



Gold Coast Rapid Transit

2 Construction Impact Management Plan

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1. Overview

1.1 Introduction

Part 2 of Volume 3 is the *Construction Phase Impact Management Plan* (IMP). This IMP includes a range of management plans and mitigation measures to address the construction issues identified through technical investigations, concept design, consultation and impact assessment described in Volume 2.

Proponents of the GCRT will be responsible for preparing a detailed Construction IMP that will relate to specific construction methods and reflect the detailed design that follows this concept design. For various mitigation measures the responsible entities identified will develop detailed procedures to ensure that mitigation measures are implemented. The CDIMP is based on the Concept Design and the IMP links the concept to future specific measures a proponent and other entities should address in the detailed design and construction phase.

Similar mitigation measures are described throughout this IMP. For example, there is a relationship with the mitigation measures described for erosion and sediment control (Chapter 4), acid sulfate soil (Chapter 15) and surface water and groundwater (Chapter 5). Each IMP describes mitigation measures from the perspective of the specific element and may overlap with similar mitigation measures required for other construction phase elements.

The Social Impact Management Plan (SIMP) is a comprehensive high-level plan based on outcomes from the Volume 7 technical report titled *Social Impact Assessment* (SIA). The SIMP has construction phase elements and is intended to be integrated with those IMPs. The SIMP is included in Part 4 of this Volume. This enables the SIMP to be presented as one IMP; however, there are distinct construction phase related actions and mitigation measures (refer to Part 4 of this Volume).

1.2 Key to Responsible Entity

The following key indicates the person/agency/entity that is assigned responsibility for actions identified in the IMP

DD	= Detailed designer	EC	= Environmental consultant/representative	PD	= Project duration
DDP	= Detailed design phase	EO	= Environmental officer	VI	= Visual inspection
PC	= Principal contractor	MER	= Monthly Environmental Report	WR	= When required
O	= Operator	Post C	= Post construction	CL	= Checklist to be completed
S	= Superintendent	Pre C	= Pre construction	NA	= Not applicable

2. Safety

2.1 Objectives

This Construction Impact Management Plan (CIMP) is intended to provide management measures for safety. The main objectives of this IMP are:

- » To provide a safe workplace and work sites during construction of the GCRT Project;
- » To provide a safe environment for maintenance of the GCRT infrastructure;
- » To improve access to and from emergencies by emergency services along the GCRT corridor; and
- » To identify potential hazards and risks and application of appropriate impact treatment/prevention/mitigation measures.

2.2 Statutory provisions

- » *Workplace Health and Safety Act 1995;*
- » *Transport Operations (Road Use Management) Act 1995;*
- » *AS 2670-1990 Evaluation of Human Exposure to Whole-Body Vibration – Part 1: General Requirements and Part 2: Continuous and Shock Induced Vibration in Buildings;*
- » *ISO 2631-1 (1997) Evaluation of Human Exposure to Whole-Body Vibration – Part 1 General Requirements;*
- » *BS 6472:1992 Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz) Structural Effects;*
- » *BS 7385: Evaluation and Measurement for Vibration in Buildings - Part 1: 1990 Guide for Measurement of Vibrations and Evaluation of their Effects on Buildings and Part 2: 1993 Evaluation and Measurement for Vibration in Buildings - Part 2 Guide to Damage Levels from Groundborne Vibration; and*
- » *DIN 4150: Part 3: 1999 Structural Vibration in Buildings - Part 3: Effects on Structures.*

2.3 Performance criteria

- » Number of reportable injuries directly related to the project;
- » Days lost to injury; and
- » Number of reportable crimes to property and persons along the GCRT corridor through project duration.

2.4 Construction Impact management actions and responsibilities

Construction impact management actions for safety are summarised in Table 1.

Table 1 Safety – Construction impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	The design of the GCRT system and ancillary elements shall have consistency of standards with all elements integrated towards providing a safe environment for all users.	DD	CL	DDP	DD
	Vandalism (including graffiti) will be minimised and managed by providing adequate security measures including lighting, security monitoring, fencing, suitable wall coatings and other controls to prevent unauthorised access.	DD	CL	DDP	DD
	Undertake road safety audits to assess design relevant to safety requirements and standards	DD	CL	DDP	DD
Construction	A Construction Traffic Management Plan shall be prepared and implemented for all works and activities that will result in changed access conditions.	PC	VI / CL	PD	S / PC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	The Principal Contractor will be required to: <ul style="list-style-type: none"> » Appoint a Project Safety Officer; » Hold safety inductions for all employees and site visitors prior to entry to the worksite; » Hold regular safety meetings; » Set up and maintain an accident reporting and investigation system; and » Undertake all construction activities in accordance with approved safety plans. 	PC	CL	PD	S / PC
	Procedures to facilitate a coordinated and rapid response strategy to accidents shall be developed through a Safety Management Plan and implemented in liaison with the appropriate authorities.	PC	Implement	PD	S / PC
	An incident management plan will be put in place for use by the construction contractor.	O	Implement	Pre C	PC
	An Emergency Services Liaison Plan is to be developed to cover the briefing of police, fire and ambulance, SES, etc during construction.	PC	Implement	Pre C	PC

2.5 Corrective actions

- » If a major accident or reported near miss occurs due to unsafe conditions on the GCRT corridor, the Principle Contractor should inspect the scene of the incident and determine its cause. If the cause was related to construction, infrastructure rectification works should be considered.
- » If adverse public feedback is received by the Community Liaison Officer in relation to a specific safety related problem, the Principle Contractor (in conjunction with the Contract Manager) is to investigate the complaint and consider modification of the unsafe condition.

2.6 Reporting requirements

The Principal Contractor shall report all site safety issues to TransLink and other relevant entities (such as Queensland Transport, GCCC, Environmental Protection Agency) as determined by the nature of the issue and the responsible agencies/regulators. Reporting is to include both internal safety issues (e.g. tool box meeting, lost time injuries and near misses) and any external issues such as local traffic incidents, which may occur as a result of construction works in a monthly report.

3. Erosion and Sediment Control

3.1 Objectives

This CIMP is intended to provide management measures for erosion and sediment control. The main objectives of this IMP are to:

- » Minimise the impacts on surface water and drainage during construction activities;
- » Implement and maintain suitable erosion and sediment control measures; and
- » Minimise the extent of disturbed land at any one time.

Sediment and erosion control is generally a construction phase issue in terms of active work sites and construction activity, creating the possibility of erosion and sediment control if not managed. This is particularly the case when works involve excavation, filling and other activities involving the movement of material (earth) and associated activities such as repeated vehicle movements over surfaces not generally designed for construction vehicle movement.

Erosion and sedimentation issues are not identified as major issues for the project; however, certain locations (such as creek/river crossings) are more sensitive from an environmental perspective. Urban locations are sensitive from an ongoing business and community perspective while the corridor is generally sensitive to acid sulfate soils.

Other chapters of the IMP also relate to erosion and sediment control, including acid sulfate soil (Chapter 15) and surface water and groundwater (Chapter 5). Other IMP elements describe mitigation measures from the perspective of those elements, which overlap with mitigation measures identified in this chapter.

3.2 Statutory provisions

- » *Environmental Protection Act 1994;*
- » *State Planning Policy 2/02- Planning and Managing Development Involving Acid Sulfate Soils;*
- » *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland (EPA);*
- » *Soil Conservation Act 1986; and*
- » *Soil Conservation Measures - Design Manual for Queensland (DNRW).*

3.3 Performance criteria

- » Sedimentation is to be limited off site to as low as reasonably practical; and
- » Erosion control measures are reviewed and maintained regularly.

3.4 Construction Impact management actions and responsibilities

Construction Impact management actions for erosion and sediment control / water management are summarised in Table 2:

Table 2 Erosion and Sediment Control / Water Management – Construction impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	Site specific sediment run-off and drainage control to be designed in detail at the following locations: <ul style="list-style-type: none"> » Melaleuca wetlands along Smith Street and Olsen Avenue (Significant Ecological Area C as identified in the Volume 7 technical report titled <i>Ecological Assessment Report</i>); and » Loders Creek, in vicinity of known breeding ponds for green thighed frog (Significant Ecological Area G as identified in the Volume 7 technical report titled <i>Ecological Assessment Report</i>). 	DD/EO	VI/MER	Pre C	EO
	Design to consider no requirement for bridge footings or pylons within Loders Creek crossing.	DD	N/A	Pre C	DD

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Hold a pre-construction meeting to identify sediment and erosion controls to be put in place.	O/S	N/A	N/A	PC
	Culvert structures are to be designed to accommodate a 1 in 100 year flow event.	DD	VI	Pre C	PC
Construction	Provide warning to all construction site workers that are involved in the implementation and management of erosion control measures, as well as drivers and plant operators involved in earthworks activities to minimise damage to the local environment.	PC	MER	Pre C / WR	PC
	Roads used during construction will be hardened and/or watered to reduce the potential for soil wind erosion.	PC	VI	Pre C / WR	PC
	Prevent uncontaminated runoff from entering excavations by diverting runoff around the works.	PC	VI	Pre C / WR	PC
	Stormwater runoff will be managed to minimise the potential for erosion including diverting flow over stable areas and away from disturbed areas and installation of appropriate structures.	PC	VI	Pre C / WR	PC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Uncontaminated sediment removed from all sediment control devices will be incorporated in landscaping, fill batters or mounds on site, or as otherwise approved by the Site Construction Supervisor. Contaminated sediment will be disposed of to an approved stockpile area or disposal area.	PC / O / EO	VI / MER	Pre C / WR / Post C	PC / O / EO
	Construction within waterways to be scheduled, as far as possible, during dry season. Where heavy rains or floods are predicted, work will cease and the site will be made as stable as practical.	PC	N/A	PD	PC
	Any waste, concrete washings or similar construction materials will be disposed of in bunded areas for containment and treatment.	PC/EO	MER	WR / Post C	EO
	The condition of erosion/stormwater control structures will be periodically checked during construction, especially after rainfall to ensure they remain effective e.g. berms, silt fences and turn-off drains.	PC/EO	MER / VI	WR / Post C	EO
	Soil and construction stockpiles will be placed away from drainage lines or stormwater drains.	PC	VI	WR	EO

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Sediment or silt barriers such as sand bags and straw bales (weed free) will be used where required.	PC	VI	WR	EO
	Erosion control structures will be installed in the following areas: » Down slope of disturbed soil; » Any areas where wind can disperse soil; » Around soil stockpiles; and » At discharge point from construction sites and roads.	PC/EO	VI	WR / PD	EO
	Permanent (restored) batters shall have topsoil spread evenly and shall then undergo hydraulic seeding/mulching (hydro mulching).	PC/EO	VI	WR / Post C	EO

3.5 Monitoring

- » The Principle Contractor shall inspect all stormwater drains and erosion control measures for discharges of suspended solids to waters daily in response to significant rainfall events (>50 mm in 24 hours);
- » During construction, Nerang River and Loders Creek water quality assessments both up- and down-stream of the site should be conducted every one to three months until completed. All assessments should consider the full suite of water quality parameters considered appropriate under the Australia and New Zealand Environment and Conservation Council (ANZECC)/Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) Guidelines for fresh water quality (ANZECC/ARMCANZ, 2000), and should be conducted in the manner prescribed in the Guidelines;
- » The location of monitoring points is to be in accordance with criteria above ANZECC/ARMCANZ, 2000 Guidelines and the EPA Queensland Water Quality Guidelines 2006;
- » Monitoring of revegetation progress and soil stabilisation;
- » Receiving waters water quality as per regulations and conditions; and
- » Daily or weekly reports (as appropriate) will be completed by the Construction Contractor and Environmental Consultant/Representative on site and reviewed by the site Construction Contractor Site Supervisor.

3.6 Corrective actions

- » The Construction Manager and the Environmental Manager are to be notified in the event of any non-compliance;
- » Corrective actions in the event of non-compliance include inspection of maintenance and erosion control measures and identification of sediment control deficiencies. Sediment fences and additional control (or rock check dams on drainage lines) may be installed to prevent transport of sediment to any waterway;
- » Revegetation works to be undertaken in areas of likely erosion; and
- » Some areas may have to be temporarily closed to repair erosion damage and to prevent further sediment transport off site.

3.7 Reporting requirements

- » Erosion and sediment control will be included in monthly reports prepared by the Construction Contractor Environmental Representative. The reports will be copied to the Construction Contractor Site Supervisor and are to recommend appropriate controls to minimise erosion on site.

4. Surface Water and Groundwater Management

4.1 Objectives

This CIMP is intended to provide management measures for water quality degradation. The main objectives of this IMP are to:

- » Minimise the impacts on surface water and drainage during construction activities;
- » Minimise the extent of disturbed land at any one time;
- » Minimise the impacts on surface water and drainage;
- » Ensure that where groundwater interacts with surface waters, groundwater quality does not compromise identified Environmental and Water Quality Objectives for those waters; and
- » Ensure that no deterioration in groundwater quality, volume or level is to occur as a result of the GCRT Project.

This IMP should be read in conjunction with Chapter 4, Erosion and Sediment Control, and Chapter 15, Acid Sulfate Soils and Potential Acid Sulfate Soils, of Volume 3. .

