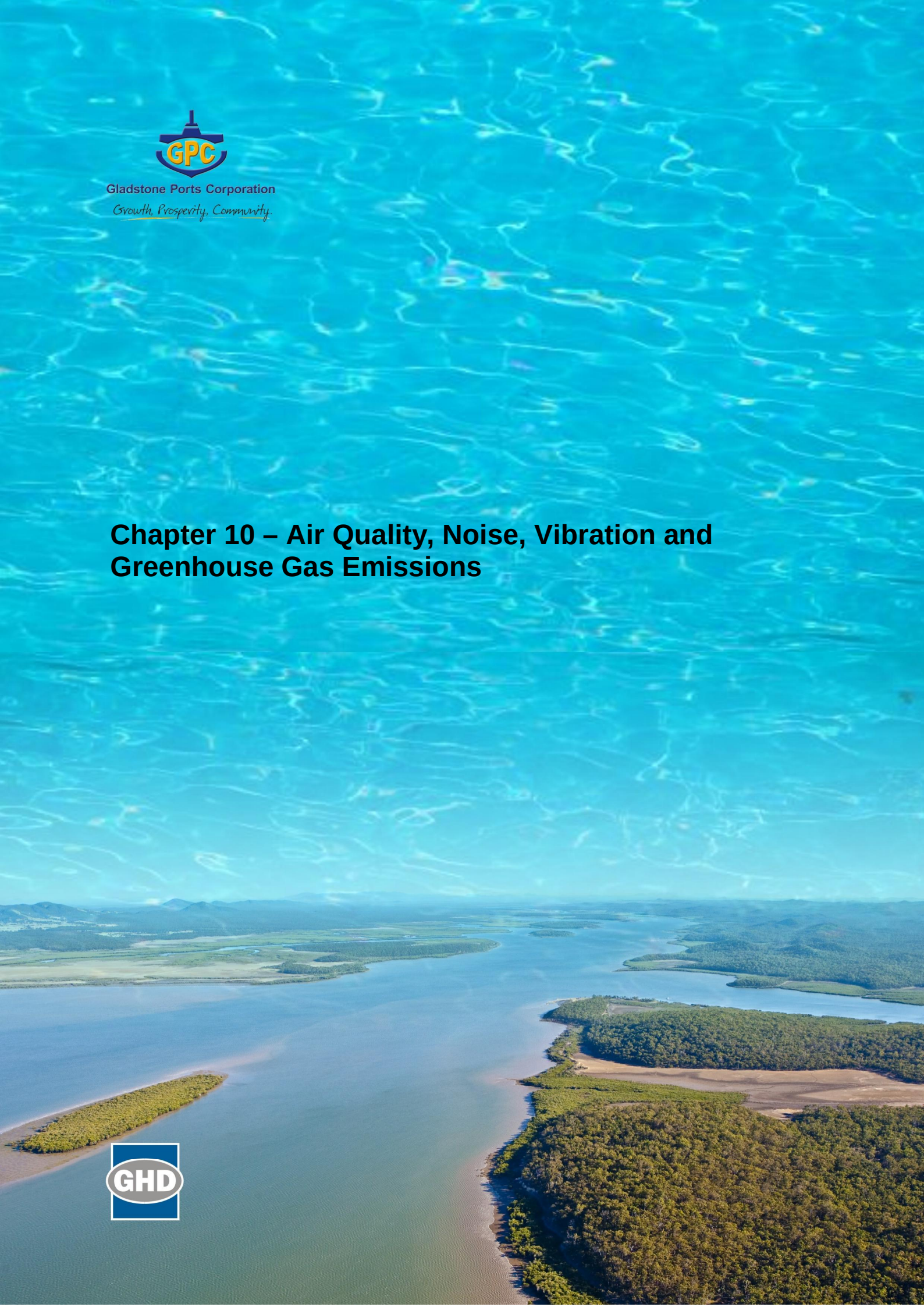
Gladstone Ports Corporation

Growth, Prosperity, Community.

Chapter 10 – Air Quality, Noise, Vibration and Greenhouse Gas Emissions



10. Air Quality, Noise, Vibration and Greenhouse Gas Emissions

Overview

This chapter presents a description of the process for the identification and management of air quality, noise, vibration and greenhouse gas emissions associated with the Project. It has been prepared in accordance with Section 3.6 Air quality, noise and vibration of the ToR for the Project (Appendix A).

The detailed assessment of noise and vibration is provided in Appendix S and a detailed Greenhouse Gas assessment provided in Appendix T.

The relevant legislation and guidelines relating to air quality, noise, vibration and greenhouse gas emissions are:

State Legislation

- *Environmental Protection Act* 1994; and
- *Nature Conservation Act* 1992.

Guidelines

- National Environment Protection (Ambient Air Quality) Measure (NEPC 1998);
- *Environmental Protection (Noise) Policy* 2008 (EPP (Noise));
- Planning for Noise Control Guidelines 2004 (PNCG);
- Australian Standard AS 1055.2:1997 – Acoustics – Description and measurement of environmental noise;
- 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 (1 Hz to 80 Hz);
- British Standard BS7385-2:1993 Evaluation and Measurement for Vibration in Buildings, Part 2 - Guide to damage levels from ground borne vibration;
- Queensland Government's Guidelines for Climate Change Impact Assessment (EPA 2008); and
- National Greenhouse Accounts (NGA) Factors", published by the Australian Government's Department of Climate Change.

10.1 Air Quality

10.1.1 Method of Assessment

Due to the nature of the potential air emissions from the Project, detailed modelling of air emissions has not been completed. The description of environmental values has been based upon a desktop review of existing air quality information published by DERM (formerly the Environment Protection Agency).

The ToR specify a number of requirements regarding air quality that are to be included in the EIS. However, as the air emissions from the Project have a low likelihood of impacting on the environment, the following aspects of the ToR have not been addressed in detail:

- The quantity and quality of all air emissions;
- Comparison of air emissions with air quality standards; and
- Predicted average ground level concentrations in nearby areas.

10.1.2 Description of Environmental Values

Gladstone is a coastal city that is bordered to the east and south by mountain ranges whereby pollutants are potentially able to become trapped until dispersed by wind or rinsed from the air by rain. In warmer seasons, with windy conditions, rainfall events will disperse pollution and rinse the air. In cooler conditions, wind speeds are generally lower and rainfall is lower, so pollutants are less likely to disperse.

Further details on the climate of the Project area have been included in Chapter 4.

DERM is currently undertaking an assessment of air quality in Gladstone. This is to address community concerns regarding the impact of air pollution from industry on the health and well-being of the community. In 2007 the EPA released an air monitoring report for Queensland, in accordance with the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM). The results published in this report showed that carbon monoxide, lead and ozone measurements were not required in Gladstone as pollutants were reasonably expected to be consistently below the relevant AAQ NEPM standard (EPA 2007). For nitrogen dioxide, sulphur dioxide and PM_{10} (particulates of 10 microns or less) the monitoring results demonstrated that the performance standards and goals of the AAQ NEPM were met during 2007 in Gladstone (EPA 2007).

10.1.3 Potential Impacts and Mitigation Measures

Potential Construction and Operation Impacts

The likelihood of significant air emissions from either the construction or operation of the Project is low as the major construction activities are to be undertaken at a maximum height of RL 7 (construction of the bund wall for the Reclamation Area), but will mostly be completed below the high water mark (dredging).

Potential sources of air emissions during the construction phase of the Project include:

- Dust emissions from mechanical disturbance during the placement of rock in the bund once it is above the high water mark;
- Vehicle exhaust emissions from construction traffic, including trucks delivering quarry materials and the movement and operation of construction machinery on the bund wall;
- Dust emissions from mechanical disturbance during the placement of capping material on the final reclamation surface; and
- Exhaust emissions from dredge vessels.

