options would need to be considered within the restrictions of proposed road boundaries outlined in this assessment. Alternatively, the use of other earth materials from nearby quarries would be considered. Estimates of imported materials are based on the current concept design and available geotechnical information and have assumed that the select material zone underneath the pavement would need to be imported. Estimates of the quantities of imported fill and imported select fill quantities assume that select material may not be readily sourced from within the construction site. Modification of in-situ materials using on site treatment such as lime or cement stabilisation would reduce potential material shortfalls.

The earthworks balance and the select material supply are important considerations in determining the process of construction and this would also be affected by any staging options. Should a staging option be chosen for the construction of the Proposal, a full review of the earthworks and material quantities balance would be undertaken as part of the staging report.

8.3.2 Sources of fill materials

There are a number of quarries within the Coffs Harbour City Council local government area, with one located in close proximity to the section of highway between Sapphire and Arrawarra.

A quarry in the Woolgoolga area is known to supply hard rock aggregate, having a product extraction limit of 88,800 m³ a year. This limit would apply to the supply of quarry materials, however opportunities exist, subject to a separate development approval processes, for the re-use of overburden or earth materials from the quarry operations.

Access to the nearby quarry, if it was required, is via Morgans Road and Graham Drive North, then onto the highway. Haulage routes for material from the quarry would utilise this access, which would then be delivered to where required adjacent to the highway. Should other quarries be required to accommodate the volume of additional material required this would most likely be sourced from quarries located to the west of Coffs Harbour.

With the objective of minimising any imported materials and conserving resources (consistent with ecologically sustainable development principles), opportunities to achieve cut / fill balance would be assessed during the detailed design phase.

8.3.3 Materials for pavements and structures

Typical pavement and structure works would require concrete, cement, aggregates, sand, steel, fuel, asphalt and water, as well as the delivery of other materials and pre-fabricated elements. Due to the size of the Proposal and the quantities of materials required for pavement construction, it is very likely that concrete and asphalt batching plants would be required on site to efficiently meet the project demand. Smaller quantities of concrete for drainage or minor structures may be sourced separately through off site commercial suppliers.

The material volume required for the road pavement is dependant on the final detailed design and pavement selection. The proposed pavement would comprise of multiple layers of pavement quality materials, including select material (crushed rock) concrete sub-base and base layers with an asphalt top layer to provide low noise surfacing from the southern extent of the Proposal to approximately 700 metres north of Bark Hut Road. Quantities of materials required for the pavement have been estimated in Table 8.2.

TABLE 8.2 PRELIMINARY ESTIMATE OF REQUIRED PAVEMENT MATERIALS ¹

MATERIAL	ESTIMATED VOLUME REQUIRED
Select fill material	180,000 m ³
Base concrete	100,000 m ³
Sub-base concrete	60,000 m ³
Crushed rock pavements	72,000 m ³
Asphalt	95,000 m ³ (240,000 tonne)

¹ The quantities of materials would be further refined during the detailed design of the project.

As well as earthworks, landscaping and pavement design, the Proposal requires structures and other works that require pre-fabricated elements to be delivered to site. These include pre-cast culverts and drainage pipes and pits, bridge girders and numerous items of roadside furniture, as outlined in Table 8.3.

TABLE 8.3 MAJOR MATERIALS TO BE IMPORTED

ITEM	ASPECT	TECHNIQUE	MATERIAL	SOURCE	AVAILABILITY
Drainage					
	Wet ground conditions	Rock blanket	Rock	Quarry	
	Culverts	Pipe / box	Concrete	Commercial, recast yards	Readily
		Culverts	Concrete	Commercial	Readily
		Headwalls	Concrete	Commercial	Readily
		Wingwalls	Sand, fines	Onsite or quarry	
		Backfill		Quarry	
		Inlet and outlet protection	Rock	Commercial	
	Subsoil	Pipes	Plastic Sand, fines	Onsite or quarry	Readily
		Backfill			
	Surface	Catch or dish drains	Concrete, fibre	Commercial	Readily
Bridges					
	Foundations	Driven or bored piles	Concrete and steel	Special supplier	Specific orders
	Pile caps	Cast-in-situ	Reinforced concrete	Commercial	Readily
	Piers	Cast-in-situ	Reinforced concrete	Commercial	Readily
	Superstructure	Concrete girders or planks	Prestressed Concrete	Special supplier	Specific orders
	Superstructure	Post tensioned voided slab	Prestressed concrete	Special supplier	Specific orders
	Deck	Cast-in-situ	Reinforced concrete	Commercial	Readily
Roadside furniture					
	Guideposts	Driven in place	Timber	Commercial	Readily
	Guard fencing	Driven in place	Steel	Commercial	Readily
	Headlight screens	Erected on site	Various material type options available, likely lightweight concrete	Commercial	Readily
	Noise barriers	Erected on site	Various material type options available, likely lightweight concrete	Commercial	Readily
	Signs	Erected on site	Steel	Commercial	Readily
	Pavement markers	Placed on road	Plastic	Commercial	Readily
	Linemarking	Painted	Paint	Commercial	Readily