4.2 Statutory Provisions

- » *Environmental Protection Act 1994;*
- » *Environmental Protection (Water) Policy 1997;*
- » *Water Act 2000;*
- » *Australia and New Zealand Environment and Conservation Council (ANZECC) Water Quality Guidelines 2000; and*
- » *EPA Queensland Water Quality Guidelines 2006.*

4.3 Performance Criteria

- » Where groundwater interacts with surface waters, groundwater quality should not compromise identified Environmental Values and Water Quality Objectives for those waters;
- » Sedimentation is to be limited off site to as low as is reasonably practicable;
- » Erosion control measures are reviewed and maintained regularly;
- » No deterioration in groundwater quality, volume or level is to occur as a result of the GCRT Project; and
- » Surface water leaving the site should be within the relevant water quality guidelines (Refer to Table 11 of Volume 7 Technical Report titled 'Surface and Groundwater Quality Assessment').

4.4 Construction Impact Management Plan actions and responsibilities

Construction Impact management actions for erosion and sediment control / water management are summarised in Table 3.

Table 3 Erosion and Sediment Control / Water Management – Construction Impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	An Acid Sulfate Soil (ASS) Management Plan is to be prepared and implemented to assess the alignment and the potential impact from ASS and provide the conditions to limit the impact on the environment such as dewatering measures, excavation and treatment methods (as per Chapter 15 of this volume).	EC / PC	WER	DDP / PD	EC / EO
	A management plan for potential contamination of groundwater from disturbed contaminated sites listed on the Environmental Management Register (EMR) and other areas of concern is to be prepared.	EC	WER	DDP / PD	EC / EO
	Strategic points along the alignment for groundwater monitoring are to be determined and monitored throughout the operation of the GCRT Project.	EC	VI	PD	EC / EO

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	<p>In accordance with GCCC specifications detailed in the document <i>'Water Sensitive Urban Design (WSUD) Guidelines'</i> incorporate Water Sensitive Urban Design measures to treat contaminated stormwater prior to runoff in to receiving surface waters. Such measures may include but not be limited to:</p> <ul style="list-style-type: none"> » Use of a range of primary, secondary and tertiary treatment devices to remove pollutants from storm water before being discharge into the waterway; » Vegetated swales; » Batter slopes to be vegetated; » Bioretention systems to be installed where appropriate; » Permanent settlement ponds and detention basins; and » First flush runoff to be discharged into treatment device on bridges. 	DD / EC / PC	VI	Post C	EO
	<p>Prepare and implement a site restoration plan for any creek banks impacted as part of proposed works.</p>	PC / DD / EC <i>PC- Experienced in bush/habitat regeneration.</i>	VI	DDP / PD	EO

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Construction	Groundwater quality data should be collected from bore monitoring points to establish baseline conditions pre construction.	EC / EO	ER	Pre C	EC / EO
	Avoid dewatering during construction to ensure that ASS and Potential Acid Sulfate Soils (PASS), within the site and on adjacent properties, are not exposed to oxygen (Chapter 15, Volume 3).	PC	VI	PD	PC / EO
	Where dewatering for more than 24 hours is required, the area within the excavation should be isolated using properly engineered sheet piling (or similar).	PC	VI	PD	PC
	Chemicals and contaminants brought onto construction sites are to be appropriately stored, managed and used to ensure no contamination of groundwater occurs.	PC	VI	PD	PC / EO
	Undertake quarterly bore testing at established points along the alignment throughout the construction period.	EC / EO	MER	PD	EC / EO
	Bridge piling construction should be undertaken using formwork excavation methods to reduce sediment loads to the waterway.	DD / PC	N/A	PD	PC
	Minimise vegetation clearing where possible.	DD / PC	VI	Pre C / PD	PC / EO

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Subject to EPA approval, isolate the entire construction area from normal waterway flow by diversion drains or similar devices.	PC / DD	VI	PD	EO / PC
	Redirect clean water away from the disturbed area and into a stabilised overland flow path.	PC / DD	VI	PD	EO / PC
	Silt fences and other sediment control devices should be constructed around the disturbed areas to filter surface water runoff (Chapter 4, Volume 3).	PC	VI	PD	EO / PC
	Prevent siltation by limiting stockpiling of spoil in the vicinity of watercourses. Utilisation of silt fencing, diversion drains or similar techniques should be implemented where appropriate.	DD / PC	VI	PD / WR	EO / PC
	Ensure erosion and sediment control measures are practiced during construction, such as: <ul style="list-style-type: none"> » stockpiling and replacing topsoil; » restoration of surface conditions; » cut off drains around stockpiles and borrow pits; » silt fences; and » sedimentation traps and basins. 	DD / PC	VI	PD / WR	EO / PC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Keep site materials on site at all times during the construction phase for protection during storm events.	PC	VI	PD	PC
	Prepare and implement an earthworks schedule to ensure appropriate erosion control measures are in place prior to potential erosion works being undertaken.	PC	CL	WR	PC / EO
	The Contractor is required to submit to TransLink (for it or its agents/partners – such as GCCC – to review) proposed methods of excavating in the bed and bank of the creek to ensure erosion and sedimentation control.	PC	MER	WR	PC
	Undertake weekly surface water quality monitoring immediately following a rainfall event during waterway crossing construction.	EC / EO	WER	PD / WR	EC / EO
	Minimise potential occurrence of erosion and ensure restoration is carried as soon as possible and in a timely manner.	PC / EO	VI	WR	EC / EO
	Construct fencing around the perimeter bank areas undergoing rehabilitation.	PC / EO	VI	PD	PC / EO

4.5 Monitoring

Monitoring requirements for groundwater and surface water impacts should be as following:

4.5.1 Groundwater

The groundwater quality bounds for the Gold Coast Rapid Transit (GCRT) system project have been identified in Volume 2, Chapter 18 of the CDIMP. In order to confirm that the project is not impacting on groundwater quality it is recommended that a series of project specific groundwater monitoring bores are established at strategic points along the final alignment. As a minimum, bores should be located at the closest point on the alignment to identified groundwater dependent ecosystems, i.e. Coombabah Lake, Conservation Park, Loders Creek and the swamp area south of Smith Street near Griffith University. Groundwater monitoring bores may also be warranted adjacent to potentially contaminated sites. Baseline (pre-construction) groundwater quality data should be collected from these bores prior to construction activities and used to establish site-specific groundwater quality objectives for the project. Bores should then be tested on a quarterly basis throughout the construction phase of the project and groundwater quality compared with the baseline case.

4.5.2 Surface Water

Gold Coast City Councils' ongoing surface water quality monitoring program regularly collects data from sites located on Loders Creek (two sites) and at the mouth of the Nerang River. Pre-construction and post-construction surface water quality data from these sites should be regularly compared to identify if the operational phase of the project is impacting surface water quality in nearby receiving waters.

Surface water quality monitoring should be undertaken weekly and immediately following a rainfall event during waterway crossing construction. Samples should be collected upstream and downstream of the construction site and analysed for the following variables:

- » Turbidity;
- » pH (acidity/alkalinity);
- » Dissolved oxygen;
- » Nutrients (i.e. Ammonia, Nitrate, Nitrite, Total Nitrogen, Reactive phosphorus); and
- » Hydrocarbons (TPH C₆-C₃₆) – only to be analysed following a spill event.

All variables should be assessed against adopted water quality objectives and baseline levels to determine whether activities are impacting on surface water quality.

4.6 Corrective actions

Remediation strategies should be implemented where results from groundwater monitoring undertaken periodically throughout the construction phase of the project indicate either:

- » The presence of contaminants;

- » Evidence of groundwater depletion;
- » Degradation of water quality (based on Surface water Quality Baseline conditions detailed in the Volume 7 Technical Report titled '*Surface and Groundwater Quality Assessment*');
- » Soil erosion and sedimentation;
- » Modification of existing drainage patterns; and
- » Water quality degradation through soil and sediment disturbance and/or removal during construction site earthwork activities adjacent to each watercourse crossing.

4.7 Reporting requirements

- » Document and report all results for surface water testing and monitoring at waterway crossings and key disturbance areas and groundwater bore testing along strategic points of the project alignment;
- » Notify DNRW of deterioration in groundwater quality, volume or level is to occur as a result of the GCRT Project;
- » Notify DNRW of any inflow of contaminants into groundwater;
- » Notify the EPA of deterioration in surface water quality as a result of the GCRT Project; and
- » Notify the EPA of any inflow of contaminants into surface waterways.

5. Terrestrial and Aquatic Ecology

5.1 Objectives

This CIMP is intended to provide management measures for terrestrial and aquatic ecology. The main objectives of this IMP are to:

- » Minimise known and potential fauna and flora impacts;
- » Minimise the clearing of native vegetation and habitat; and
- » Minimise the impact on water quality and riparian ecosystems.

5.2 Statutory provisions

Table 4 outlines the legislation and policy relevant to the terrestrial and aquatic values of the Gold Coast Rapid Transit corridor (GCRT).

Table 4 Terrestrial and Aquatic Ecology Statutory Instruments

Legislation	Administering Authority
COMMONWEALTH	
<i>Environmental Protection and Biodiversity Conservation Act 1999 (EPBC)</i>	Department of Environment and Water Resources (DEWR)
STATE	
<i>Integrated Planning Act 1997 (IPA)</i>	Department of Infrastructure and Planning (DIP)
<i>Environmental Protection Act 1994 (EPA)</i>	Environmental Protection Agency (EPA)
<i>Nature Conservation Act 1992 (NCA)</i>	EPA
<i>Fisheries Act 1994</i>	Department of Primary Industries and Fisheries (DPI&F)
<i>Water Act 2000</i>	Department of Natural Resources and Water (DNRW)
<i>Vegetation Management Act 1999 (VMA)</i>	DNRW
<i>Land Protection (Pest and Stock Route Management) Act 2002</i>	DNRW
<i>Biodiversity Planning Assessment (BPA)</i>	EPA
<i>Coastal Protection and Management Act 1995</i>	EPA
<i>Marine Parks Act 2004</i>	EPA



Legislation	Administering Authority
<i>Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016 (the Koala Plan)</i>	EPA
LOCAL	
Gold Coast City Council Planning Scheme	Gold Coast City Council (GCCC)
Gold Coast City Council Nature Conservation Strategy	GCCC

5.3 Performance criteria

- » Clearing beyond the required limits should not occur;
- » Noxious weeds within site area do not occur or are removed when they do so that these do not remain in the operational phase (Chapter 7, Volume 3);
- » Number of hollows and/or fauna habitats lost in cleared areas (with relocation or other mitigation where these are lost); and
- » Environmental health of ecosystems along the corridor is maintained.

5.4 Issues and Impacts

During construction of the GCRT the following general issues and impacts may occur:

- » Loss and damage to significant remnant communities, including Endangered, Of Concern and Not of Concern regional ecosystems;
- » Loss and damage to regrowth, non-remnant and modified vegetation communities, such as parklands;
- » Reduction and damage to the ecological condition of urban bushland patches through fragmentation and reduction in viable area-perimeter ratio (edge effects);
- » Reduction of local biodiversity especially regarding intact/undisturbed patches of vegetation;
- » Reduction in local species richness through habitat loss and fragmentation;
- » Loss of important urban bushland communities and decrease in landscape connectivity;
- » Loss of characteristic vegetation within communities;
- » Disturbance of waterway and wetland vegetation;
- » Loss or damage to threatened flora species and/or their habitat;
- » Spread and introduction of weeds;
- » Loss or reduction of essential habitat for listed fauna species;
- » Loss or reduction of refugial habitat for urban-avoiding wildlife species;

- » Loss or reduction of abundance and diversity of resources;
- » Isolation of wildlife populations by clearing vegetation from within wildlife movement corridors;
- » Loss and fragmentation of riparian vegetation;
- » Degradation of water quality;
- » Aquatic habitat loss; and
- » Loss or damage to threatened species and/or their essential habitat.

During construction of the GCRT the following issues and impacts for ecologically significant areas may occur are detailed below.

5.4.1 Loders Creek frog habitat

Issues

- » Wallum froglet listed as vulnerable under NCA; and
- » Green-thighed frog listed rare under NCA.

Impacts

- » Run off and sedimentation;
- » Weed infestation; and
- » Habitat fragmentation and population isolation.

5.4.2 Griffith University

Issues

- » Glossy-black cockatoos listed as vulnerable under NCA;
- » Wallum froglet listed as vulnerable under NCA;
- » Swamp orchid listed as endangered under EPBC; and
- » Regional Ecosystems.

5.4.3 Cascade Gardens

Issues

- » Greg-headed flying-fox listed as vulnerable under the EPBC Act.

Impacts

- » Loss of vegetation/habitat;
- » Noise and light pollution during construction;
- » Displacement due to habitat reduction;
- » Human/social disturbance if bat colony relocates; and
- » Perceived threat of disease.