Vehicle exhaust emissions during construction have the potential to impact on air quality; however the impact is likely to be very low due to the number of vehicles and short-term period of construction. Dust emissions have the potential to affect health and amenity, however due to the short-term nature of construction, the limited amount of construction activity being undertaken above water and the distance

from sensitive receptors, there is a very low likelihood of dust emissions impacting on either health or amenity.

The potential impact from the operation phase of the Project is:

- Dust from the surface of the completed reclamation area from wind erosion.

As with the construction emissions, there is a low likelihood of dust emissions from the reclamation area impacting on health or amenity as the quantity of dust likely to be generated from wind erosion of the reclamation area is small.

Mitigation Measures

The mitigation of the impacts identified above is proposed through the following measures:

- Dust suppression trucks to be used on the Reclamation Area, as required;
- All construction vehicles including dredging vessels to be properly maintained and standard emission reduction devices are to remain on vehicles; and
- Progressive revegetation of the reclamation area in stages as construction is complete.

10.2 Greenhouse Gas Emissions and Abatement

10.2.1 Method of Assessment

A greenhouse gas (GHG) assessment was completed to provide a qualitative investigation of potential greenhouse gas emissions associated with the Project. Where sufficient information was available regarding emission sources likely to be significant for the Project, a quantitative assessment of these emissions has been undertaken and is provided in Appendix T.

The assessment considered the construction of the Western Basin Reclamation Area and the dredging operations. Figure 10-1 shows the greenhouse assessment boundaries.

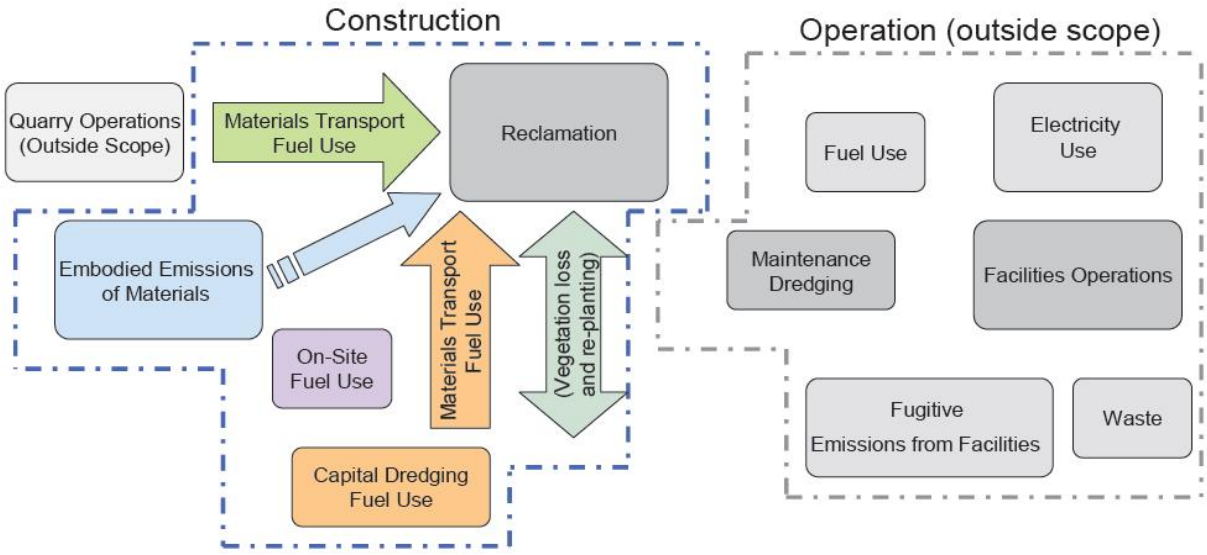


Figure 10-1 Project GHG Assessment Boundaries

The GHG assessment was undertaken using a methodology adapted from the GHG component of the Queensland Government's Guidelines for Climate Change Impact Assessment (EPA 2008). The main steps that have been completed for the assessment are:

- Summarise the existing legislation and policies relevant to GHG emissions from this project;
- Summarise the existing environment in regards to current levels of GHG emissions from the State of Queensland and relevant sectors, as well as from current activities at the site;
- Identify the main potential sources of GHG emissions from the construction of the reclamation bund and dredging activities and calculate approximate GHG emissions using factors and methodologies outlined in "National Greenhouse Accounts (NGA) Factors", published by the Australian Government's Department of Climate Change; and
- Investigate the potential for mitigation or reductions of project related GHG emissions.

GHG emissions from facilities to be constructed on the Reclamation Area in the future will be assessed by future proponents, so these emissions have not been included in the GHG assessment.

10.2.2 Description of Environmental Values

In 2007 the Intergovernmental Panel on Climate Change (IPCC) released its fourth assessment report which stated that warming of the climate system is now unequivocal and is very likely due to the observed increase in GHG concentrations in the atmosphere as a result of human activities (IPCC 2007).

Greenhouse gases are those gases in the earth's atmosphere that trap heat, allowing the temperature of the earth to be kept at a level that is necessary to maintain life. An increase in the levels of these gases in the atmosphere results in an increase in the amount of heat being trapped, leading to warming of the earth's surface. This is commonly referred to as the enhanced greenhouse effect. The three main greenhouse gases are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O).

The latest overview of GHG emissions estimates for Australia was published by the Department of Climate Change in June 2009. These estimates relate to data for the period from 1990 to 2007. The 2007 annual estimates for Australia, Queensland and for the sectors relevant to this project are summarised in Table 10-1.

Table 10-1 2007 Annual GHG Emissions Estimates (DCC, 2009a)

	Australia	Queensland	
	Emissions (Mt)	Emissions (Mt)	% Contribution to National Emissions
Total Net Emissions	597.2	181.6	30.4%
Manufacturing and Construction	48.7	12.4	25.5%
Transport	78.8	18.9	24.0%

Sources of Greenhouse Gases from Construction Phase Activities

The construction phase of this project will include the building of the revetment walls of the bund and the dredging operations that will supply the fill material for the Reclamation Area. The potential sources of GHG emissions from this construction phase are outlined in Figure 10-2.