8.3.4 Water

The principal construction activities and associated water requirements are provided in Table 8.4.

TABLE 8.4 ESTIMATED VOLUMES OF WATER REQUIRED BY PRINCIPAL CONSTRUCTION ACTIVITIES ¹

ACTIVITY	ESTIMATED WATER VOLUME REQUIRED	POTENTIAL WATER SOURCE
Manufacture of concrete	Approximately 40 mega litres (over construction period).	Higher quality town water likely to be required for consistency in concrete production.
Compaction of earthworks	Approximately 60 mega litres (over construction period, based on 6% moisture content).	Lesser quality recycled water from Coffs Harbour City Council waste water treatment plant and re-use pipeline.
Dust suppression	The volume of water required for dust suppression is difficult to assess, as it would be dependent on a number of factors such as weather conditions, locality, type of work, etc. Based on an allowance of 80,000 litres per day for the duration of the earthworks activities, the estimated volume required would be approximately 60 mega litres.	Recycled water as above or possible drawdown on major (non water supply) reservoirs in vicinity of Proposal.
Estimated total volume of water	160 mega litres	

¹ The estimated quantity of water would be further refined during the detailed design of the project.

Supply of water for various construction activities would be investigated from a number of potential sources as noted in Table 8.4 above. However, water quality requirements vary for different activities (high quality for mass concrete production versus lower quality for compaction control and dust suppression). Further, any water source would be required to meet occupational and health safety standards for use on construction sites.

8.4 Ancillary facilities and activities

During construction, there would be a requirement for numerous temporary construction areas to accommodate a range of facilities including construction compounds, batch plants and stockpile areas. Locations for these facilities would be confirmed during detailed design.

8.4.1 Construction compounds

Construction compounds (major and minor) would be required for personnel, portable offices, vehicle parking areas, materials and plant. Due to the length of the Proposal, as well as the possible staging of the construction, several construction compounds would be required.

Construction compounds could be co-located with or separated from the potential batch plant sites nominated in Section 8.4.2 below. A major construction compound would require an area of at least one hectare. Potential construction compounds would generally be located on:

- Residual land currently owned by the RTA.
- Existing cleared areas within parts of properties acquired by the RTA for the Proposal.
- Available land within the road reserve that has manageable environmental constraints.
- Land leased from private property owners.

Minor compounds would focus on more specialist areas of construction such as retaining walls and major bridge sites. Sites identified below are nominated based on their proximity to specialist construction areas and are potential sites only. Other sites that are not listed here may be identified by the successful contractor as suitable, based on the construction program or phases of construction works.

Additional criterion for positioning construction facilities within the highway corridor are identified in Table 8.5. Identified sites could include, but are not limited to:

- Near Campbell Close at the start of the Proposal.
- The western end of Hunter Close.
- Local access road north of Gaudrons Road.
- Local access road south of Killara Avenue.
- Suitable sites east of the highway between Tiki Road and Emerald Beach.
- Existing timber mill property to be acquired south of Emerald Beach.
- On Woolgoolga Creek Road for access to Woolgoolga Creek.
- North of Bark Hut Road.

The final locations for the construction compounds would be identified in the construction environmental management plan for the Proposal, referred to in the draft Statement of Commitments (Appendix A).