5.5 Construction Impact management actions and responsibilities

Construction Impact management actions for terrestrial and aquatic ecology are summarised Table 5:

Table 5 Terrestrial and aquatic ecology – Construction Impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	In areas of high environmental significance, such as wetlands, the construction footprint should be reduced to the minimum necessary, to keep vegetation clearing to a minimum.	DD / PC	<i>footprint design</i>	DDP	DD
	Fauna friendly underpasses and crossing infrastructure are designed at strategic locations to allow fauna movement and minimise any barrier effects caused by the development. (note 'underpasses' include those under raised structure such as the crossing of Loders Creek – no other locations along the corridor are considered necessary to incorporate this kind of mitigation measure)	DD / EC / PC	<i>Fauna crossing design</i>	DDP	DD / EO

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Targeted surveys of threatened flora should be undertaken in all areas identified as significant ecological areas once the exact clearing/construction footprint has been determined and pegged out.	DD / EC / PC	<i>Flora surveying</i>	Pre C	EO
	Within the significant ecological area B construction is to occur progressively along the corridor (i.e. no provision for an access track adjacent to the corridor for movement of vehicles or machinery – all movement to occur in front of construction front).	DD / PC	Construction and construction access	Pre C / C	DD / PC
	Any clearing within significant ecological areas is to be clearly defined with flagging tape and no clearing is to occur outside designated areas.	PC	<i>Clearing</i>	WR	PC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Areas approved to be cleared by DNRW must be clearly delineated on the ground so that clearing contractors do not clear excess remnant vegetation. Clearing contractors must be given a copy of the clearing permit and be aware of any conditions or requirements.	DD / EC	Clearing	WR	EO
	Any development within declared Koala Habitat Areas is to be in accordance with the Koala Plan 2006, such as sequential clearing.	DD / EC / PC	Clearing	WR	PC / EO
	Buffers are to be maintained in accordance with GCCC Waterways and Wetlands codes.	DD / EC	Clearing	WR	EO
	All areas of ecological significance are protected from run-off and sedimentation with sediment barriers.	DD / EC / PC	C	WR	PC
	Develop a Weed Management Strategy (Chapter 7, Volume 3).	DD / EC	Pre C	Pre C	EO

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Develop an erosion and sediment control strategy (Chapter 4, Volume 3).	DD / EC	Pre C	Pre C	EO
Construction	Site infrastructure should be located in the existing cleared areas along the corridor. No clearing of remnant vegetation areas (as per the <i>Vegetation Management Act</i> classifications) or identified significant ecological areas should occur to accommodate site infrastructure.	PC	C	WR	PC
	Construction activities to be restricted to within working width, especially in sections relating to waterways.	PC	C	WR	PC
	A fauna spotter-catcher is to be present to search for and relocate wildlife during vegetation clearing.	PC	<i>Clearing</i>	WR	EO <i>Fauna spotter-catcher</i>

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Within this significant ecological area B (Loders Creek) construction is to occur progressively along the corridor (i.e. no provision for an access track adjacent to the corridor for movement of vehicles or machinery – all movement to occur ahead of construction front and not along side to reduce the impact area footprint).	DD / PC	C	Pre C / C	DD / PC
	Hollow logs and other movable habitat features should be salvaged from areas to be cleared and either relocated into areas of remnant vegetation that are to be retained or replaced in areas that have been rehabilitated.	PC / EC	<i>Clearing</i>	Pre C / C	PC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Areas approved to be cleared by DNRW must be clearly delineated on the ground so that clearing contractors do not clear excess remnant vegetation. Clearing contractors must be given a copy of the clearing permit and be aware of any conditions or requirements.	PC / EC	Clearing	WR	EO
	Habitat trees, whether dead or alive, should be identified and retained wherever possible.	EC/PC	Clearing	WR	EO
	Any excavations are to allow provision for fauna escape / temporary exclusion fencing around ecologically significant areas during construction to ensure animals do not enter the construction site.	PC	C	C	PC
	Buffers are to be maintained in accordance with GCCC Waterways and Wetlands codes.	PC / EC	C	WR	PC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Access is to be restricted to designated areas during construction and no access into surrounding native bushland.	PC	C	C	PC
	Clearing activities should be planned where possible for a dry period when strong winds are least likely. Site hardening should commence as soon as practicable after clearing is completed.	PC	<i>Clearing</i>	WR	PC
	Feral animals and pest species should be dealt with as part of a coordinated management approach that takes into consideration the GCCC's pest management strategy.	PC	C	WR	PC
	Clearly flagging the boundaries of the construction zone with brightly coloured fencing and instructing construction workers clearly on their obligations to protect retained woodland.	PC	C	C	PC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Peripheral lighting should be kept to that necessary for a minimal level of security and safety and should not be directed into remnant vegetation.	PC	C	C	PC
	Where possible ongoing cleared vegetation is to be mulched and used in rehabilitation activities.	PC	<i>Clearing</i>	C	PC
	All disturbed areas, in particular waterways and wetlands are to be revegetated using locally indigenous species appropriate to the position in the landscape.	PC	Revegetation	Post C	DD / PC
	Cleared vegetation or soil is not to be pushed up against trees, stored against fence lines or within 50 metres of gullies and drainage lines.	PC	C	C	PC
	All waterways are protected from run-off and sedimentation with sediment barriers.	PC	C	C	PC
	The beds and banks within the aquatic ecosystems are reinstated.	PC	C	C	PC

5.6 Construction Impact Management Actions and Responsibilities for specific areas

Construction impact management actions for specific areas of high ecological significance are summarised in, Table 6 and Table 7.

Table 6 Loders Creek frog habitat – Construction Impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	Hydraulic modelling needs to be done to show that no changes to water flows will occur at Loders Creek. (refer also to <i>Volume 2 Chapter 19 Hydrology and Hydraulics</i>)	DD / EC	DDP <i>Hydraulic modelling</i>	Pre C	DD / EC
	Width of section design to be minimised as much as possible.	DD	DDP	Pre C	DD
	Elevated transport structures to be utilised to minimise disturbance to ecological areas.	DD / EC	DDP	Pre C	DD
Construction	Sedimentation and run-off to be controlled during construction i.e. erect temporary sediment fences during construction.	PC	Construction	WR	PC
	Construction activities to be restricted within working width.	PC	C	WR	PC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Vegetation along Loders Creek to be protected by barricade fencing.	PC / EC	C	WR	PC
	Bank stabilisation and revegetation of riparian zone above Loders Creek to be conducted.	PC / EC	<i>Revegetation</i>	WR	PC
	Cleared areas to be rehabilitated with appropriate native species.	PC / EC	<i>Revegetation</i>	WR	PC
	A licensed fauna spotter to be engaged during clearing activities.	PC	<i>Clearing</i>	WR	EO <i>Fauna spotter-catcher</i>
	Breeding ponds are to be marked and protected from clearing and construction activities.	PC / EC	<i>Clearing and Construction</i>	Pre C	PC
	Breeding ponds to be constructed to increase population viability.	PC / EC	<i>Clearing and Construction</i>	Pre C	PC

Table 7 Cascade Gardens – Construction impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	Any new power lines (such as overhead power for LRT) to be installed shall minimise electrocution risk to bats – also consider relocating lines on the western side of the highway or consider undergrounding.	DD	DDP	Pre C	DD
	Transit stops are not to be positioned near the colony.	DD	DDP	Pre C	DD
	All vegetation at the site to be protected from clearing.	DD / EC	<i>Clearing</i>	Pre C	EO
	Artificial light sources to be directed away from the vegetation and erect a protective barrier to protect bats from light source.	DD	<i>Civil design</i> DDP	Pre C	DD
Construction	Noise and vibration dampening technology to be used during construction.	PC	Construction	WR	PC
	Monitoring of the flying-fox camp to be conducted weekly during construction.	DD/EC	VI	C	EO

5.7 Monitoring

- » Construction Contractor and Environmental Consultant/Representative to ensure vegetation to be cleared is clearly delineated;
- » Construction Contractor and Environmental Consultant/Representative to ensure all vegetation clearing is undertaken in accordance with EMP and any other work plans;
- » Herbicide application sheet and weed removal works records completed by the weed removal contractor are to be recorded and submitted to Construction Contractor and Environmental Consultant/Representative daily; and
- » Photo-monitoring of selected sites will be instigated prior to construction and continue through the construction period. These sites will be photographed on a regular basis and collated into a Site Photo Register.

5.8 Corrective actions

- » Natural ground surface to be restored if disturbed;
- » Immediate reinstatement of area if works are beyond limits of construction; and
- » Replacement of hollows destroyed and relocation of them to other areas onsite not disturbed by clearing activities.

5.9 Reporting requirements

- » Weekly progress rejuvenation monitoring records to be maintained on file by Construction Contractor and Environmental Consultant/Representative and
- » Monthly rejuvenation operational works sheet are to be recorded and submitted to Construction Contractor and Environmental Consultant/Representative/

6. Weed Management

The definition of a “weed” for the purposes of management is based on that of ‘environmental weed,’ namely a species that by virtue of fecundity and growth habit has the potential to establish large infestations that dominate and eventually exclude the native vegetation. A list of weeds known to occur along the corridor is provided in Volume 8 Technical Report titled ‘*Ecology*’ (GHD June 2007).

6.1 Objectives

This CIMP is intended to provide management measures for weed management. The main objectives of this IMP are to:

- » Minimise the introduction and/or spread of weeds;
- » Promptly identify areas requiring weed control;
- » Eliminate infestation of noxious weed species; and
- » Effectively control weed species.

6.2 Performance criteria

Outbreaks of declared or noxious weeds do not occur or are transmitted via the construction activities of the GCRT Project.

6.3 Impact management actions and responsibilities

Construction impact management actions for weed management are summarised in Table 8.

Table 8 Weed Management – Construction impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	A Weed Management Strategy should be developed prior to construction activities commencing and include the measures outlined below.	EC	MER / CL	Pre C	EC / EO
Construction	Upon arrival at the project area, all vehicles, equipment and portable infrastructure (including trailers, generators, workshop and accommodation huts, etc) will be inspected for the presence of weeds and loose soil. If required, vehicles and equipment are to be cleaned to remove weeds/loose soil.	PC	VI	PD / WR	PC
	Cleaning procedures need to remove soil and organic matter from the surface of vehicles, equipment and portable infrastructure, including undercarriage and running gear.	PC	CL / VI	PD / WR	PC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Vehicles should be regularly inspected for weeds and/or excess dirt build-up and cleaned if necessary.	PC	VI	PD / WR	PC
	Stockpiling of weed infested material should be avoided and removed from the site to an appropriate waste facility immediately.	PC	VI	PD	PC
	Any fill imported to the site should also be certified as being free of weed species.	PC	VI / CL	PD	PC
	Areas of bare ground will be sprayed for weeds on a regular basis.	PC	VI	PD	PC
	Maintenance contractors to ensure they remain on the designated maintenance track and do not disturb surrounding vegetation, including areas replanted.	PC	VI	PD	PC
	Control programs to be carried out by personnel qualified in the recognition of target weeds and potential weed species.	PC	MER / CL	PD	EC / EO

6.4 Corrective actions

- » Investigations/corrective actions undertaken as a result of the complaint will be documented and compiled within the Complaints Register. Corrective actions will be closed out by senior management according to an agreed responsibility and timescale; and
- » If a substantial outbreak of a declared noxious weed is found on the site corrective measures will be taken in accordance with the Construction Environmental Management Plan (CEMP).

6.5 Reporting requirements

- » Presence of noxious weeds will be reported to the appropriate local authorities by the Construction Manager; and
- » Daily herbicide application sheet and weed removal works records from weed removal contractor to be recorded and submitted to Construction Contractor and Environmental Consultant/Representative daily.

7. Noise and Vibration

7.1 Objectives

This CIMP is intended to provide management measures for noise and vibration. The main objectives of this IMP are to:

- » Address the acoustical requirements outlined in the project's Terms of Reference in relation to the construction phase of the project;
- » Identify potentially sensitive locations in relation to construction and operational noise and vibration;
- » Evaluate the potential for resulting impacts and the scope for the reduction of these impacts through reasonable and feasible mitigation strategies; and
- » Recommend in principle appropriate mitigation measures and noise and vibration performance requirements with the aim to protect community values and sensitive locations in relation to construction noise and vibration.

7.2 Statutory provisions

7.2.1 Noise

- » *Environmental Protection (Noise) Policy 1997.*
- » *Department of Main Roads Road Traffic Noise Management: Code of Practice (August 2007);*
- » *Queensland Rail Code of Practice – Railway Noise Management (November 2007);*
- » *Australian Standard AS2701, Acoustics – Description and Measurement of Road Traffic Noise;*
- » *Australian Standard AS1055, Acoustics Description and Measurement of Environmental Noise;*
- » *AS/NZS 2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors; and*
- » *Environmental Protection Agency, Ecoaccess Guideline Planning for Noise Control 2004.*

7.2.2 Vibration

- » New South Wales (NSW) Department of Environment and Climate Change (DECC) Assessing Vibration: A Technical Guideline 2006;
- » British Standard BS6472:1992 Guide to evaluation of human exposure to vibration in buildings;
- » British Standard BS6841:1993 Evaluation and Measurement for Vibration in Buildings, Part 2 – Guide to damage levels from ground borne vibration; and
- » German Standard DIN 4150 and BS 7385: Part 2 – 1993.

7.3 Performance criteria

7.3.1 Noise

The Queensland EPA Ecoaccess Guideline *Planning for Noise Control, 2004* recommends maximum internal noise levels in sleeping areas to avoid sleep disturbance. The guideline states as a rule for planning short term events, the indoor sound pressure level should not exceed approximately 45 dB(A)_{maxLpA} more than 10-15 times per night.

The maximum recommended internal noise levels specified in AS/NZS 2107: 2000 *Acoustics - Recommended design sound levels and reverberation times for building interiors* have been adopted for the construction noise goals and are shown in Table 9 for a selection of building uses that may be relevant to building uses near construction sites.