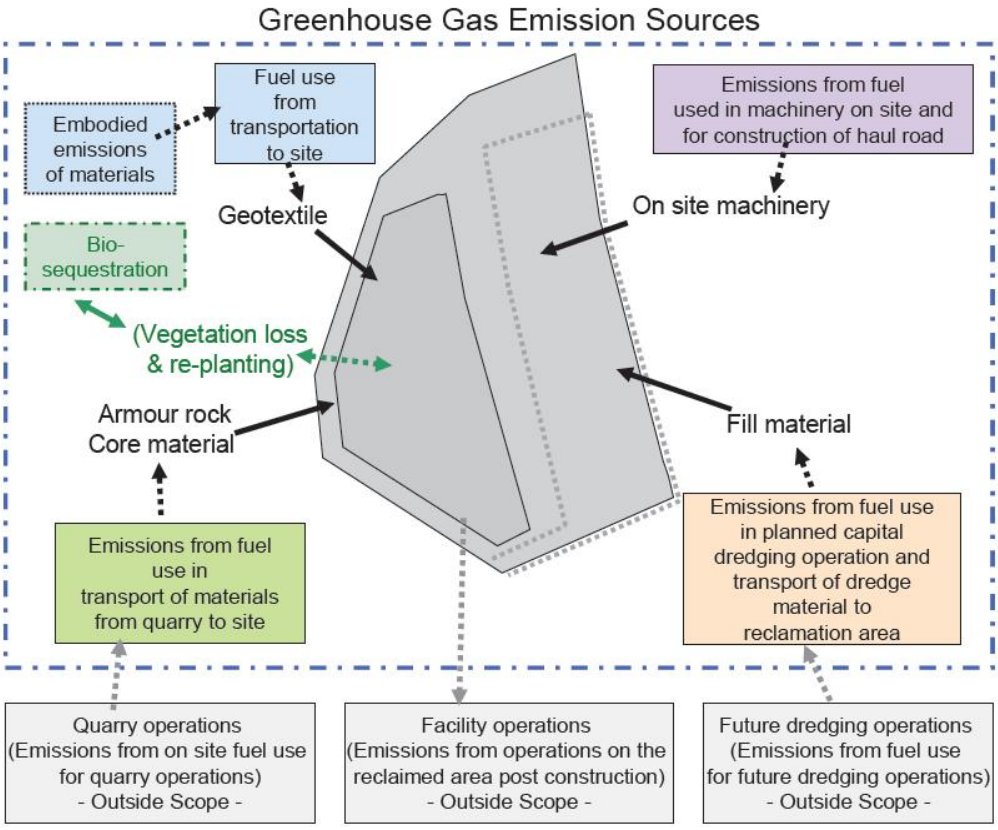


Figure 10-2 Potential GHG Emission Sources from Construction of the Reclamation Area

Sources of GHG emissions that have been identified for the Project are:

- Transportation of the bund armour and core material from the quarry to the Reclamation Area;
- Embodied emissions from the manufacturing of the geotextile material;
- Diesel fuel consumption of the on-site machinery; and
- Fuel required for capital dredging programs that will fill the Reclamation Area with dredged material.

Taking into account the estimate of GHG emissions from the transportation of the bund armour, core material, the embodied emissions of the geotextile, the diesel consumption of on site machinery and filling of the Reclamation Area with dredged material, the total GHG emissions from the construction phase of the Western Basin Dredging and Disposal project are estimated at approximately 300,500 tonnes of carbon dioxide equivalent (tCO_2-e). Table 10-2 and Figure 10-2 summarise the breakdown of the potential main GHG emissions sources from this project. It is clear that the use of fuel for the capital dredging operations will be the most significant source of GHG emissions for this project. Further details on the calculations of GHG emissions can be found in Appendix T.

Table 10-2 Estimate of GHG Emissions from Main Sources During Construction Phase

GHG emissions source	Approximate estimate of GHG emissions
Transport of materials	2,500 tCO_2-e
Embodied emissions of geotextile	300 tCO_2-e
On site machinery (at Reclamation Area)	6,700 tCO_2-e
Dredging	291,000 tCO_2-e
Total	**300,500 tCO_2-e**

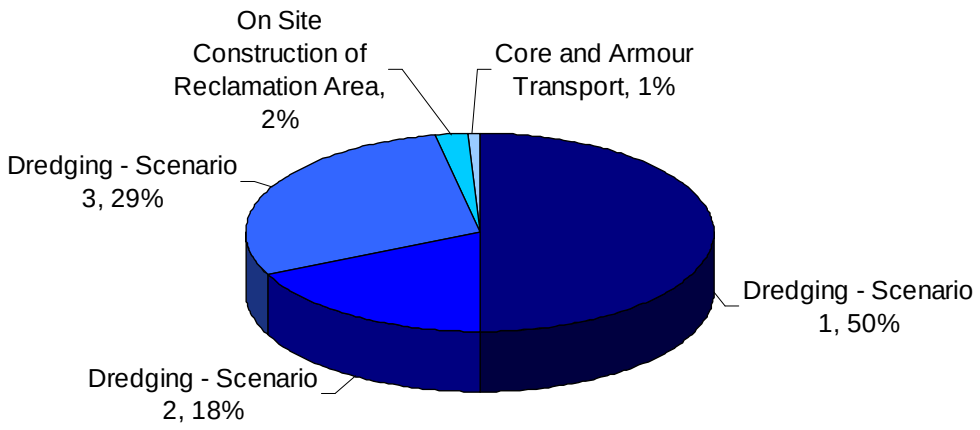


Figure 10-3 Estimate of GHG Emissions from Main Sources During Construction Phase

10.2.3 Potential Impacts and Mitigation Measures

Potential Impacts of GHG Emissions

When compared with the annual baseline emissions for the State of Queensland, the GHG emissions potentially being generated from the main sources during the construction phase of this project could be expected to be approximately 0.17% of Queensland's annual emissions. It should be noted that the quantitative estimation of emissions only covers sources deemed to be significant, and for which a reasonable level of information was available.

Mitigation Measures

Methods for reducing GHG emissions are generally based on the following themes:

- **Avoid**: Identify where and how GHG emissions associated with the proposal can be avoided;
- **Reduce**: Identify where behaviour or processes can be modified to achieve GHG emission reductions; and
- **Switch**: Identify where fuel and energy source switching can be used to reduce GHG emissions.

The following mitigation options could be employed during the appropriate phase of the Project in order to reduce the quantity of GHG emissions arising from the Project. Although the GHG emissions resulting from the dredging phase of the Project are by far the largest source, reductions achieved in all components of the project will be important in reducing the overall GHG emissions.

Dredging

The dredging programs that will be carried out to fill the Western Basin Reclamation are required for various capital works in the surrounding area. These dredging projects will be required regardless of the presence of the Western Basin Reclamation Area. Therefore, the presence of the Reclamation Area for the disposal of the dredged material may reduce the need for dredgers to travel further distances. This would reduce the fuel use and possible GHG emissions as a result of the dredging activities.

Mitigation measures for the dredging activities related to the Project are:

- By designing the dredging operation to reduce overall fuel use, the GHG emissions from the dredging and transportation of the dredged material will be reduced;
- By scheduling the dredging programs so that the same dredgers can be used on each operation, fuel use associated with the potential mobilisation of the dredgers will be reduced; and
- Selecting newer dredges with more efficient engines, if possible, will also result in significant reductions in GHG emissions through fuel savings.

Transport

- The driving methods employed by the drivers operating the trucks will impact on the amount of fuel used and therefore, the GHG emissions associated with the transportation of the quarried materials to the site. Studies have shown that implementing smoother driving practices can result in fuel savings of between 5 and 10% (OECD 2001). A 10% savings in fuel used for transport during the construction phase of this project could equate to around 88,000 Litres, or 255 tCO_2-e;
- Options to reduce any possible congestion associated with the filling and emptying of the trucks at the quarry and Reclamation Area should also be implemented to avoid trucks spending more time on each trip than is necessary. Measures that could be implemented on the quarry and reclamation site include single direction loop roads in and out of the sites that allow trucks to enter and leave without unnecessary manoeuvring, and procedures to encourage drivers to turn off engines when any significant delays are experienced along the route; and
- The potential to use bio-fuels for the transport vehicles should be investigated to further reduce GHG emissions.

Embodied Emission of Construction Materials

- Sourcing polyester geotextile manufactured from recycled PET, if possible, would significantly reduce the amount of embodied emissions in the geotextile material used for the Reclamation Area (Geofabrics Australasia 2009).

Reclamation Area Construction Site

- Choosing the most suitable site equipment that can carry out the required tasks with the most efficient fuel consumption rates will result in reduced GHG emissions from on-site equipment fuel use;
- Fuel saving initiatives on site such as implementing efficient driving practices onsite has the potential to further reduce GHG emissions (OECD 2001); and
- The potential to switch to the use of bio-fuels for the onsite machinery should be investigated to further reduce GHG emissions.