8.4.2 Concrete and asphalt batch plants

As indicated above, it is expected that 160,000 m³ of base and sub-base concrete would be required for the Proposal. It is highly likely that the construction contractor would establish one or more concrete batching plants on site for the bulk supply of concrete for major paving and other operations.

It is likely that the Proposal would include sections of asphalt pavement and it is estimated that over the nominal three year construction period, 240,000 tonne of asphalt would be required. The construction contractor may therefore propose to install one or more asphalt batching plants, or a mobile plant on site for the bulk supply of asphalt

The batching plant sites would induce substantial incoming and outgoing traffic movements as a result of the supply of materials such as cement, aggregate and sands. As indicated in Table 8.4, approximately 160 mega litres of water would be needed for various aspects of construction and environmental management, and as such, a regular water supply would be required.

Batching plants would also require temporary buildings for staff offices and other facilities. They would be placed selectively along the proposed alignment to facilitate cost effective delivery of concrete and asphalt. In considering the 25 kilometres length of the Proposal and the desire to limit haulage, the following sites have been identified for initial consideration and assessment as possible locations for batch plants:

- Northern end of Hoys Road, Moonee Beach.
- On the existing highway at Unwins Road or within the adjacent Woolgoolga industrial area (subject to location, this could be in either the upgrade or bypass sections).
- South of Arrawarra Beach Road at the proposed rest area.

8.4.3 Stockpiles

A number of stockpile locations may also be required along the Proposal due to its length. These would be used to store, prepare and distribute aggregate and other bulk materials such as topsoil, sands, pre-cast culverts drainage pipes and drainage pits for the construction of the Proposal.

Materials such as topsoil, mulched timber and any unsuitable cut material would need to be stockpiled during construction of the Proposal prior to being re-used in the final landscaping. The selection of these sites would be the responsibility of the successful construction contractor and would need to comply with the criteria set out in Table 8.5.

TABLE 8.5 CRITERIA FOR LOCATION OF ANCILLARY FACILITIES

LOCATION CRITERIA	CONSTRUCTION COMPOUND	BATCH PLANTS	STOCKPILE AREAS
Environmental			
More than 100 metres from waterway.	Yes	Yes	Yes
Areas of low ecological and heritage conservation significance.	Yes	Yes	Yes
Distance from dwellings or other activities that may be affected by noise or other plant impacts.	200 metres	200 metres	100 metres
Construction			
Easy and safe access to the main road network.	Yes	Yes	Yes
Relatively level ground elevated to assist drainage and allow treatment of runoff.	Yes	Yes	Yes
Minimum area preferred.	1 Hectare	1 Hectare	1 Hectare

8.4.4 Criteria for location of ancillary facilities

It is important to locate ancillary works in areas that facilitate efficient and cost effective construction of the Proposal while ensuring minimal biophysical and social impact. This would be achieved through compliance with the construction and environmental criteria set out in Table 8.5. In addition to considering these criteria, security of the site would also be considered in determining appropriate locations.

Should a site(s) be identified that complies with most, but not all of the identified criteria, and management measures can be applied to effectively ameliorate potential impacts, it would be further considered for use.

8.4.5 Potential impacts of ancillary facilities

The criteria outlined for the location of ancillary facilities have been developed in order to minimise any impacts that the facilities would have on the surrounding environment. However, the ancillary facilities could still have an environmental impact. Although the exact location of ancillary facilities as well as the staging of the Proposal is yet unknown, the potential impacts and proposed management strategies are outlined in general terms in Table 8.6.

Ancillary facilities would be solely for use on this Proposal and would be removed on completion of construction.