Table 9 Recommended Internal Noise Design Levels from AS 2107:2000

Type of Building Occupancy/ Activity	Maximum Recommended Design Sound Level L _{Aeq} dB(A)
Educational area – Teaching space	45
Educational area – Libraries – general areas	50
Educational area – Gymnasium	55
Health building – Consulting room	45
Health building – Operating theatres	45
Health building – Ward	45
Office building – General office areas	45
Public buildings – Exhibition areas	50
Place of worship – With speech amplification	40
Residential building – Sleeping area near major road	40
Residential building – Living area near major road	45

7.3.2 Vibration

Human Subjective Response

German Standard *DIN 4150 Part 2-1975* summarises human tactile perception of vibration and can be seen in Table 10 below.

Table 10 Vibration Levels and Human Perception of Motion (source DIN 4150 Part 2-1975)

Approximate vibration level	Perception
0.10 mm/s	Not felt
0.15 mm/s	Threshold of perception
0.35 mm/s	Barely noticeable
1.0 mm/s	Noticeable
2.2 mm/s	Easily noticeable
6 mm/s	Strongly noticeable
14 mm/s	Very strongly noticeable

Blasting

The Queensland *Environmental Protection (Noise) Policy 1997*, (EPP (Noise)) defines acceptable vibration limits for blasting with 80% compliance in stating that:

“The noise from blasting is reasonable if, measured outside the most exposed part of an affected noise sensitive place the air-blast overpressure is not more than 115 dB(Lin Peak) for 4 out of any 5 consecutive blasts; and the ground vibration is:

- » *For vibrations of more than 35 Hz - not more than 25 mm/s ground vibration, peak particle velocity; or*
- » *For vibrations of not more than 35 Hz - not more than 10 mm/s ground vibration, peak particle velocity.”*

Effect of Vibration on Structures

Transient and continuous vibration guidelines in order to ensure a minimal risk of cosmetic damage to residential and other sensitive buildings are presented in Table 11. These guide values are considered conservative, as the actual degree of tolerance of a building depends on the structural characteristics and frequency spectrum of the vibration. In the case of continuous vibration, *BS7385-2:1993* recommends that targets outlined below be reduced to 50 percent.

Table 11 Transient Vibration Guidelines for Cosmetic Damage

Vibration Type	Peak Particle Velocity (PPV)		
	Reinforced or framed structures - Industrial and heavy commercial buildings.	Un-reinforced or light framed structures - Residential or light commercial type buildings	
Transient vibration	50 mm/s at 4 Hz and above	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Continuous vibration	25 mm/s at 4 Hz and above	7.5 mm/s at 4 Hz increasing to 10 mm/s at 15 Hz	10 mm/s at 15 Hz increasing to 25 mm/s at 40 Hz and above

Human Comfort

Acceptable values of human exposure to continuous and impulsive vibration are dependent on the time of day and the activity taking place in the occupied space. Satisfactory vibration levels are established with respect to human response as shown in Table 12 below and are from *AS 2670.2–1990* (DECC, 2006). The RMS is a vibration level averaged within a defined time period. For peak vibration levels to be readily monitored during construction, the RMS vibration levels need to be multiplied by an appropriate “crest” factor (i.e. ratio of the peak level to RMS level).

Crest factors vary from 1.4 for construction activities of a sinusoidal nature i.e. rolling plant, (up to four or more for intermittent activities such as compressor driven pile driving).

Table 12 Criteria for Exposure to Continuous and Impulsive Vibration

Place	Time	Assessment Criteria			
		Root Mean Square (RMS) Velocity mm/s		Peak Velocity mm/s	
		Preferred	Maximum	Preferred	Maximum
Continuous vibration					
Critical working areas (e.g. hospital operating theatres, precision laboratories)	Day or night time	0.1	0.2	0.14	0.28
Residences	Day time	0.20	0.40	0.28	0.56
	Night time	0.14	0.28	0.20	0.40
Offices	Day or night time	0.40	0.80	0.56	1.1
Workshops	Day or night time	0.80	1.6	1.1	2.2
Impulsive Vibration					
Critical working areas (e.g. hospital operating theatres, precision laboratories)	Day or night time	0.10	0.20	0.14	0.28
Residences	Day time	6.0	12.0	8.6	17.0
	Night time	2.0	4.0	2.8	5.6
Offices	Day or night time	13.0	26.0	18.0	36.0
Workshops	Day or night time	13.0	26.0	18.0	36.0

7.4 Impact management actions and responsibilities

Impact management actions for noise and vibration are summarised in Table 13.

Table 13 Noise and Vibration – Impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	A detailed Construction Noise and Vibration Management Plan should be prepared based on building specific and site specific vibration sensitivity investigations and mitigation strategies.	PC	MER / CL	DDP	EC
Construction	Construction is limited to 6:30am – 6:30pm Monday to Saturday and construction must be inaudible at noise receivers on Sundays, Public Holidays and all other times as a way of protecting noise amenity. Approval must be sought for construction activities outside these hours.	PC	MER	PD	EC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Noise and vibration mitigation measures are installed in accordance with the Construction Noise and Vibration Management Plan (i.e. construction of noise barriers, screens).	PC	VI	PD	PC
	Construction plant and equipment are serviced regularly to minimise noise.	PC	VI	PD	PC
	Selection of plant and equipment that produce minimal noise.	PC	VI	PD	PC
	All appropriate mobile plant are fixed with residential class mufflers.	PC	VI	PD	PC
	Fixed plant and equipment (including material stockpiles and vehicle parking areas) are located as far as practical from noise sensitive areas.	PC	VI	PD	PC
	Community consultation is carried out notifying the community of proposed time and duration of works, progress of construction, upcoming noise activities and efforts being made to reduce noise.	PC	MER	PD	EC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Ongoing refinement of noise mitigation implementation should occur.	PC	MER / CL	PD	EC
	Residents are relocated in response to vibration impacts, in accordance with the Construction Noise and Vibration Management Plan.	PC	CL	PD	PC
	Activities contributing to vibration may need to be limited in areas where high vibration levels are predicted.	PC	WR	PD	PC

7.5 Corrective actions

In response to noise or vibration complaints, the construction manager should be notified and a suitable acoustic consultant should carry out inspections of noise and vibration levels from construction activity.

The construction manager is to be notified in the event of non-compliance with construction noise or vibration goals.

Corrective actions may include:

- » the use of noise barriers;
- » a review of the impact management plans for noise and vibration; and
- » community consultation to notify the community of the proposed time and duration of works, progress of construction, upcoming noise activities and efforts being made to reduce noise and vibration.

7.6 Reporting requirements

Regular maintenance should be carried out on all construction equipment to ensure that each item is operating efficiently and producing 'normal' levels of noise and vibration. Regular inspections and maintenance of noise barriers or screens should also be carried out. Any deterioration of the condition of noise barriers or screens should be reported to the construction manager. All noise and vibration complaints should be reported to the construction manager and the Environmental Consultant/Representative.

8. Air Quality

8.1 Objectives

This CIMP is intended to provide management measures for air quality. The main objectives of this IMP are to:

- » Minimise dust emissions;
- » Minimise air pollutant emissions from construction vehicles and machinery; and
- » Minimise potential odour impact.

8.2 Statutory provisions

- » *Environmental Protection (Air) Policy 1997* (EPP (Air));
- » *National Environment Protection (Ambient Air Quality) Measure (Air NEPM)*. Ambient Air Quality and Air Toxics. Environment Protection and Heritage Council (EPHC); and
- » “*Roadside air quality in south-east Queensland*” Environment Technical Report No.38, Environmental Protection Agency, Queensland Government March 2001.

8.3 Performance criteria

A Queensland EPA report into roadside air quality (Neale and Wainwright, 2001) identified significant species for air pollutant levels experienced by residences and business premises adjacent to major roads. Vehicle emissions of interest are:

- » Gaseous products of combustion such as Carbon Monoxide (CO), oxides of nitrogen (NO and NO₂) and oxides of sulphur (SO₂);
- » Solid matter and aerosols such as particulate matter (PM₁₀ and PM_{2.5}) and lead (Pb); and
- » Petroleum derived emissions such as unburnt fuel including Polycyclic Aromatic Hydrocarbons (PAHs) and Volatile Organic Compounds (VOCs).

The *Environmental Protection (Air) Policy Act of 1997*, referred to as the EPP (Air), sets out ambient air quality goals to judge pollutant levels against potential to cause harm to human health and wellbeing in Queensland. Reporting from Neale and Wainwright (2001) determined that the relevant indicators relevant to satisfying EPP (Air) for roadside investigations are CO, NO₂, PM₁₀ and Lead.

The National Environment Protection Council of Environmental Ministers, now the EPHC, set uniform standards for Australian ambient air in June 1998. These are known as the National Environment Protection (Ambient Air Quality) Measure, also known as Air NEPM, which sets non-binding¹ standards and ten-year goals (i.e. 2008).

¹ The Air NEPM standards apply to regional Air Quality as it affects the general population and does not apply in areas impacted by localised air emissions such as industrial sources and heavily trafficked streets and roads.

A variation to the Ambient Air Quality NEPM was made in May 2003 “which strengthens air quality standards to help protect Australians from the adverse health impacts of small pollutant particles”.² The variation introduced advisory reporting standards for fine particles of size 2.5 micrometres or less (also known as PM_{2.5}).

An Air Toxics NEPM was introduced by EPHC in 2004. “The Air Toxics Measure is primarily concerned with the collection of data on ambient (i.e. outdoor) levels of formaldehyde, toluene, xylene, benzene and PAHs at locations where elevated levels are expected to occur and there is a likelihood that significant population exposure could occur”³. The motor vehicle is implicated as the major emission source in all five of the Air Toxics under investigation.

Various emission constituents are detailed in Table 14 with relevant EPP Air goals, Air NEPM standards and goals and Air Toxics monitoring investigation levels.

Table 14 Various emission constituents with relevant EPP Air goals, Air NEPM standards and goals and Air Toxics monitoring investigation levels

Key Emission Constituent	EPP (Air)	NEPM
Carbon Monoxide (CO)	8 ppm as 8-hour average	9 ppm as 8-hour average (No more than 1 day per year)
Nitrogen Dioxide (NO ₂)	0.160 ppm as 1-hour average	0.12 ppm as 1-hour average (No more than 1 day per year)
Sulphur Dioxide (SO ₂)	0.250 ppm as 10-minute average 0.200 ppm as 1-hour average 0.040 ppm as 24-hour average 0.020 ppm as annual average	(No more than 1 day per year) 0.200 as 1-hour average 0.080 ppm as 24-hour average 0.020 ppm as annual average
Photochemical Oxidants (as O ₃)	0.098 ppm as 1-hour average 0.079 ppm as 4-hour average	0.100 ppm as 1-hour average 0.080 ppm as 4-hour average (No more than 1 day per year)
Respirable Particulate Matter (PM ₁₀)	150µg/m ³ as 24-hour average 50µg/m ³ as annual-hour average	50µg/m ³ as 24-hour average (No more than 5 days per year)
Fine Particulate Matter (PM _{2.5})	N/A	25µg/m ³ as 24-hour average 8 µg/m ³ as annual average (Advisory reporting standard only)
Lead (Pb)	1.5µg/m ³ as 90-day average	0.5 µg/m ³ as annual average
Benzo(a)pyrene (as a marker for PAHs)	N/A	0.3 µg/m ³ as annual average

² http://www.ephc.gov.au/nepms/air/air_variation.html

³ http://www.ephc.gov.au/pdf/Air_Toxics/FinalAirToxicsNEPM.pdf



Key Emission Constituent	EPP (Air)	NEPM
Toluene	2.0 ppm as 24-hour average (Neale 2005)	1.0 ppm as 24-hour average 0.1 ppm as annual average
Benzene	N/A	0.003 ppm as annual average
Formaldehyde	0.07 ppm as 30-min average (EPP)	0.04 ppm as 24-hour average
Xylene (as total of ortho, meta and para isomers)	N/A	0.25 ppm as 24-hour average 0.20 ppm as annual average

8.4 Construction impact management actions and responsibilities

Construction impact management actions for air quality are summarised in Table 15.

Table 15 Air Quality – Construction impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design					
Construction	Ensure vehicles and plant comply with the Australia Design Standards for emissions and are maintained to meet emission standards.	PC / O	VI	N/A	PC / O
	Regularly service vehicles and ensure service records are made available for review.	PC / O	VI / CL	WR	PC / O
	Ensure construction vehicles are turned off when not in use to assist compliance with emission standards.	PC / O / S / EO	VI	N/A	PC / O / S / EO



8.5 Corrective actions

Prompt mitigation and monitoring of excessive emissions to air, which may involve:

- » Visual monitoring of construction vehicles so that any vehicles that are not complying with emission standards can be serviced to reduce emissions; and
- » Provide awareness training to all responsible parties to ensure that non-compliances are quickly mitigated against.

8.6 Reporting requirements

- » Daily visual inspections to ensure that Australian Design Standards are being met.