Other

- Some actions that are proposed to protect vegetation on and around the site will contribute towards offsetting greenhouse gas emissions. For example, setting the reclamation back from the foreshore to allow for maintenance of the mangrove communities and maintaining the final decant pond as a wetland;
- Vegetation of the Reclamation Area (to occur as filling is completed) could contribute to offsetting of GHG emissions for the Project; and
- Carrying out any additional fuel and energy savings measures identified in the Gladstone Port Corporation Energy Efficiency Opportunity assessments, such as the implementation of a system for analysing energy usage, as well as working to ensure that energy efficiency clauses are included in all equipment tender specifications, will also contribute to reducing the potential GHG emissions associated with this project.

10.3 Noise

10.3.1 Method of Assessment

The following tasks have been undertaken in relation to the assessment of noise impacts from the Project:

- Sensitive receivers were identified using available aerial photography and planning maps;
- A review of existing noise monitoring data in the vicinity of the proposed project at potentially impacted receivers was completed;
- An investigation of existing background and ambient noise levels for the day, evening and night time periods was completed;
- Any current activities near the Project area which may contribute to the background level of noise and ground vibration were identified;
- Project specific noise goals with consideration to the Queensland EPA publications *Environmental Protection (Noise) Policy 2008*, Noise Measurement Manual 2000, Planning for Noise Control 2004,

and Australian Standard AS 1055.2:1997 – Acoustics – Description and measurement of environmental noise, have been identified;

- A desktop review of noise levels for proposed construction plant, equipment and other activities at the proposed dredging area was completed; and
- An investigation of the potential noise impacts on sensitive receivers from dredging has been completed.

This chapter discusses the impacts of noise from construction activities, but does not assess noise impacts from operational activities. Future proponents establishing facilities on the Western Basin Reclamation Area will assess any noise impacts under their environmental process. Maintenance dredging is likely to occur annually for short periods and is not expected to have any significant noise impact.

10.3.2 Description of Environmental Values

The environmental values to be enhanced or protected under the Queensland Environmental Protection (Noise) Policy 2008 (EPP(Noise)) are:

- Protecting the health and biodiversity of ecosystems;
- Human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to sleep, study and be involved in recreation, including relaxation and conversation; and
- Protecting the amenity of the community.

Acoustic quality objectives are also set out in the EPP (Noise) schedule 1 and relate to noise limits for various sensitive receivers, with limits determined by the time of day and environmental value of the receiver. Sensitive receivers were identified for the Project based on aerial photography, a site inspection and liaison with GPC. The nearest sensitive receivers to the Project area are listed in Table 10-3.

Table 10-3 Project Sensitive Receivers

Receiver No.	Type	Location	Distance to Proposal
R01	Residential	Mt Larcom-Gladstone Road	9000m from Reclamation Area
R02	Residential	Mt Larcom-Gladstone Road	8500m from Reclamation Area
R03	Residential	Fisherman's Road	5500m from Reclamation Area
R04	Residential	Tide Island	450m from dredging
R05	Residential	Witt Island	750m from dredging
R06	Residential	Compigne Island	2700m from dredging
R07	Residential	Turtle Island	2500m from dredging
R08	Residential	Quoin Island	3400m from dredging
R09	Residential	Endeavour Parade, Flinders Parade, Auckland Street, Oaka Lane - Gladstone	1100m from dredging

Receiver No.	Type	Location	Distance to Proposal
R10	Protected Area	Between Friend Point and Laird Point	600m from dredging

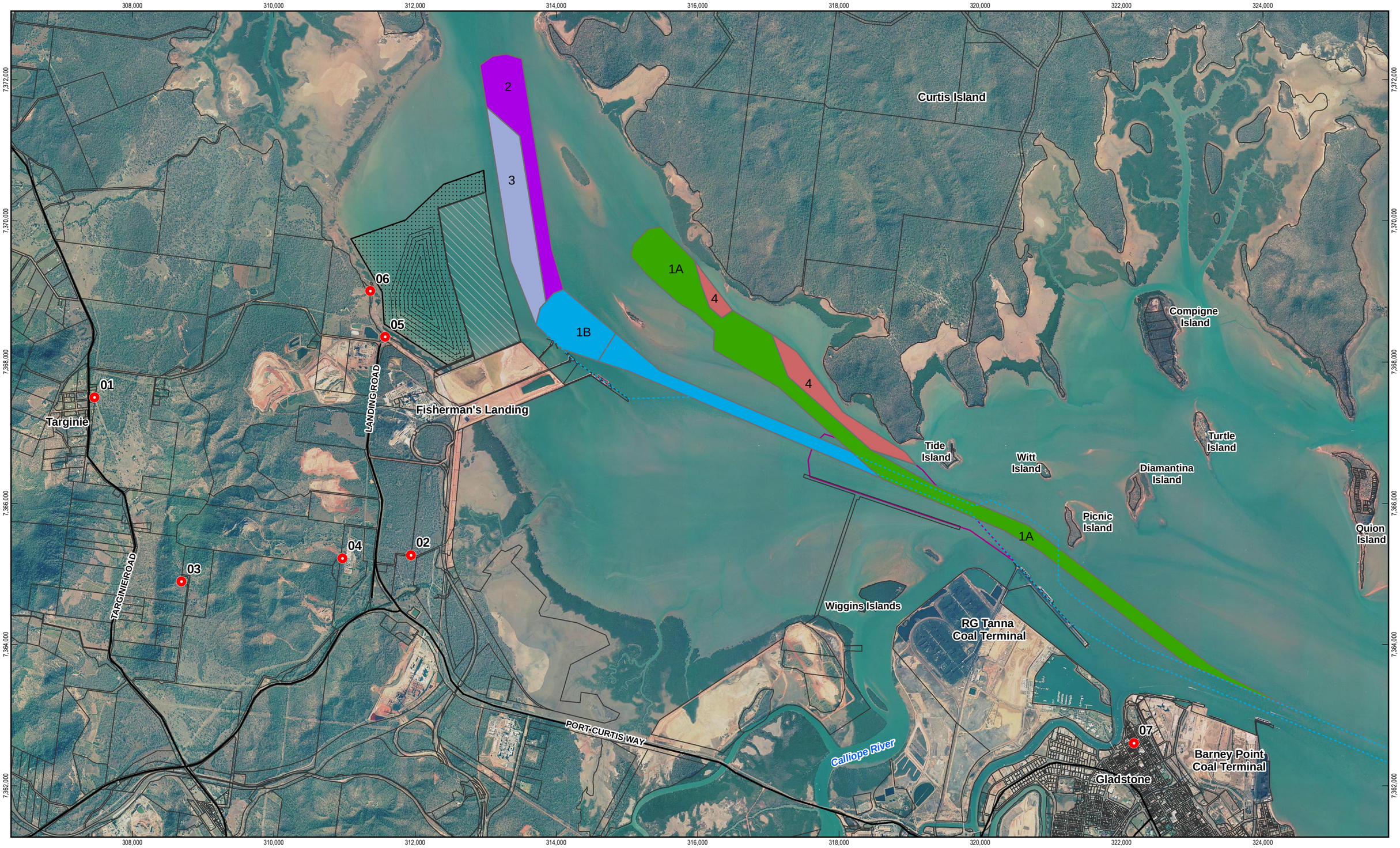
Baseline Noise Monitoring and Review

Noise monitoring has been undertaken in the area for several other noise impact assessments including the Fisherman's Landing Northern Expansion EIS, the Gladstone LNG Project, Gladstone Pacific Nickel EIS and the Wiggins Island Coal Terminal. In addition to this existing information, unattended noise monitoring has been undertaken at two locations around the Project Area to gain a better understanding of the existing ambient noise environment. Attended noise monitoring was also undertaken at seven locations within the Project Area concentrated in the vicinity of the proposed Western Basin Reclamation Area. Further details of the noise monitoring, including the details of the results, can be found in Appendix S. A map of the locations of the noise monitoring is shown in Figure 10-4.