TABLE 8.6 POTENTIAL IMPACTS OF ANCILLARY FACILITIES

POTENTIAL IMPACT	PROPOSED MANAGEMENT MEASURE
Soil and water	
<ul style="list-style-type: none"> ■ Soil erosion. ■ Discharge of sediment. ■ Potential disturbance of Acid Sulfate soils. 	<ul style="list-style-type: none"> ■ Comply with criteria. Compound to be located 100 metres away from any watercourses. ■ Minimise area of disturbance to vegetation and topsoil. ■ Implementation of appropriate erosion, sedimentation and pollution controls such as silt fencing. ■ Sedimentation basins would be designed and sized for optimised performance during operation and construction phase. ■ Any disturbed acid sulfate soils would be managed in accordance with sections SW9 and SW10 of the draft Statement of Commitments. ■ Treat runoff from fuel storage areas and vehicle wash down area prior to discharge. ■ Prompt clean-up and removal of spillage of materials. ■ Comply with sections SW1 to SW8 and CS1 and CS2 (as relevant) of the draft Statement of Commitments.
Noise and vibration	
<ul style="list-style-type: none"> ■ Additional vehicle and equipment noise 	<ul style="list-style-type: none"> ■ This issue is addressed in Chapter 11. ■ Comply with sections CN1 to CN10 of the draft Statement of Commitments.
Traffic and access	
<ul style="list-style-type: none"> ■ Impacts on surrounding roadways 	<ul style="list-style-type: none"> ■ This issue is addressed in Chapter 10. ■ Implementing dedicated access points into construction compounds / sites. ■ Comply with sections T1 and T2 of the draft Statement of Commitments.
Air quality	
<ul style="list-style-type: none"> ■ Dust generation ■ Fumes generating from batch plants etc. 	<ul style="list-style-type: none"> ■ Implementing measures including protection of erodible material stockpiles. ■ Minimising energy use. ■ Maintain and operate all plant and equipment to a proper and efficient condition. ■ Implement a dust monitoring program. ■ Comply with sections AQ1 and AQ2 and G1 to G3 of the draft Statement of Commitments.
Flora and fauna impacts	
<ul style="list-style-type: none"> ■ Removal of potential habitat ■ Impacts on threatened species 	<ul style="list-style-type: none"> ■ Comply with criteria outlined above to avoid vegetated areas by selecting cleared land with low ecological significance. ■ Avoid areas that are known to have threatened flora / fauna species. ■ If any clearing is to occur, inspect areas to be cleared for presence of native fauna. ■ Comply with sections F1 to F26 (as relevant) of the draft Statement of Commitments.
Aboriginal heritage	
<ul style="list-style-type: none"> ■ Impact on previously undiscovered Aboriginal sites 	<ul style="list-style-type: none"> ■ Comply with criteria outlined above so that any compound is located on cleared land with low Aboriginal heritage significance. ■ Comply with sections AH1 to AH10 (as relevant) of the draft Statement of Commitments.
Waste	
	<ul style="list-style-type: none"> ■ Minimise generated waste. ■ Implement a recycle / reuse strategy as part of the construction environmental management plan. ■ Comply with sections WR1 to WR3 (as relevant) of the draft Statement of Commitments.

8.5 Energy requirements

All construction activities associated with the Proposal would consume energy. Activities with high-energy demands, generally decreasing order, include:

- Excavation of earth and rock cuttings.
- Removal, relocation and compaction of excavated material in fill embankments.
- Clearing vegetation.
- Transport of raw materials.
- Pavement construction.
- Construction of major bridges and structures.
- Demolition of existing structures.
- Operation of electronic signage and lighting.

Equipment and vehicles on the construction site would consume a large quantity of fuel. It is estimated that 1.5 litres of fuel are required for each cubic metre of earthworks and on this basis, it is estimated that four million litres of fuel would be used for earthworks operations.

Other activities such as the delivery of raw materials to batching plants and the construction of bridges would also utilise a large amount of fuel. It is estimated that up to 10 million litres of fuel would be required for such activities.

Electricity needs on the site would be minor and connecting the offices to the local power grid would be sufficient. Some generators may be necessary for emergency power supply.

8.6 Waste minimisation and management

Specific requirements for waste minimisation and management during the construction of the Proposal would be detailed in the construction environmental management plan.

The waste minimisation and management strategy would comply with relevant State Government legislation and policies and any conditions of approval. These include the *Waste Avoidance and Resource Recovery Act 2001* and the draft *NSW Waste Avoidance and Resource Recovery Strategy 2006* (DECC 2006).

Where possible, materials would be re-used either on-site or off-site. These would include tree and plant material which would be mulched or chipped on site and any materials from demolished structures, as well as any soil and rock material.

Recycling facilities for on-site personnel would also be provided to facilitate recycling of paper, plastic, glass and other re-useable materials. Liquid waste such as paints and solvents would be disposed in accordance with the (then) NSW EPA (1999) *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes*.