9. Waste management

9.1 Objectives

This CIMP is intended to provide management measures for waste management. The main objectives of this IMP are to:

- » Take all reasonable and practicable measures to reduce and recycle waste during the construction phase, and adhere to the principals of the manage waste in accordance with the Waste Hierarchy by:
 - Reducing packaging associated with raw products during the procurement process;
 - Reducing wastes generated by product wastage through design and procurement processes;
 - Reusing products on site, where possible;
 - Reusing ‘waste’ products on other projects, where possible;
 - Separation of recyclable wastes for collection and processing into new products;
 - Treatment of wastes to render them less harmful or available for reuse in another manner; and
- » Dispose of wastes through appropriately licensed contractors and service providers (where relevant) and within the requirements of any site-specific approvals.

9.2 The Waste Hierarchy

The waste hierarchy encourages the adoption of options for reducing waste generation, handling and disposal of waste and specifies the order of preference shown in Figure 9-1 for dealing with wastes - with those towards the top of the list more desirable than those towards the bottom (EPA 2007).

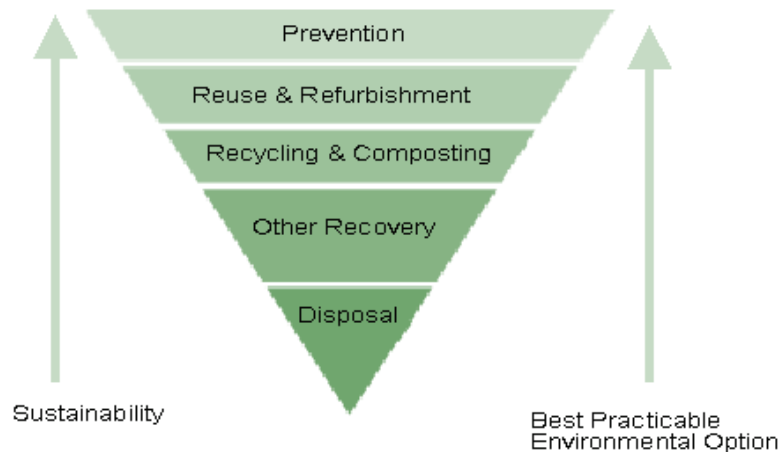


Figure 9-1: The Waste Hierarchy

- » Prevention - Waste should be avoided or reduced at source as much as possible.
- » Reuse and refurbishment - Where waste cannot be avoided, waste materials should be reused at source or refurbished then reused.

- » Recycling and composting - Where they cannot be reused, waste materials should then be recycled or reprocessed into a form that allows them to be reclaimed as a secondary resource that can be used, in whole or part, to replace virgin materials.
- » Other recovery - Where secondary resources are unable to be reclaimed, the energy content of the waste should be recovered and used as a substitute for non-renewable energy sources.
- » Disposal - Only if waste cannot be avoided, reused, recycled or recovered should disposal be considered.

9.3 Statutory Provisions

The Queensland legislation, regulations and guidelines relevant for waste management include:

- » *Environmental Protection Act 1994;*
- » *Environmental Protection Regulation 1998;*
- » *Environmental Protection (Waste Management) Policy 2000;*
- » *Environmental Protection (Waste Management) Regulation 2000;*
- » *Waste Management Strategy for Queensland 1996 (EPA); and*
- » *Construction and Demolition Wastes, Waste Management and Resource Use Opportunities - 2002 (EPA).*

Regulated wastes are those wastes that are non-domestic wastes mentioned in Schedule 7 of the *Environmental Protection Regulation, 1998*, and are managed in accordance with specific legislation under Environmentally Relevant Activities (ERAs). The storage, transport, treatment and disposal of all regulated wastes require Development Approvals and registration certificates.

9.4 Performance Criteria

- » Waste products reused on site where possible;
- » Separation for recycling of 100% of recyclable materials such as steel, aluminium, paper and plastics from the sites office areas;
- » Capture and recycling of 75% scrap steel from demolition and construction activities;
- » All residual waste products are sent to appropriately licensed destinations for either recycling, reuse, treatment or disposal;
- » No contamination incident occurring as a result of waste storage, transport or disposal;
- » No rejection of loads by the receiving facility for non-compliant wastes; and
- » Regulated wastes stored, transported, tracked and disposed as per regulated waste legislation

9.5 Construction Impact Management Actions and Responsibilities

Construction impact management actions for waste management are summarised in Table 16 for the design, construction and operation phases.

Table 16 Waste management – Construction impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	Utilise materials that have reuse opportunities where cost and product performance is comparable to virgin product.	DD	As per detailed design	DDP	DD
	Review of depot location and design to ensure requirements for any relocation of refuse from the Baratta Street landfill are taken into consideration. In particular potential wastes associated with previous uses including asbestos.	DD	Detailed geotechnical investigation	DDP	DD, EC, Geotech
Construction	Preparation of site specific waste management plans as part of the CEMP. These should ensure that items covered in this table are adequately addressed on a site by site basis for the whole of project.	PC		Pre C	PC
	No personal litter will be left at any work site or access track.	PC	VI	PD	PC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Provision of suitable area within construction footprint for the location of bins and skips required for the management of waste materials.	PC	VI	PRE C	PC
	Suitable bins and skips to be provided for the separation of waste streams into reusable (such as concrete, bricks, tiles, timber) and recyclable (such as glass, paper, plastics, steel, aluminium, paper).	PC	MER	PRE C	PC
	All construction waste left on site will be secured and stored and provision for return to suppliers or reuse on other sites.	PC	VI	PD	PC
	Order construction materials in bulk, where possible, and procurement of goods with minimal packaging.	PC	MER	PRE C	PC
	Waste will be treated, stored and disposed of to a licensed waste disposal location by an appropriately licensed or registered contractor (see Table 17).	PC	MER	PD	PC and EO

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Regulated wastes (e.g. hydrocarbons) will be stored in appropriately sealed containers suitably marked and identifying their contents. Regulated wastes will be transferred to a waste contractor licensed to receive such waste. Collection bins will be removed from construction sites, as required, and consigned to a local contractor licensed to receive such waste.	PC	MER	WR	PC and EC
	Vegetation waste should be reused onsite where possible	PC	MER	WR	PC and EO
	Portable toilets to be provided on the site for use of workers and arrange for de-sludging/cleaning by contractor.	PC		PD	PC
	Contaminated soils and impacted water to be treated and disposed of in accordance with EPA guidelines and landfill licence criteria.	PC	MER	WR	PC, EO and EC
	Used oils to be collected and recycled by a licensed contractor.	PC	MER	PD	PC
	An education and training program for employees in identifying different materials that can be reused and recycled and the appropriate disposal method for all other materials to be implemented.	PC	MER	PRE C	PC and EO

9.6 Monitoring

- » Construction Contractor shall undertake visual observations of construction sites and access roads as well as skips and bins to ensure that waste materials are being placed in the appropriate storage areas;
- » Waste audits may be undertaken by Superintendent staff to ensure waste is being managed appropriately;
- » Materials, wastes and spills records will be reported to the Construction Contractor Project Manager; and
- » Monthly inspections will be undertaken of facilities and compounds.

9.7 Reporting

- » All waste transport and disposal dockets obtained during construction will be kept and recorded in the monthly environmental report;
- » At completion of the construction phase of the project, a waste report should be prepared summarising all known waste quantities and types associated with the project;
- » Non-conformances will be documented by the Construction Contractor; and
- » Daily or weekly reports (as appropriate) will be completed on site and reviewed by the Construction Contractor Site Supervisor.

9.8 Corrective action

- » The Superintendent will delegate clean up works;
- » If environmental nuisance or harm is caused by waste onsite, waste management procedures are to be reviewed and changed where practicable; and
- » Investigations/corrective actions undertaken as a result of a complaint will be documented and compiled within the complaints register. Corrective actions will be closed out by senior management according to an agreed responsibility and timescale.

Typical wastes types and their management requirements throughout the construction process are identified in Table 17 below.

Table 17 Waste Disposal Locations

Type	Nature	Treatment	Likely Destination	Records Require
Solid	General refuse	Placed in wheelie or industrial bin, collected by licensed waste contractor	GCCC nominated landfill	Removal contractor registration certificate and records
	Putrescible	Placed in wheelie or industrial bin, collected by licensed waste contractor.	GCCC nominated landfill	Removal contractor records
	Paper	Separated and placed in designated area, collected by licensed waste contractor	Recycled	Removal contractor records
	Metal	Separated and placed in designated area, collected by licensed waste contractor	Recycled	Removal contractor records
	Plastics	Separated and placed in designated area, collected by licensed waste contractor	Recycled if possible, otherwise disposed of as landfill	Removal contractor records
	Glass	Separated to be recycled, collected by licensed waste contractor	Recycled	Removal contractor records
	Green	Mulched, reused onsite for landscaping and erosion and sediment control	Site	Stockpile locations
	Contaminated Soil and Landfill Refuse	Develop a plan for testing, assessment and if required remediation of the site	N/A	Reports as per regulatory requirements
Regulated waste	Batteries, chemical containers, oily rags	Placed in a designated covered and bunded area, collected by a licensed waste contractor	Disposed of as required by GCCC	Waste tracking requirements
	Tyres	Placed into designated industrial bins	Regulated Waste	Waste tracking requirements
	Fuels oils and grease	Placed into designated tanks or industrial bins	Regulated waste	Waste tracking requirements



Type	Nature	Treatment	Likely Destination	Records Require
Liquid	Oil, oily waters	Placed in designated covered area which is to be bunded, collected by licensed waste contractor	Recycled if possible, otherwise disposed of as required by GCCC	Waste tracking requirements
	Paints, oily mixtures, noxious liquids	Placed in designated covered area which is to be bunded, collected by licensed waste contractor	Recycled if possible, otherwise disposed of as required by GCCC	Waste tracking requirements

10. Transport and Traffic

10.1 Objectives

This CIMP is intended to provide management measures for transport and traffic impacts. The main objectives of this IMP are to:

- » Ensure that the RT system operates in a safe and efficient manner;
- » Enhance pedestrian and cycle accessibility and connectivity to / from and around RT stations;
- » Ensure that the local road network operates in a safe and efficient manner during construction of the RT system;
- » Manage the impact on parking and loading zones during construction phase in accordance with the Gold Coast City's Parking Strategy;
- » Minimise the magnitude of property related impacts, in particular property access during the construction phase; and
- » Minimise the delay to road users, cyclists, pedestrians and buses in the construction phase.

10.2 Statutory Provisions

- » *Transport Planning and Coordination Act 1994;*
- » *Transport Infrastructure Act 1994; and*
- » *Manual of Uniform Traffic Control Devices (MUTCD).*

10.3 Performance Criteria

The following performance criteria should be considered with respect to mitigating traffic and transport impacts created during the construction and operating phases of the GCRT:

- » Minimal impact on the operational efficiency of the local road and public transport network;
- » Minimal impact on the pedestrian and cycle network – where temporary alternative routes are necessary these would comply with the appropriate design standards for safety and disability access. Pedestrian and cycle facilities are to be either maintained or improved. No degradation of the quality or presence of pedestrian and cycle facilities should be evident. These are to be designed using appropriate design standards for disability access;
- » Minimal impact on access to local residences and commercial premises;
- » Minimal impact during special events e.g. Indy 300 – construction in the affected area will be avoided; and
- » Provision of safe alternative access and movement routes during the construction phase.

10.4 Construction Impact Management Actions and Responsibilities

Construction impact management actions for transport / traffic are summarised in Table 18 for the design, construction and operation phases of the RT system.

Table 18 Transport / Traffic – Construction Impact Management Actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed By
Design	The design developed will be constructed in accordance with the objectives and limitations of the traffic management objectives.	DD	CL	DDP	TransLink
	The design will be developed in accordance with environmental objectives to minimise impact. The design should include measures to mitigate any adverse environmental impacts.	DD	CL	DDP	TransLink
	Utility service relocations will be constructed in accordance with the traffic management objectives.	DD	CL	DDP	TransLink
	Additional traffic modelling (strategic and microsimulation modelling) will need to be undertaken to confirm changes to the road network and RT operational parameters. The design of intersections will need to strike a balance between operational efficiency of the road network, performance of the RT and property impacts.	DD	CL	DDP	TransLink

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed By
	Amendments to the local street network will be undertaken to minimise the impact on local access. Where local access is impacted, alternate access will be provided where possible or alternative arrangements provided on a case-by-case basis.	DD	CL	DDP	TransLink
	Safe provision for pedestrians and cyclists will be made where existing paths are: <ul style="list-style-type: none"> » Impacted by the RT system; » In the vicinity of stations. 	DD	CL	DDP	TransLink
	The design of pedestrian and cycle pathways and any over/underpasses will incorporate adequate safety measures and aim to improve existing facilities along the RT corridor and within the immediate vicinity of RT station. This will include improvements to the at-grade pedestrian crossing facilities particularly at locations where large pedestrian volumes are expected.	DD	CL	DDP	TransLink
	Where pedestrian access is severed, new facilities will be built, particularly at areas of high pedestrian demand.	DD	CL	DDP	TransLink
	The design of the immediate vicinity of the RT stations will provide a high level of pedestrian access.	DD	CL	DDP	TransLink