Significant existing noise sources in the area surrounding the Project Area have been identified as the following:

- Rio Tinto Alcan Yarwun;
- RATY operations at the Fisherman's Landing facility;
- Stuart Shale Oil;
- RG Tanna Coal Terminal;
- Barney Point Coal Terminal;
- Port Central;
- Landing Road, Forest Road and Mount Larcom-Gladstone Road; and
- Other dredging activities in the area.

The area surrounding the Project Area has been noted to experience elevated evening and night-time noise levels due to existing industrial noise. This includes rail shunting, existing annual maintenance dredging in the Clinton Channel, industrial noise from Port Central and road traffic noise in the area. Residents are also located within 200 m of road, rail and industrial activities that operate 24 hours a day.



1:50,000 (at A3)

0 0.5 1 1.5 2

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 56

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LEGEND

- Noise Monitoring Location
- Cadastre
- Fisherman's Landing Northern Expansion
- Western Basin Reclamation
- Wiggins Island (Approved)
- Stage 1A - North China Bay LNG Precinct
- Stage 1B - Fisherman's Landing LNG
- Stage 2 - Laird Point LNG
- Stage 3 - Fisherman's Landing
- Stage 4 - Hamilton Point

Port of Gladstone
Western Basin Dredging and Disposal Project

Noise Monitoring Locations and Dredge Scenarios

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Revision A
Date 30 Aug 2009

Figure 10-4

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Level 4 201 Charlotte Street Brisbane QLD 4000 Australia **T** +61 7 3316 3000 **F** +61 7 3316 3333 **E** bnemail@ghd.com **W** www.ghd.com

Noise Goals

In Queensland, construction activities should be in accordance with general building work hours as described under Section 440R – "Building Work" of the QLD *Environmental Protection Act 1994*. Under the regulation, no audible noise is permitted at the following times:

- 6.30 pm to 6.30 am – Monday to Saturday; and
- Sundays and public holidays.

The time restrictions are designed to strike a balance between protecting noise amenity and the need to start construction activities early in the morning.

As reclamation activities for the Project will be undertaken over 12 months and may require works to be undertaken outside normal building work hours, reclamation activities have been compared to planning noise guidelines generally related to fixed industrial premises, commercial premises and mining operations.

Dredging activities will be undertaken in stages, and will not be fixed in any one area. Noise impact from dredging may impact on residents of Witt Island, Tide Island, Compigne Island, Turtle Island, Quion Island and also residents of Gladstone, near Port Central. To assess the potential impact on these receivers, recommended outdoor background noise planning levels have been assumed for receivers on the islands adjacent to proposed dredging locations.

Table 10-4 outlines the project specific noise goals for the identified sensitive receivers. These goals have been set based upon the principle that noise from continuous sources should be no more than 3 dB(A) above the background noise level, as specified in the QLD EPA Planning for Noise Control (PNC) Guideline (EPA 2004). Details of how the project specific noise goals have been calculated are included in Appendix T.

Table 10-4 Project Specific Noise Goals dB(A)

Location	Construction activity	Time Period		
		Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
R01	Reclamation	41	29	23
R02	Reclamation	45	45	47
R03	Reclamation	48	43	38
R04	Dredging	48	43	38
R05	Dredging	48	43	38
R06	Dredging	48	43	38
R07	Dredging	48	43	38
R08	Dredging	48	43	38
R09	Dredging	48	43	38
R10	Dredging	48	43	38

In addition to the noise goals outlined above, the EPP (Noise) 2008 states that for a protected area, or an area identified under a conservation plan under the *Nature Conservation Act 1992* as a critical habitat or an area of major interest, the acoustic quality objectives are 'the level of noise that preserves the amenity of the existing area or place'.

The Great Barrier Reef Coast Marine Park (State) (GBRCMP) is protected by the *Marine Parks Act 2004*, and has been identified as a sensitive receiver for the project (R10). The appropriate noise criteria is specified in the EPP (Noise) 2008 as being 'the level of noise that preserves the amenity of the existing marine park'. The nearest zoned marine park to the proposed site is habitat protection zone of the GBRCMP located to the north between Friend Point and Laird Point, approximately 2.5 km north of the proposed Reclamation Area.

10.3.3 Potential Impacts and Mitigation Measures

Noise Modelling

Acoustic modelling was undertaken using Computer Aided Noise Abatement software (CadnaA) to predict the effects of noise generated by the construction of the Project, based on available data.

Noise sources that have been modelled are from the following activities:

- Construction of the reclamation area, including tip trucks, earthmoving machinery, vibratory rollers and other smaller construction vehicles;
- Dredging activities including the operation of:
  - Large trailing suction hopper dredger;
  - Medium trailing suction hopper dredger;
  - Large cutter suction dredger;
  - Medium cutter suction dredger;
  - Backhoe dredger; and
  - Workboats, survey boats and tug boats.
- Pile driving for the 19 beacons and channel markers to be installed.

For the purpose of completing noise modelling, assumptions have been made regarding the schedule of construction machinery operation. Construction activities to be undertaken in the Reclamation Area have been assumed to be undertaken between the hours of 6.30am and 6.30pm, Monday to Saturday. No construction activities will be undertaken on Sundays or public holidays. It has been assumed that dredging activities will occur seven days a week, 24 hours a day. Worst-case noise modelling was undertaken and modelled sources have been assumed to operate under full load at all times. Further details of the assumptions made for the modelling can be found in Appendix T.

Two dredging scenarios have been modelled, scenario 1A and scenario 2. These scenarios were chosen as they each represent the worst case scenario in terms of noise emissions. Details of these scenarios have been discussed in Chapter 2. The results of noise modelling at each of the sensitive receivers are presented in Table 10-5. Noise levels in bold indicate exceedences of the noise goals defined above in Table 10-4.

Table 10-5 Predicted Noise Levels from Proposed Construction Activities 1.5m above ground dB(A)

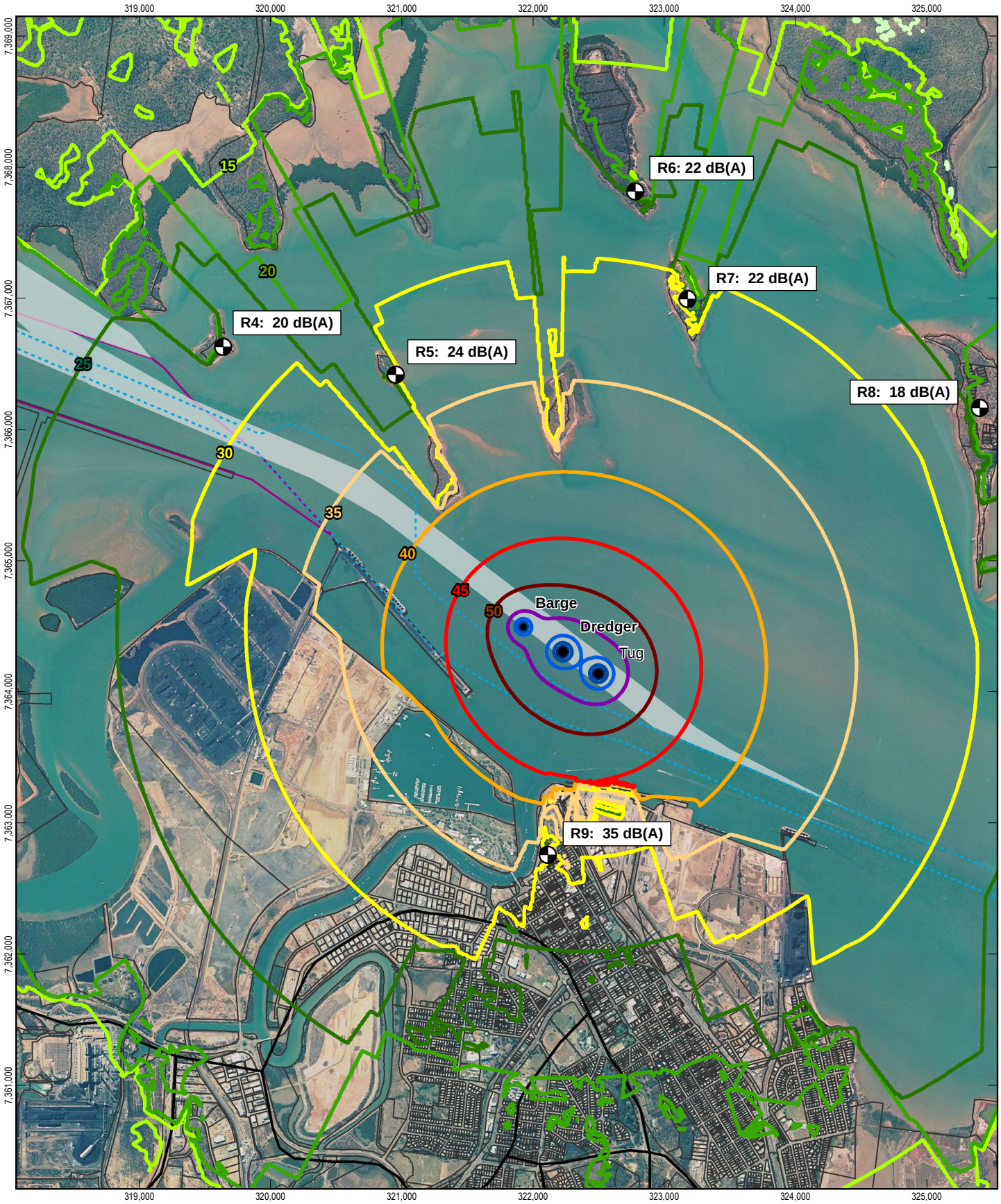
Location	Distance from source	Neutral meteorological conditions Predicted Noise Impact dB(A)	Noise-enhancing meteorological conditions Predicted Noise Impact dB(A)
R01	9000m from Reclamation Area	15	22
R02	8500m from Reclamation Area	18	25
R03	5500m from Reclamation Area	25	31
R04	450m from dredging	**41**	**45**
R05	750m from dredging	34	37
R06	2700m from dredging	23	27
R07	2500m from dredging	22	26
R08	3400m from dredging	18	23
R09	1100m from dredging	35	**39**
R10	600m from dredging	**41**	**45**

Potential Impacts

The results of the modelling show that the predicted noise levels from construction activities are below the ambient and background noise levels and comply with the worst case night time site specific criteria of 45 dB(A) for the receiver on Fisherman's Road and 25 dB(A) for the receivers on Targinie Road.

Noise levels have the potential to exceed the night time construction goal of 38 dB(A) at receivers R04 and R10 during neutral weather conditions and at receivers R4, R9 and R10 by 1 dB during noise enhancing weather conditions.

Figure 10-5 to Figure 10-8 show the predicted noise contours at the identified sensitive receivers for dredging activities (Scenarios 1A and 2) and construction of the Reclamation Area.



LEGEND

- Noise Receptor
- Existing Channels, Swing Basins and Berths
- Proposed Dredging

Sound Pressure Level dB(A)

80, 70, 60, 50, 40, 30, 20, 10

NOTES:
Sound Pressure Level dB(A)
Results based on modelling assumptions
Predicted Noise Contribution Contours: 1.5m
Worst-Case LAeq
Wind/Atmosppheric conditions: Neutral.

1:40,000 (at A4)
0 0.25 0.5 0.75 1
Kilometers
Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

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Port of Gladstone
Western Basin Dredging and Disposal Project

Noise Prediction Contours for Dredging Activities (South-east Section of Scenario 1A)

Job Number 42-15386
Revision A
Date 01 Sept 2009

Figure 10-5

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LEGEND

- Noise Receptor
- Existing Channels, Swing Basins and Berths
- Proposed Dredging

Sound Pressure Level dB(A)

80 70 60 50 40 30 20 10

NOTES:
Sound Pressure Level dB(A)
Results based on modelling assumptions
Predicted Noise Contribution Contours: 1.5m
Worst-Case LAeq
Wind/Atmosppheric conditions: Neutral.

1:60,000 (at A4)
0 0.5 1 1.5 2
Kilometers
Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

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Port of Gladstone
Western Basin Dredging and Disposal Project

Noise Prediction Contours for Dredging Activities (Scenario 1A)

Job Number 42-15386
Revision A
Date 01 Sept 2009

Figure 10-6

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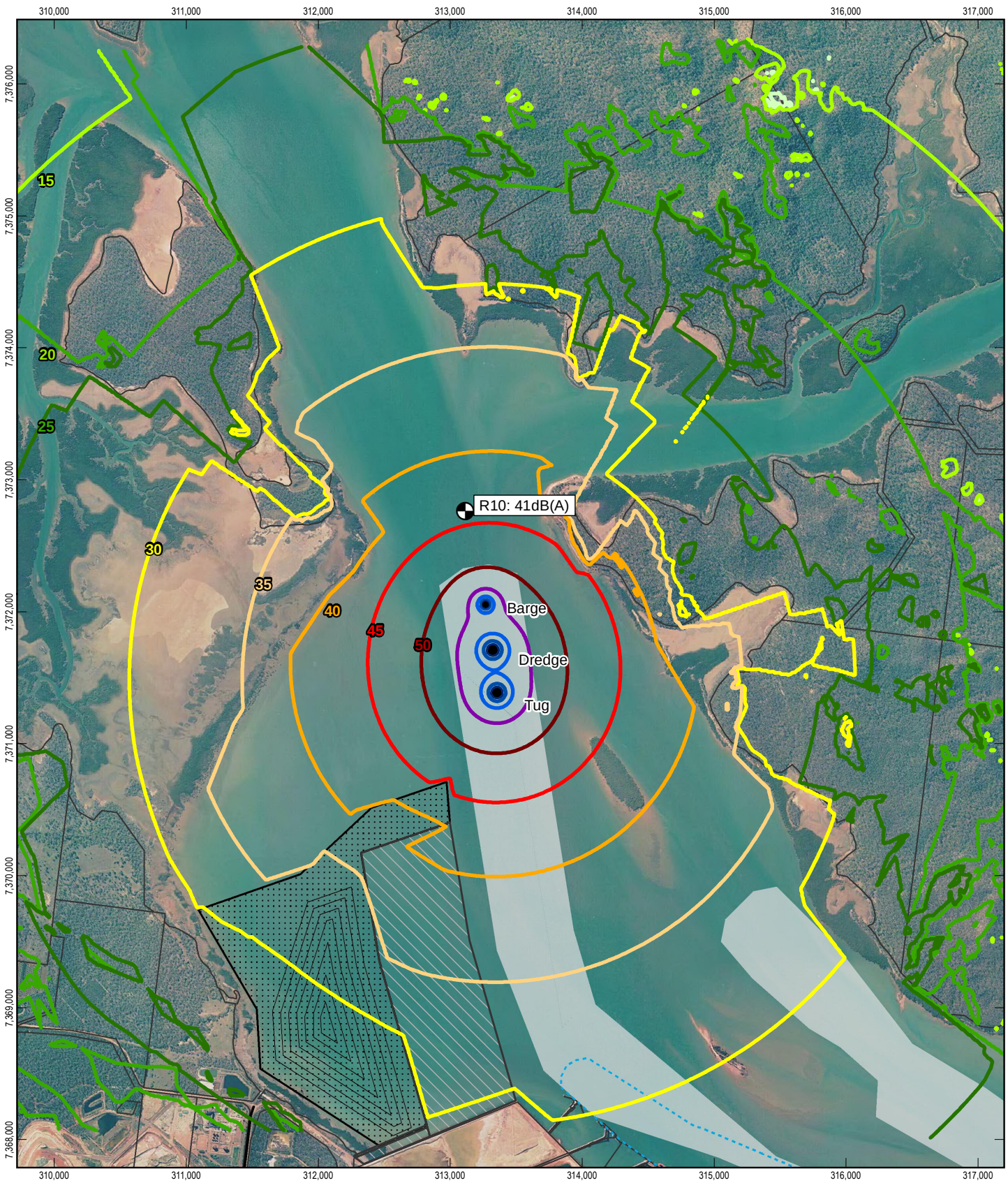