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed By
	Detailed examination and consultation with local government and the community will be carried out regarding areas for employment which may be a generator of long term parking currently occurring on local streets.	DD	CL	DDP	TransLink
	Maintenance minimisation objectives will be adopted in the development of the design.	DD	CL	DDP	TransLink
Construction	Detailed Traffic Management Plans will be implemented for worksites, haulage and delivery routes to manage and minimise potential impacts.	PC	VI and CL	Pre C	S
	The Detailed Traffic Management Plans will be provided to traffic management authorities and signed-off by those authorities prior to construction commencing.	PC and authorities (GCCC and DMR)	Submit	Pre C	S
	The Detailed Traffic Management Plan will be implemented to minimise disruption to the arterial road network and consistent with expectations of the community and road users.	PC	VI and CL	PD	S
	Elements of the Detailed Traffic Management Plans are modelled as required, in particular, at temporary alternative routes and specific intersection rearrangements	PC	Modelling	Pre C	S

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed By
	Two-way traffic flow will be maintained on all roads if possible. If closures are required, they are to be carried out during non-peak periods as necessary and with approval from the Superintendent. When necessary, arrangements are to be made with property owners that are directly affected.	PC	VI and CL	PD	S
	Traffic lanes on arterial roads will be maintained with a 60 km/hr design speed. Requirements may be reduced for off-peak periods with approval of the Superintendent.	PC	VI and CL	PD / WR	S
	Allowance will be made for redirection of bus routes as required by TransLink.	PC	CL	PD / WR	TransLink
	Allowance will be made for relocation of utility services prior to commencement of construction whenever possible.	PC	CL	Pre C	S
	Crash barrier protection will be provided to all work areas.	PC	VI and CL	PD	S
	Ingress and egress for construction traffic will be located to avoid conflict with arterial roads.	PC	VI and CL	PD	S
	Consultation will be held with the community and property owners regarding all restrictions and changes to access arrangements.	PC	Public Notification	WR	S
	Provisions will be made for all existing pedestrian and cycle movements adjacent and across the worksite where required.	PC	VI and CL	PD	S

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed By
	There will be access to emergency services and procedures will be established to coordinate and facilitate responses to traffic incidents including rapid response strategies.	PC	CL	PD	S
	Night work will be limited whenever possible and will be approved by the Superintendent.	PC	CL	PD	S
	The cost of all alternative traffic control measures will be evaluated in the selection of the measures to be adopted.	PC	CL	WR	S

10.5 Corrective Actions

- » Construction Contractor to investigate adverse public feedback, poor arterial road performance and RT performance, incidents and the response time to clear incidents;
- » Traffic management plans are to be prepared well in advance of actual works and adequate notice is to be given to affected residents and general traffic;
- » To develop an efficient system of recording poor road and/or RT performance, any incidents (vehicular or pedestrian) and reporting to the appropriate authority in a timely manner;
- » To develop appropriate maintenance procedures well in advance to ensure maintenance crews do not significantly impact on the operational efficiency of the road network and RT system;
- » To implement a public awareness campaign prior to construction of the RT to inform the public of the new traffic network and to educate the public transport users about the RT system and its operating characteristics; and
- » To form a traffic management group with the GCCC and the DMR to co-ordinate the implementation of the proposed traffic management plan during construction of the GCRT and to coordinate with other major construction projects, which may contribute to traffic network congestion. The proposed traffic arrangement during construction will be modelled to optimise the programming of the traffic changes and other projects, and to minimise the impact on the overall Gold Coast traffic network. The programme and temporary access arrangements will be included in a construction traffic management policy required under the construction contract documentation.

10.6 Reporting Requirements

All feedback, road network and RT performance, incidents and corrective actions taken will be reported to the appropriate authority in a timely manner.

11. Chemical and Fuels

11.1 Objectives

This CIMP is intended to provide management measures for chemicals and fuels. The main objectives of this IMP are to take all reasonable and practicable measures to:

- » Ensure safe storage of combustible materials and hazardous materials such as fuel, paint, oils and lubricants;
- » Ensure spills are contained;
- » Prevent and minimise environmental contamination that may occur in the event of a leakage; and
- » Prevent and minimise ignition risk and damage due to spread of fire associated with the storage of chemicals and fuels.

11.2 Statutory provisions

A partial list of legislations, regulations and guidelines applicable for the storage and handling of fuels, paints, oils and lubricants would be as follows:

- » Dangerous Goods Safety Management Act 2001(DGSM Act);
- » Workplace Health and Safety Act 1995;
- » AS/NZ1596: The Storage and Handling of LP Gas;
- » AS/NZS1940: The Storage and Handling of Flammable and Combustible Liquids;
- » AS/NZS 4360: Risk Management;
- » AS 4332: Storage and handling of gases in cylinders;
- » AS 1692: Steel tanks for flammable and combustible liquids;
- » AS 2430.1: Classification of hazardous areas – general requirements;
- » AS 2746: Working areas for gas fuelled vehicles; and
- » AS/NZS 3833: Storage and handling of mixed classes of dangerous goods in packages and intermediate bulk containers.

Actions will vary depending on the type, quantity and storage details of materials at the depot.

11.3 Performance criteria

- » Substances are stored as per applicable statutory provisions;
- » Spills are contained;
- » Environmental contamination as a result of leakage from spills is prevented; and
- » Workplace Health and Safety practices are adhered.

11.4 Construction Impact management actions and responsibilities

Typical impact management actions for chemical and fuels are summarised in Table 19.

Table 19 Chemical and Fuels – Construction Impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	Chemicals and fuels are stored and handled in accordance with the requirements of the Dangerous Goods Safety Management Act	EC / DD		Pre C / DDP	EC
	A Risk Management Plan is to be prepared	EC / DD		Pre C / DDP	EC
	Safety Management Systems to be developed	EC / DD		Pre C / DDP	EC
	Emergency plans and procedures to be developed	EC / DD		Pre C / DDP	EC
	Dangerous goods registers to be developed	EC / DD		Pre C / DDP	EC
	Appropriate site placarding to be implemented	EC / DD		Pre C / DDP	EC
	Emergency manifests to be developed	EC / DD		Pre C / DDP	EC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Appropriate fire suppression systems to be selected and designed.	EC / DD		Pre C / DDP	DD
	Affected people and neighbours to the site to be consulted regarding the storage and measures to be put in place.	O		Pre C / DDP	O and EC
	Department of Emergency Services to be notified of possible large DGL (Dangerous Goods Listed materials) or MHF (Major Hazardous Facilities).	EC / DD		Pre C / DDP	EC and DD
	A safety report to be submitted to the Department of Emergency Services showing how the facility will continue to operate safely.	EC / DD		Pre C / DDP	EC
Construction	The depot, stations and facilities associated with the rapid transit corridor to be constructed in accordance with legislation and approved plans.	PC	VI	PD	PC
	Compliance with Workplace Health and Safety Act requirements to be ensured.	PC	VI / MER	PD	PC

11.5 Monitoring

- » The Operator must ensure compliance with general workplace and safety requirements by undertaking comprehensive audits;
- » Requirements under safety management systems;
- » Undertake monitoring and inspection to prevent flow of dangerous goods outside designated areas; and
- » The operator must continuously monitor and ensure adequate security arrangements to prevent unauthorised entry to storage areas.

11.6 Reporting requirements

- » The operator must maintain a register of all dangerous and combustible goods stored or handled on DGL premises. This register must contain material safety data sheets (MSDS) for all dangerous goods stored or handled and must be readily accessible to all working on premises;
- » Emergency plans and procedures must be prepared for large DGLs, maintained, documented, reviewed and updated in consultation with employees, neighbours and emergency services;
- » Manifests of dangerous goods stored at large DGLs must be kept readily available for emergency services;
- » Safety report must be submitted to the regulatory authority. The facility must review this safety report every five years and provide updates to the regulatory authority;
- » Written record of all consultation done with employees in preparing and updating the safety reports; and
- » In the event of a major accident, the Division of Workplace Health and Safety or the CHEM Services is notified by the operator as soon as practicably possible with the details of the accident and affect it had on people, property or the environment.

11.7 Corrective actions

- » All major accidents are investigated and consultation is undertaken with employees about ways to avoid similar accidents in the future; and
- » Near misses are investigated and consultation is undertaken with employees about ways to avoid these incidents in future. In case of spills, safely dispose waste generated from cleanup of the spills.

12. Cultural Heritage

12.1 Overview

Cultural heritage matters are divided into two elements:

- » Indigenous cultural heritage; and
- » European cultural heritage.

This IMP provides for both elements.

12.2 Indigenous Cultural Heritage

At the time of preparing this CDIMP, a parallel activity is being undertaken to address indigenous cultural heritage in relation to the GCRT Project. The intended result is a Cultural Heritage Management Plan in accordance with the provisions of the *Aboriginal Cultural Heritage Act 2003*.

12.3 European Cultural Heritage:

12.3.1 Objectives

This CIMP is intended to provide management measures for European Cultural Heritage. The main objective of this IMP is to minimise and mitigate the loss of, or damage to, items of cultural heritage and archaeological significance as a result of the proposed transport corridor and associated construction works.

12.4 Statutory provisions

- » *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*;
- » *Australian Heritage Council Act 2003*;
- » *Queensland Heritage Act 1992*; and
- » Gold Coast Planning Scheme.

12.5 Performance criteria

Take action to ensure all reasonable and practicable measures are taken to avoid activities during the project that may harm items of heritage and archaeological significance.

12.6 Construction Impact management actions and responsibilities

Construction impact management actions for cultural heritage are summarised in Table 20.

Table 20 Cultural Heritage – Construction impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	The Rapid Transit corridor is to be designed to take into account each of the heritage sites, places and precincts discussed in Volume 2, Chapter 14 of the CDIMP, and, where possible, avoid or manage impacts.	DD and CHC	CL, and VI	DDP	DD
	Resumption of footpaths associated with buildings of historical significance should be mitigated through the use of <i>accessible design elements</i> such as level paving and difference in finishes to define footpath and congregational space and retention of shopfront awning.	DD and CHC	VI in accordance with Detailed Design Drawings	Pre C & DDP	DD
	The introduction of transport corridor infrastructure to the adjacent streetscapes should be mitigated through the use of sympathetic design elements that minimise the visual prominence of the new transport corridor, that retain ease of pedestrian access to and from the site and, where possible, retain or reinstate the natural landscape.	DD, ENG and CHC	VI in accordance with Detailed Design Drawings	DDP	DD

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	The rapid transit corridor is to be designed and integrated to enhance the on-going historical role of the Southport Township Character Area.	DD, ENG and CHC	VI accordance with Detailed Design Drawings	DDP	DD
	Opportunity for the contextual and visual enhancement of the Southport Town Centre Precinct through the use of sympathetic design elements to promote amenity through pedestrian access and a general cohesion of streetscape to be considered.	DD	Vi in accordance with Detailed Design Drawings	DDP	DD
	The GCRT stations should be an open design, avoiding where possible the introduction of a physical and visual barrier to streetscape and providing an opportunity for the inclusion of interpretive elements.	DD	VI in accordance with Detailed Design Drawings	DDP	DD
	Design teams to be provided with specific recommendations to manage the proposed project around key historic sites with minimal impact and improved interpretation.	DD and CHC	Detailed Design Drawings, CL and VI	DDP	DD
	GCCC heritage planners (Office of City Architect and Heritage) to be consulted and involved in many of the stages, actions and responsibilities.	DD and CHC	Detailed Design Drawings, CL and VI	DDP	DD
	The resumption of footpath adjacent to the Q1 building should be mitigated through level paving and differentiation in finishes that define Q1 and footpath space.	DD	Detailed Design Drawings	DDP	DD

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Construction	Direct impacts proposed by an increase in existing pipework and new bubble up pit in close proximity to the Southport Drill Hall should be mitigated through a thorough assessment of the direct implications, by an engineer prior to construction or prevented by the relocation of the RCP.	ENG	CL and Report	Pre C	PC, S
	<p>Project development within the boundaries of the following sites should be avoided wherever possible, or managed to provide protection of those locally significant cultural heritage sites by qualified professionals:</p> <ul style="list-style-type: none"> » Former Southport Town Hall, Nerang St, Southport; » Masonic Temple and Hall, 78 Nerang St, Southport; » St Peters Anglican Church, Nerang/High Streets, Southport; » Southport Uniting Church and Hall, Scarborough/Short Streets, Southport; » Former Ambulance Building, 45 Nerang St, Southport; » Trinity Lutheran Church, 165 Queen St, Southport; » Former Dougbar Building, Nerang St, Southport; » Former Trustee House, 66 Nerang St, 	PC, DD, EC and CHC	CL and MER	PD	EC and CHC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Southport. » The Cecil Hotel, Nerang St, Southport.				
	A Conservation Management Plan (CMP) will be prepared for the site in advance of the construction of the transport corridor to assess and manage cultural heritage values contained within the sites. The CMP should be constructed for a site in direct consultation with the EPA Cultural Heritage Branch and Queensland Heritage Council.	EC and CHC	Assessment and Reporting	Pre C	EC and ARC
	The development pressure placed on the sites resulting from revitalisation of the area generated by the GCRT, as well as vacant land with potential remnant archaeology and green-space and other inappropriate development should be managed by the development control measures of the GCCC.	EC and ARC	CL and MER	PD	EC and ARC
	Any work sites for storage of machinery or spoil sites for disposal of material from construction activities must be assessed for cultural heritage values.	PC, EC, CHC and ARC	VI and CL	Pre C	EC, ARC and CHC
	A heritage archaeologist to be appointed for the duration of the construction phase of the GCRT.	PC, EC and ARC	CL	PD	ARC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	The proposed construction of piers located within 20 metres of a site listed on the State Heritage Register will require a site specific conservation management plan.	ENG and CHC	Assessment and reporting	Pre C	ENG
	Where the rapid transit corridor construction occurs within 30 metres of a heritage place ensure the settlement and vibrations standards listed in the CDIMP apply.	PC and ENG	CL, assessment and reporting	Pre C	ENG
	GCCC heritage planners (Office of City Architect and Heritage) need to be consulted and involved in many of the stages, actions and responsibilities.	S	consultation	Pre C, PD	CHC

12.7 Corrective actions

- » Any potential artefacts uncovered during the site works are to be reported to a qualified archaeologist for formal identification;
- » If artefacts or items of significance are found, works will cease and a designated buffer placed around the site with no unauthorised entry within this area will be permitted until an archaeologist determines the significance of the find;
- » Verified cultural heritage and archaeological significant items found during the site works are to be documented in-situ and the findings of the documents are to be forwarded to the relevant authorities; and
- » The cultural heritage and value of the site is to be respected at all times.