LEGEND

- Noise Receptor
- Existing Channels, Swing Basins and Berths
- Proposed Dredging
- Western Basin Reclamation Area
- Fisherman's Landing Northern Expansion

Sound Pressure Level dB(A)

80	40
70	30
60	20
50	10

NOTES:
Sound Pressure Level dB(A)
Results based on modelling assumptions
Predicted Noise Contribution Contours: 1.5m
Worst-Case LAeq
Wind/Atmosppheric conditions: Neutral.

1:40,000 (at A4)
0 0.25 0.5 0.75 1
Kilometers
Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

N

Port of Gladstone
Western Basin Dredging and Disposal Project

Noise Prediction Contours for Dredging Activities (Scenario 2)

Job Number	42-15386
Revision	A
Date	01 Sept 2009

Figure 10-7

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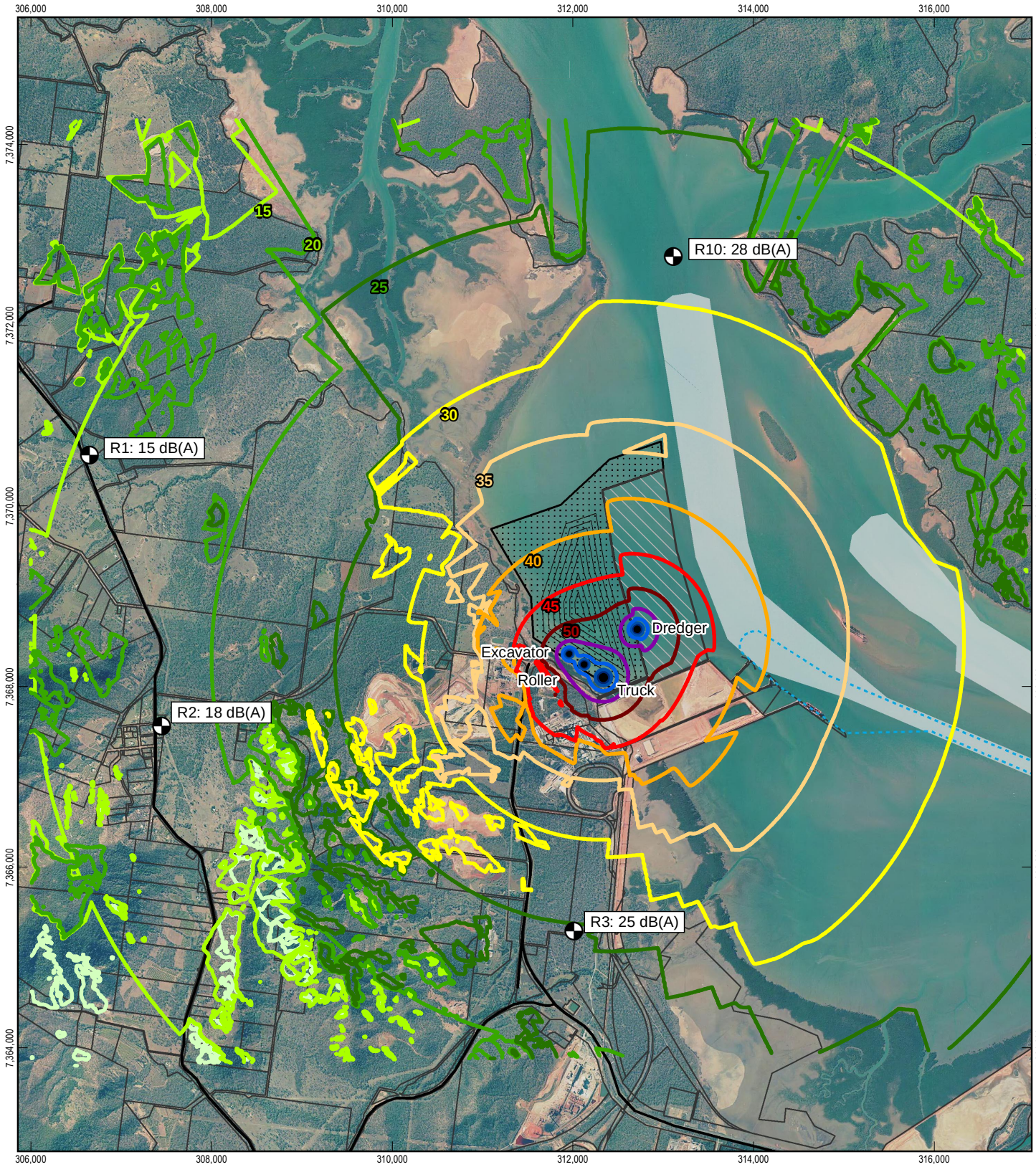

LEGEND

- Noise Receptor
- Existing Channels, Swing Basins and Berths
- Proposed Dredging
- Western Basin Reclamation Area
- Fisherman's Landing Northern Expansion

Sound Pressure Level dB(A)

80 70 60 50 40 30 20 10

NOTES:
Sound Pressure Level dB(A)
Results based on modelling assumptions
Predicted Noise Contribution Contours: 1.5m
Worst-Case LAeq
Wind/Atmosppheric conditions: Neutral.

1:60,000 (at A4)
0 0.5 1 1.5 2
Kilometers
Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

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Port of Gladstone
Western Basin Dredging and Disposal Project

Noise Prediction Contours for Worst-Case Reclamation Activities

Job Number 42-15386
Revision A
Date 01 Sept 2009

Figure 10-8

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The results of the assessment suggest that construction activities associated with the Project will not significantly impact on:

- The health and biodiversity of ecosystems;
- Human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to sleep, study and be involved in recreation, including relaxation and conversation; and
- The amenity of the community.

Noise from dredging activities has the potential to exceed the project noise goals by 3 dB during the night time period at one receiver (R04 – Tide Island) during neutral weather conditions and receivers R04, R09 and R10 by 1 dB during noise enhancing weather conditions. Any exceedence of noise goals is likely to be temporary as the dredging vessels will be constantly moving, therefore the location of the noise source will not be in any one location for an extended period of time.

Modelling suggest that noise levels experienced on nearby tidal flats will range from 40 – 55 dB(A) during assumed dredging activities. These levels are similar to noise levels experienced adjacent to other sites within the GSDA and comparable to noise levels in natural environments during windy conditions.

Underwater Noise

Airborne noise transmission from construction of the Reclamation Area into the surrounding waters is likely to be insignificant when compared to natural underwater noise in the area. Only construction activities being undertaken on, or directly adjacent to the water, will likely transmit airborne sound into the water. However, it is unlikely that airborne transmission of construction noise will contribute significantly to the level of underwater sound.

Activities that may create underwater noise include dredging activities, placement of rock for the bund wall and pile driving. Potential effects of the elevated background noise levels caused by this introduced man-made noise on marine megafauna include:

- Limiting the detection of natural sounds;
- Disturbing normal behaviour resulting in possible displacement from areas; and
- Causing temporary or permanent reductions in hearing sensitivity.