12.8 Reporting requirements

The Construction Contractor shall provide a written report to the Contract Manager within 24 hours of the discovery of item(s) of Archaeological significance. The report will detail what item(s) were discovered, where, when and what procedures were taken upon discovery.

The Environmental Consultant together with the Cultural Heritage Consultant or Archaeologist shall provide a written report on a monthly basis to the Contract Manager and Construction Contractor to inform them of any new impacts or issues affecting cultural heritage or items of archaeological significance.

13. Acid Sulfate Soil and Potential Acid Sulfate Soil

13.1 Objectives

This CIMP is intended to provide management measures for ASS and PASS. The main objectives of this IMP are to:

- » Avoid/minimise disturbance of ASS and PASS;
- » Aim to improve soil and geotechnical stability; and
- » Mitigate potential visual impacts from ASS to the landscape.

Note that while ASS/PASS presents management issues for construction and environmental impact, there is also possible visual impact from landscapes where ASS has not been managed. This impact has a tendency to create barren landscapes. However, there is a well-established body of ASS/PASS management approaches, which would be expected to be applied to the GCRT Project.

13.2 Statutory provisions

- » *Environmental Protection Act 1994* (EP Act); and
- » *State Planning Policy 2/02 Planning and Managing Development Involving Acid Sulfate Soils (SPP 2/02)*.

The purpose of SPP 2/02 is to ensure that development involving ASS is planned and managed to avoid the release of potentially harmful contaminants into the environment. This SPP applies to certain areas of Queensland listed in Annex 1 where the natural ground level is less than 20 metres Australian Height Datum (AHD) and soil below 5 metres AHD is disturbed by the proposed works. The local government area of the Gold Coast is listed in Annex 1 of SPP 2/02; therefore, this SPP will apply to the proposed development of the GCRT for development involving the excavation of, or otherwise removing, 100 m³ or more of soil or sediment or filling of land involving 500 m³ or more of material with an average depth of 0.5 metres or greater.

13.3 Performance criteria

- » No impacts resulting from the disturbance of ASS and/or contaminated soil and/or uncontrolled release of affected runoff to receiving waterways;
- » No complaints relating to erosion, sedimentation, contamination and/or disturbance of ASS; and
- » No incidents resulting in environmental nuisance and/or material or serious environmental harm due to disturbance of ASS or site contamination.

13.4 Construction impact management actions and responsibilities

Construction impact management actions for PASS / ASS are summarised in Table 21.

Table 21 PASS / ASS – Construction impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	A detailed investigation to be completed in areas identified as potentially containing ASS affected material or where disturbance of soil and sediment will extend below 5 metres AHD into Quaternary alluvium material identified during the geotechnical investigations.	DD	As per detailed design drawings	DDP	EC
	An Acid Sulfate Soils Management Plan (ASSMP) to be developed in consultation with the DNRW and in accordance with relevant standards and guidelines for construction.	DD	As per details design drawings	DDP	EC
Construction	Any materials excavated from areas identified as PASS are to be adequately segregated, stockpiled, contained and treated.	PC	VI	PD	S and EC
	The ASSMP is to be implemented and communicated.	PC	VI	PD	EO and EC

13.5 Corrective actions

- » Incorporate and adopt design principles and concepts aimed at stockpiling, containing and treating excavated material identified as PASS;
- » Adopt periodic review of scheduling/staging of GCRT development for the purpose of reducing PASS disturbance; and
- » Remediation as required for instances of site contamination and other impacts associated with disturbance of ASS.

13.6 Reporting requirements

- » Report the implementation of design measures;
- » Report all incidents and complaints in accordance with reporting procedures;
- » Notification to EPA/DNRW of any instances of material or serious environmental harm; and
- » Report all sampling and analysis results in monthly report.

14. Contaminated Land

14.1 Objectives

This CIMP is intended to provide management measures for contaminated land. The main objectives of this IMP are to:

- » Manage the potential health and environmental risks from contaminated land;
- » Manage the way contaminated spoil is removed and treated to ensure the risk is not relocated to another site (land parcel); and
- » Minimise the potential and risk for hazardous events.

While there are EMR listed sites along the GCRT corridor, the general risks are not regarded as high in terms of the construction risks. The concept design has generally avoided locations where higher contaminated land risks might occur. There is an established approach to managing risk from contaminated land, which would be expected to be applied during the construction phase of the GCRT.

14.2 Statutory provisions

- » *Environmental Protection Act 1994 (EP Act);*
- » *The National Environment Protection (Assessment of Site Contamination) Measure (NEPM) (National Environment Protection Council [NEPC] 1999);*
- » *Australian and New Zealand Environment and Conservation Council (ANZECC)/National Health and Medical Research Council (NHMRC) Guidelines for the Assessment and Management of Contaminated Sites;*
- » *The Australian Standard AS4482.1-2005 Guide to the sampling and investigation of potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds (Standards Australia, 2005); and*
- » *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland. (Department of Environment 1998).*

There are a number of contaminated land responsibilities involved in the GCRT, with respect to the EP Act. All project staff have a general environmental duty under Section 319 of the EP Act and must not carry out any activities that cause, or are likely to cause, environmental harm, unless all reasonable and practical measures are taken to prevent or minimise harm. If project staff, whilst performing their work, notice that serious or material environmental harm is being caused or threatened by their actions or the actions of someone else, they should then report the matter, under Section 320 of the EP Act. Additionally, project staff are required to comply with the following items at all times:

- » Principal Contractor's environmental policy and Environmental Management System (EMS);
- » Relevant legislation, with particular attention to environmental legislation under this IMP;
- » IMP requirements including relevant criteria for design, construction and operation; and
- » Training requirements.



14.3 Performance criteria

- » Minimise impacts resulting from the disturbance of contaminated land;
- » Minimise complaints relating to land contamination; and
- » No incidents resulting in environmental nuisance and/or material or serious environmental harm due to site contamination or spills.

14.4 Construction impact management actions and responsibilities

Construction impact management actions for contaminated land are summarised in Table 22.

Table 22 Contaminated Land – Construction impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	Detailed site history investigation of the study corridor is to be undertaken to identify areas of potential soil contamination.	DD	SI	Pre C	EC
	Owners/operators of Petroleum Product and Oil Storage facilities are to be contacted to ascertain location and size of storage and the nature of the products stored.	DD	SI	Pre C	EC
	Broad contamination land investigation to be undertaken in locations where earthworks may potentially encounter contaminated soils (e.g. areas that are listed on the EMR and identified areas from a site history and observations analysis).	DD	SI	Pre C	EC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Remediation Plan for removal, transport and remediation of contaminated soil to be prepared and implemented in accordance with: <ul style="list-style-type: none"> » ANZECC/NHMRC – Guidelines for Assessment and Management of Contaminated Sites » The EP Act as amended and other related Acts, Policies and Statutory Regulations of Federal, State and Local Government » NEPM (Assessment of Site Contamination) (NEPC 1999) » Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland (Department of Environment 1998) 	DD	SI	Pre C	EC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	A Hazardous Materials Register to be developed to include details on: <ul style="list-style-type: none"> » Storage location; » Storage requirements; » Proper usage; » Handling information; and » Disposal procedures. 	DD	CL and VI	Pre C	EC
	Chemical and fuel storage areas are to be designed to comply with Australian Standards such as AS 1940: Storage and Handling of Flammable and Combustible Liquids and AS 3780: The Storage and Handling of Corrosive Substances.	DD	CL	Pre C	EC
	Emergency response procedures, including (Emergency) Incident Management Plans ((E)IMPs) to be developed, to incorporate spill response procedures.	DD	CL	Pre C	EC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Construction	Health and environmental risks from contaminated land are to be managed.	PC	CL and VI	PD	EO and EC
	Contaminated spoil is removed and disposed of to ensure the risk is not relocated to another site.	PC	CL and VI	PD	EO and EC
	Induction and training regarding contaminated land issues is to be undertaken for construction staff.	PC	CL	Pre C and WR	EC
	Applicable guidelines are to be adopted for storage requirements including the adequacy and need for bunding around stores.	PC	CL and VI	DD	EO and EC
	Spills and leaks are to be cleaned up and remediated as specified in the (E)IMPs.	PC	SI	PD	EO and EC
	Spills response and containment equipment is to be kept on the worksite in close proximity to storage and handling areas.	PC	CL and VI	Pre C and PD	EO and EC
	Validation sampling to be conducted following remediation or covering of contaminated soil, and achieve sign-off by the EPA or by a certified and qualified auditor.	PC	SI	PD	EO and EC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	(E)IMPs for the containment and clean up procedures for spillage of fuels and other dangerous goods, including the provision of access and egress of emergency vehicles to be implemented.	PC	CL	Pre C and PD	EO and EC
	Containment and clean up procedures dealing with the prevention and management of spillage of spoil during transport to spoil placement sites as part of a Sediment and Erosion Control Plan to be implemented.	PC	CL	Pre C and PD	EO and EC
	Transport of regulated wastes and contaminated soils or other materials to be conducted by licensed contractors for disposal at licensed facilities, in accordance with legislative requirements.	PC	CL	PD	EO and EC
	Refuelling and maintenance activities to be conducted in designated bunded areas to minimise the potential for soil and water contamination to result from these activities. Appropriate spill response plans should be prepared.	PC	CL	PD	EO and EC

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Where land is found affected by contamination, a Site Management Plan (SMP) is to be developed in accordance with relevant standards and guidelines and obtain approval of the SMP from the EPA.	PC	SI	PD	EO and EC
	Areas where spills occur during the transport of contaminated material to be contained, cleaned and remediated.	PC	CL and VI	PD	EO and EC

14.5 Corrective actions

- » Incorporate and adopt design principles and concepts aimed at reducing the risk of disturbance to sites identified through investigation as potentially contaminated land;
- » Adopt periodic review of scheduling/staging of project development for the purpose of reducing the risk of land contamination as a result of the GCRT;
- » If land is found affected by contamination, an SMP will need to be approved by the EPA and implemented;
- » If spills occur during the transport of contaminated material, the area affected will require remediation; and
- » Manage contaminated material/sites in accordance with EPA requirements.

14.6 Reporting requirements

- » Site activities during construction, relating to excavation, removal and/or disposal of potentially contaminated material must ensure that environmental harm is prevented. To achieve this outcome, specific procedures must be developed and implemented. These procedures should be developed by a suitably qualified person (a person whose qualifications and experience complies with the requirements of Section 381 of the EP Act). A suitably qualified individual must also supervise and report on these activities;
- » Project staff responsible for any baseline, construction monitoring should ensure that all monitoring equipment used is regularly calibrated and the results recorded/reported. All monitoring and sampling undertaken should be in accordance with the relevant agency guidelines or Australian Standards. All analytical testing performed should use National Association of Testing Authorities (NATA) approved procedures or if this is unavailable, be performed to the best relevant standard; and
- » All investigations must be reported to the Superintendent.

15. Dust Management

15.1 Objectives

This IMP is intended to provide management measures for typical dust management and high-level dust management. The main objectives of this IMP are to:

- » Minimise the potential dust impacts on sensitive locations that could arise from the construction and maintenance of the proposed GCRT Project;
- » Ensure there is no health risk or loss of amenity at sensitive receptors due to emissions of dust to the environment;
- » Identify dust sources and their significance;
- » Provide objectives and targets for off-site impacts;
- » Provide for dust control where both 'typical' and 'high level' mitigation measures are defined;
- » Outline the dust monitoring required;
- » Ensure that ambient air quality is maintained in the vicinity of the GCRT construction route;
- » Eliminate causes of local complaint from dust originating from construction activity; and
- » Ensure particulate real-time route monitoring does not exceed PM_{10} greater than $50\mu\text{g}/\text{m}^3$ over a 24-hour average.

15.2 Statutory provisions

15.2.1 Queensland

The *Environmental Protection (Air) Policy Act of 1997* (EPP (Air)), sets out ambient air quality goals by which pollutant levels can be assessed for their potential to cause harm to human health and wellbeing in Queensland. Neale and Wainwright (2001) determined that the relevant pollutants with corresponding goals in EPP (Air) for operational roadside investigations are CO, NO₂, PM₁₀ and Lead. For ambient dust the EPP (Air) goals are:

- » (respirable) particulate matter as PM₁₀: $150\mu\text{g}/\text{m}^3$ as a 24-hour average and $50\mu\text{g}/\text{m}^3$ as an annual average; and
- » particles (as Total Suspended Particulate, TSP): $90\mu\text{g}/\text{m}^3$ as an annual average.

The EPP (Air) is silent on dustfall as a nuisance pollutant. New South Wales have set a deposited dust criterion (Department of Environment and Conservation, 2005) that is widely used as an informal guideline in other states. This criterion is $2.0\text{ g}/\text{m}^2/\text{month}$ as a maximum increase in deposited dust with the maximum total deposited dust level to be below $4.0\text{ g}/\text{m}^2/\text{month}$. Despite this criterion being required to be met as an annual average only, it is sometimes used on a per month basis or even a daily (Airport Link 2005 and Parsons Brinckerhoff 2006) 'dust deposition guide' of $120\text{ mg}/\text{m}^2/\text{day}$.

15.2.2 National

The National Environment Protection Council of Environmental Ministers, now the EPHC, set uniform standards for Australian ambient air in June 1998. These are known as the *National Environment Protection (Ambient Air Quality) Measure*, also known as Air NEPM, which sets non-binding⁴ standards and ten-year goals (i.e. 2008). The Air NEPM goal for PM₁₀ is 50µg/m³ as a 24-hour average (no more than 5 days per year).

A variation to the Air NEPM was made in May 2003 “which strengthens air quality standards to help protect Australians from the adverse health impacts of small pollutant particles” (EPHC, 2008). The variation introduced advisory reporting standards for fine particles of size 2.5 micrometres or less (also known as PM_{2.5}). The NEPM standard for PM_{2.5} is 25µg/m³ as a 24-hour average and 8µg/m³ as an annual average.

15.2.3 Construction Projects - Queensland

Generally, major construction activities of this nature in Queensland are required to comply with the conditions of the Office of the Coordinator-General within the Department of Infrastructure. This regulates the Queensland Government's involvement in the delivery of significant development and infrastructure projects.

For the Airport Link project in Brisbane the Coordinator-General has set dustfall criteria for the release of dust from construction works, which are indicated in Table 23. Additionally, the health-based goal for ambient air is 50µg/m³ for daily average PM₁₀ (no more than five times per year).

Table 23 Recommended dust monitoring goals for major construction works in Queensland

Existing dust fallout (g/m ² /month)	Maximum increase above background (g/m ² /month)	
	Residential area	Commercial area
2	2	2
3	1	2
4	0	1
5 and above	0	0

15.3 Performance criteria

- » The objectives can be met by complying with any targets set by the Coordinator-General as discussed in section 15.2.3;
- » All typical local dust complaints responded to within 12 hours;

⁴ The Air NEPM standards apply to regional Air Quality as it effects the general population and does not apply in areas impacted by localised air emissions such as industrial sources, construction activity and heavily trafficked streets and roads.

- » Mitigation measures for typical dust management to implemented within 24 hours of receiving a verified dust complaint;
- » All high level local dust complaints responded to within six hours; and
- » Mitigation measures for higher level dust management implemented within 12 hours of receiving a legitimate dust complaint.

15.4 Issues and Impacts

During construction and ongoing maintenance of the GCRT Project, dust will be generated principally via the following mechanisms:

- » **Mechanical disturbance:** dust emissions brought about by construction and maintenance vehicles/equipment; and
- » **Wind erosion:** dust emissions from exposed, disturbed soil surfaces under high wind speeds.

On-going maintenance of the transit system is expected to generate little and only sporadic dust events. These can be considered normal construction activity not associated with a significant project and are no longer considered in this report.

Construction and maintenance activities along the transit route that will generate localised emissions to air of crustal dust will be:

- » Excavation;
- » Pavement works and curb ripping and reinstatement;
- » Wheel generated dust from mobile plant and deliveries;
- » Handling and localised stockpiling of topsoil and spoil;
- » Removal and transport from site of spoil;
- » Localised welding fumes, cutting and grinding dust;
- » Delivery to site and infill of bedding and fill material;
- » Levelling and rehabilitation of disturbed soil surfaces; and
- » Wind erosion of exposed unstable soil surfaces and localised stockpiles.

Vehicle exhaust emissions during the construction phase have the potential to impact on air quality; however, the dust impact is likely to be negligible given the short-term construction period at any one location.

All construction and administrative vehicles are to be maintained in a serviceable condition such that exhaust emissions are reduced to manufacturer specified levels.

15.5 Construction impact management actions and responsibilities - Typical Dust Management

From the identification of potential dust emission sources, appropriate dust management and mitigation measures for a **typical** level of control applies along the transit route where construction activity is occurring and there are no immediate sensitive receptors (within 70 metres). Impact management actions for construction dust management are summarised in Table 24.

Table 24 Typical Dust Management– Construction impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Construction	All construction and maintenance equipment/vehicles to be operated and maintained in sound working order to minimise exhaust emissions.	PC / O	VI	WR	PC / O
	Defined haul routes to be used (especially when delivery into the commercial areas, where areas are limited for stockpile establishment).	PC / O	N/A	N/A	N/A
	Vehicular speeds will be limited to 15 km/h on areas of unconsolidated or unsealed soil associated with the immediate site works.	PC / O	VI	WR	PC / O

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Watering of exposed surfaces, as required, to reduce risk of nuisance dust.	PC / EO	VI	WR	PC / EO
	Regular sweeping of access roads to ensure material is not transported onto roads around the site.	PC	VI	WR	PC
	<p>Review of daily weather updates from the Bureau of Meteorology, or a private meteorology service provider, to give warning of likely strong winds to assist with daily management of wind blown dust from unconsolidated soil surfaces and material stockpiles. This includes:</p> <ul style="list-style-type: none"> » All haulage vehicles are to have their loads covered while transporting material; and » Areas of disturbed soil, stockpiles and temporary spoil containment are to be covered by mulch or tarpaulins as best as practicable. 	PC / O	VI	WR	PC / O

15.5.1 Monitoring and Reporting Requirements

- » Visible observations of dust moving off-site; especially during dry and/or windy weather;
- » Daily audit of mitigation equipment and dryness of exposed surfaces by site manager (includes logging complaints and action taken);
- » Dust deposition gauges operated in front of representative residences if construction activity likely to be within 500 metres for more than 30 days; and
- » Free-call number available for public complaints.

15.5.2 Corrective actions

Prompt mitigation of visible dust emissions, which may involve:

- » Stabilisation of surface silt content through application of localised water sprays, or the use of appropriate chemical dust suppressants (suitable for stockpiles and spoil dumps);
- » Control of mechanically induced dust emissions (from clearing, scraping, excavation, loading, dumping, filling and levelling activities, etc.) by application of water sprays; and
- » Awareness of operational areas more frequently exposed to higher winds and the predominant wind directions in these areas at various times of the year. Temporary wind barriers may be employed where necessary.

15.6 Construction impact management actions and responsibilities – High Level Dust Management

It is proposed that high-level dust control be achieved by developing a proactive and reactive dust management regime, which makes use of real-time particulate monitoring. This regime may employ one or two real-time aerosol monitors, with PM₁₀ size selective inlets, which will be located between construction operations and identified sensitive receptor sites (as the construction activity moves along the route).

These real-time monitors can be configured to provide a warning (via an audible or visible signal or as a communication link) of short-term elevations in concentrations of respirable dust so that immediate dust suppression and remediation steps can be initiated. Reactive mitigation measures may include application of water sprays, reducing the intensity of operations, or even altering the type of construction operations, until suitable meteorological conditions prevail. The threshold particulate concentration for alarm/warning activation would be based on a criteria level established by the Coordinator-General as an intervention level for respirable dust; typically 150µg/m³ as a short term trigger which will result in the daily dust exposure being below the daily EPP (Air) limit.

Impact management actions for construction dust management are summarised in Table 25.

Table 25 High Level Dust Management– Construction impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	All controls for typical dust management and mitigation to be identified and implemented.	PC / O	VI	WR	PC / O
	Temporary cyclone fencing with wind reducing mesh (shade-cloth) to be implemented between construction activity and pedestrian areas along Surfers Paradise Boulevard, commercial and retail areas in Southport, Gold Coast Hospital and Southport Primary School.	PC	VI	WR	PC
	Real-time and reactive dust monitoring system to be established.	PC / EO / O	VI / MER	PD	EO



15.6.1 Corrective actions

- » Immediate cessation of activity when real-time monitoring indicates PM₁₀ dust levels above 150µg/m³ over a rolling 1-hour average; and
- » All other monitoring and reporting for 'typical' dust management.

15.6.2 Monitoring and Reporting Requirements

Real-time dust monitoring conforming to:

- » Australian Standard AS 2922-1987 Ambient Air – Guide for the siting of sampling units; and
- » AS/NZ 3580.12.1 2001 Methods for sampling and analysis of ambient air Method 12.1: Determination of light scattering - Integrating nephelometer method.

All other monitoring and reporting for 'typical' management including:

- » Visible observations;
- » Daily audits;
- » Dust deposition gauges;
- » Logging complaints and corrective actions; and
- » Public free-call number.

16. Clean up and Rehabilitation

16.1 Objectives

This CIMP is intended to provide management measures for clean up and rehabilitation. The main objectives of this IMP are to:

- » Improve the visual amenity of the working areas after construction;
- » Restore and enhance disturbed areas in the post construction phase;
- » Maximise survival opportunities for areas of retained vegetation and newly rehabilitated areas;
- » Restore fauna habitat and maintain connectivity along the sites; and
- » Prevent existing and new weeds from re-establishing within the rehabilitated areas.

16.2 Statutory provisions

- » *Environment Protection and Biodiversity Conservation (EPBC) Act 1999;*
- » *Environmental Protection Act 1994;*
- » *Vegetation Management Act 1999;*
- » *Plant Protection Act 1989;*
- » *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016 (the Koala Plan);*
- » *Nature Conservation Act 1994;*
- » *Water Act 2000;*
- » *Fisheries Act 1994;*
- » *Land Protection (Pest and Stock Route Management) Act 2002; and*
- » Gold Coast City Council Nature Conservation Strategies and Policies.

16.3 Performance criteria

- » Plant survival rates in newly revegetated sections area greater than 70 percent for three months post construction;
- » Site remains free of major environmental weeds and infestations; and
- » Site is cleared of all construction-generated waste once construction is complete.

16.4 Construction impact management actions and responsibilities

Construction impact management actions for clean up and rehabilitation are summarised in Table 26.

Table 26 Clean up and Rehabilitation – Construction impact management actions

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
Design	<p>A desktop investigation of areas within or adjacent to the alignment that are identified as ecologically important is to be undertaken to inform revegetation choices, particularly:</p> <ul style="list-style-type: none"> » Moreton Bay Ramsar Wetland; » Coombabah Fish Habitat Area; » Coombabah Lake Conservation Area; » Burleigh Heads National Park; and » Currumbin Hill Conservation Area. 	DD	DDP	Pre C	EC / EO

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	<p>A Clean Up and Rehabilitation Plan is to be developed as part of project design including:</p> <ul style="list-style-type: none"> » A list of recommended native species for rehabilitation and ensuring recommended native plant species will not aggressively compete or displace existing native species. » A list of priority weed species for control and implement post construction control measures. » Rehabilitation techniques suitable for the site taking into account the topography, soils and ecological processes (i.e. natural regeneration, direct seeding, planting from tube stock, etc). Provide planting densities and techniques as required. 	DD	DDP	Pre C	EC / EO

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	Where loss of native vegetation cannot be avoided, offsets by suitable revegetation, in consultation with NRW and/or DEW, are to be determined.	DD	DDP	Pre C	EC / EO
Construction	A Clean Up and Rehabilitation Plan is to be implemented and communicated.	PC	VI	PD	EC / EO
	Rehabilitation of disturbed areas to occur as soon as possible.	PC	VI	Post C	EC / EO
	Mulching, watering and fertiliser regimes, regular inspection schedules for damage or disease, replacement planting criteria and weed eradication measures to be undertaken.	PC	MER	Post C	EC / EO
	A monitoring program to measure the effectiveness of adopted measures to be implemented.	PC	MER	PD	EC / EO

Phases	Actions	Responsibilities	Monitoring and Reporting Compliance		
			Activity	Activity Timing	Activity Performed by
	A maintenance program to ensure the long-term health and vigour of retained vegetation and the healthy growth of new plantings and/or direct seeded areas to be implemented.	PC	MER	Post C	EC / EO
	Ensure sites are left free of construction-generated wastes and wastes are disposed of appropriately.	PC	VI	Post C	O / S

16.5 Corrective actions

- » Inform the Environmental Officer or Environmental Consultant of all incidents of non-conformance that occur;
- » Adopt principles and concepts aimed at reducing the risk of disturbance to flora and fauna; and
- » Adopt periodic review of scheduling/staging of the project development for the purpose of reducing the risk of impacting on significant ecological characteristics.

16.6 Reporting requirements

- » Report the implementation of the Clean Up and Rehabilitation Plan in accordance with the monthly environmental reporting requirements, including information on:
 - Plant growth, percentage cover and survival rates;
 - Plant losses through herbivores, disease, vandalism, storm damage, etc;
 - Weed regrowth and control measures;
 - Plant replacement;
 - Guard repair and weeding inside guards;
 - Maintenance watering regime; and
- » Report any incidents or complaints in accordance with reporting procedures.



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