These potential effects depend to a degree on the species of marine mammal involved. The potential area or zone of influence of a man-made sound is also influenced strongly by the levels and types of ambient noise (Richardson *et al*. 1995).

The construction of the marine structures for the Project will result in increased occurrence of underwater noise. The potential impacts of underwater noise on marine animals have been discussed in Chapter 9. It has been concluded that the underwater noise predicted to be generation by construction activities for the Project will have a low impact on marine animals.

Mitigation Measures

Noise from project construction activities is not likely to have a significant impact on the local environment. However, to further minimise noise emissions, the following management and mitigation measures will be implemented:

- All combustion engine plant, such as generators and compressors, will be checked to ensure they produce minimal noise;

- Where practical, all vehicular movements to and from the dredging site will be made only during normal working hours;
- Where practical, machines will be operated at low speed or power and be switched off when not being used rather than left idling for prolonged periods;
- Activities that cause excessive noise (such as pile driving) will be limited to business days or Saturdays between 6:30 am and 6:30 pm;
- Pile driving will, where possible, be undertaken during a low tide;
- A soft-start procedure between long breaks in activity, where the piling energy is gradually increased over a 5-10 minute time period will be implemented. This will alert marine animals to the presence of the piling activities and enable animals to move to a distance where the likelihood of injury is reduced;
- Machines found to produce excessive noise compared to industry best practice will be removed from the site or stood down until repairs or modifications can be made;
- Community consultation will be undertaken at the sensitive receivers prior to works;
- Where possible, dredging in areas close to sensitive receivers will be avoided during the night time period; and
- Vehicles, dredgers and tugs will be kept properly serviced and fitted with appropriate mufflers.

10.4 Vibration

10.4.1 Method of Assessment

The impact of vibrations from the construction activities related to the Project was assessed in conjunction with the noise impacts, using a similar methodology. The following tasks were completed:

- Identification of sensitive receivers;
- Identification of any current activities near the Project area which may contribute to the background level of ground vibration;
- Undertake a desktop review of sources of vibration for the construction activities to be undertaken for the Project; and
- Investigation of the potential vibration impacts on the sensitive receivers.

Further details on the assessment of vibrations can be found in Appendix T.

10.4.2 Description of Environmental Values

In the absence of a specific Queensland guideline addressing vibration issues, consideration was given to the following publications for the determination of monitoring sites and appropriate measurement parameters:

- 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 (1 Hz to 80 Hz); and

- British Standard BS7385-2:1993 Evaluation and Measurement for Vibration in Buildings, Part 2 - Guide to damage levels from ground borne vibration.

The above standards are typically adopted by industry in Australia for the assessment of construction and operational vibration impacts.

The nature and levels of vibration emitted will vary with the activities being carried out on site. Figure 10-9 illustrates the different patterns of vibration from different types of construction machinery. The acceptable level of vibrations depends on the nature of the vibration (continuous or impulsive), the time of day, and the activity taking place. Vibrations from construction activities can potentially impact on human comfort and buildings or structures.

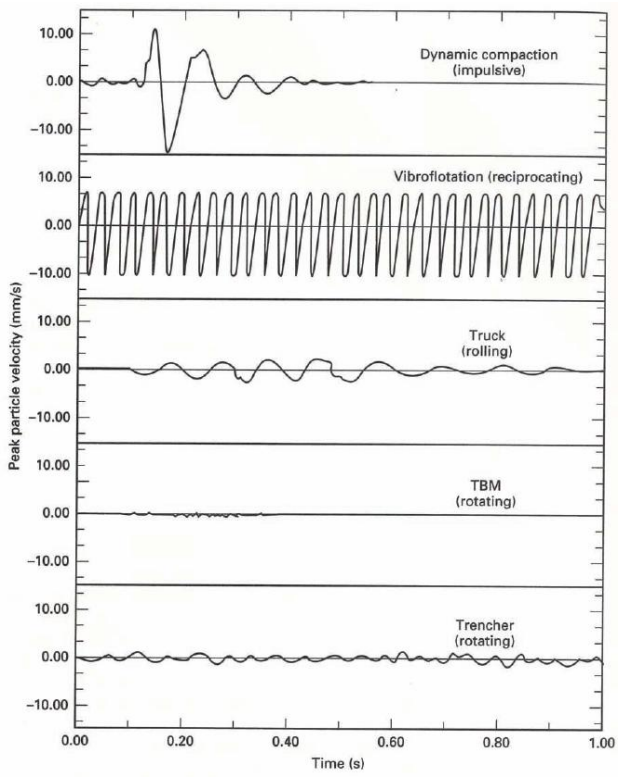

Figure 10-9 Typical Waveforms Associated with Various Construction Activities (Source: Dowding 1996)

The sensitive receivers for vibration are the same as those identified in the noise assessment, outlined in Section 10.3.2.

10.4.3 Potential Impacts and Mitigation Measures

It is possible that the sensitive receivers will observe vibrations from construction activities at times, however the level of annoyance will depend on individuals. The nearest sensitive receivers for the Project are located further than 500m from construction activities.

As can be seen in Figure 10-10, the building damage 7.5 mm/s lower limit is normally not exceeded by general construction activities at distances greater than 20-30 metres from the nearest sensitive receivers.

In the context of the Project, the nearest sensitive receivers will be located further than 500m of the construction activities, and as such, no appreciable impact is expected.

As there is a very low likelihood that there will be any impacts from vibrations generated by construction activities, no mitigation measures are required to manage impacts.

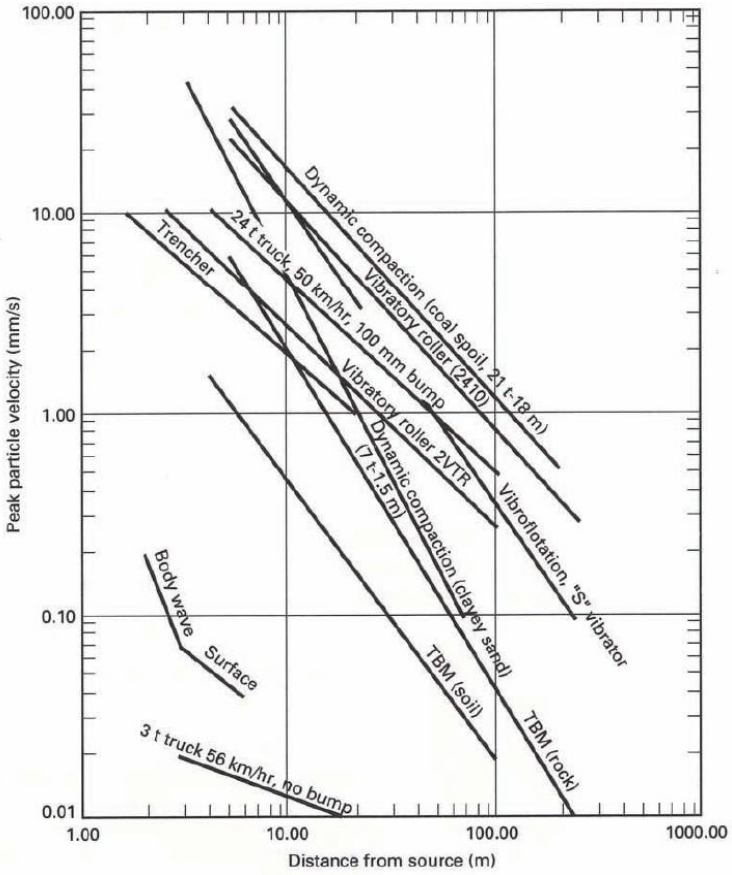

Figure 10-10 Typical Vibration Levels of Common Construction Activities (Source: Dowding 1996)