Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project

Coordinator-General's evaluation report on the environmental impact statement

July 2020

COORDINATOR-GENERAL

Queensland Government

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Synopsis

This report provides my evaluation, as Coordinator-General, of Gladstone Ports Corporation Limited's environmental impact statement on the Port of Gladstone Gatcombe and Golding Cutting Channel Duplication project.

My evaluation concludes that the project can proceed, subject to the over 250 stringent conditions and 20 recommendations in this report to manage the project's environmental impacts. These conditions and recommendations support the extensive mitigation measures and commitments described by the proponent in its environmental impact statement.

Construction of the first stage of the project could commence as early as 2023, however I recognise that this depends on future trade needs, safety and efficiency requirements, the commercial and financial support needed to underwrite the delivery, and following completion and approval of a detailed business case through Building Queensland. The proponent estimates capital expenditure would be at least $760 million with 386 full time equivalent jobs during construction and 23 full time equivalent jobs during operations.

The Port of Gladstone is owned by the State of Queensland and is Queensland's largest multi-commodity port and the world's fourth largest coal export terminal, with a total annual throughput of approximately 124 million tonnes in 2018-19. Commodities include coal, liquefied natural gas, bauxite, alumina, cement, petroleum, ammonia and grain, with the potential for future hydrogen production and export facilities.

The project would duplicate the existing Port access channels by dredging 12.6 million cubic metres of seabed material to reach a depth of approximately 16.1 metres, a width of 200 metres and a length of approximately 15 kilometres. Consistent with the Queensland's Governments commitments to protect the Great Barrier Reef, all the capital dredging material would be beneficially reused to create reclamation areas for potential future port infrastructure, including wharves to support increased port throughput.

Currently, large vessels which have a deep draft, including capesize ships that import and export commodities from Queensland and LNG tankers, can safely use the channels during higher tides only. The project would allow two-way passage of these larger vessels in all weather and tides, improving the efficiency and safety of the Port of Gladstone and reducing ship queuing outside the Port within the Great Barrier Reef World Heritage Area.

The Port of Gladstone is a key gateway for Queensland's bulk export products. The proponent estimates that without the project there may be potential lost opportunities to increase Queensland's imports and exports and generate higher economic returns for the State. The Port's throughput is limited by its 150 million tonne annual capacity.

I have set extensive conditions in this report to manage the project's environmental impacts. Conditions include strict water quality release limits, an extensive water quality monitoring program and contaminant trigger investigation levels to ensure corrective actions are implemented if necessary. The conditions ensure that the bund walls for the reclamation areas are constructed in accordance with industry best practice, with the integrity and performance of the walls monitored during and following placement of the dredged material to ensure their performance.

I have set conditions to specify maximum disturbance limits on habitat for marine animals of state significance, including marine turtles, dugongs, inshore dolphins and shorebirds and I have required that an offset strategy be finalised before the project can commence. The conditions I have set also require a

range of measures to be implemented to minimise disturbances to marine animals from noise and vibration, lighting and interaction with dredge vessels. Minimal impacts are predicted at residences, with the closest residence approximately one kilometre from dredging activities and the majority more than five kilometres away from dredging and construction activities.

Matters of national environmental significance for the project are being assessed separately by the Commonwealth Department of Agriculture, Water and the Environment under the *Environment Protection and Biodiversity Conservation Act 1999*.

My report concludes that there are significant benefits for Queensland to be derived from the project, and that adverse environmental impacts can be adequately avoided, minimised, mitigated and/or offset as required through the conditions I have set and the recommendations I have made in this report.

Accordingly, I recommend that the project proceed.

This report will lapse six years following the publication date of this report, unless I set another date at a future time that extends the report.

A copy of this report will be provided to the proponent and relevant state government agencies, and will also be made publicly available at **www.dsdmip.qld.gov.au/gladstonechannel**

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Toni Power
Coordinator-General

6 July 2020

Report Summary

This report evaluates the environmental impact statement (EIS), prepared by the Gladstone Ports Corporation Limited, for the Port of Gladstone Gatcombe and Golding Cutting Channel Duplication project (the project). This evaluation has been prepared pursuant to section 34D of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act).

This report evaluates matters relevant for State and local government consideration. Separately, the Commonwealth Department of Agriculture, Water and the Environment (DAWE) will assess the matters of national environmental significance (MNES) and decide on the project under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act).

In undertaking my evaluation, I have considered the draft EIS, revised draft EIS, issues raised in submissions during the public consultation periods, supplementary information and advice I have received from relevant state and local government agencies.

This report summary starts with a description of the project and an explanation of its economic benefits. The main two parts of the remainder of this report summary reflect the structure of the report and the two main components of the project:

- capital dredging works and dredge material transfer
- placement of dredge material and reclamation works.

Evaluation topics within the two main parts of this report summary include marine water quality, matters of state environmental significance, transport, noise, vibration, air quality and greenhouse gases. Several matters are also evaluated from a whole of project perspective for cultural heritage and social matters.

Project description

Gladstone Ports Corporation Limited, a Queensland Government-owned corporation, proposes to duplicate the existing Gatcombe and Golding Cutting shipping channels in the Port of Gladstone (the Port). The Port is Queensland's largest multi-commodity port and the world's fourth largest coal export terminal, with a total annual throughput of 124 million tonnes in 2018-19.

The project would provide for two-way passage of large ships that import and export commodities to Queensland, including capesize vessels and liquified natural gas (LNG) tankers, through the outer harbour in all weather and tides, improving the efficiency and safety of the Port and reducing ship queuing outside the Port within the Great Barrier Reef World Heritage Area. The project would support the projected medium to long-term growth in industry, trade and export from the Gladstone region.

Capital dredging of 12.6 million cubic metres (Mm^3) of sedimentary seabed would be undertaken to deepen and widen the existing Gatcombe and Golding Cutting shipping channels to a final design depth of approximately 16.1 metres (m) below lowest astronomical tide (LAT) and a width of 200 m. The duplicated channels would have a combined length of approximately 15 kilometres (km) comprising the approximately 6 km long duplicated Gatcombe Channel and the approximately 9 km duplicated Golding Cutting Channel.

Dredged material from the duplicated channels would be transported by barge approximately 20 km from the northern end of the Gatcombe Channel to a new barge unloading facility (BUF).

The BUF would be constructed adjacent to the existing Western Basin (WB) reclamation area, north of Fisherman's Landing. Capital dredging of 0.25 Mm^3 would also be required to enable barge access to the BUF along a 2.3 km barge access channel.

The dredged material is proposed to be beneficially reused by placing it within three reclamation areas. A small amount of material would be placed within a 11 hectare area of the existing WB reclamation area, with most material to be placed within two new Western Basin Expansion (WBE) reclamation areas (northern and southern). These two new reclamation areas would total 276 hectares, which could be used for future port infrastructure, including wharves to support increased port throughput.

The new WBE reclamation areas are proposed to be located immediately adjacent to and to the north of the existing WB reclamation area. The design and construction of the bund walls for the new WBE reclamation areas would respond to the findings and recommendations of the Independent Review of the Bund Wall at the Port of Gladstone (2014).

Economic benefits

The project provides for future growth and better safety and efficiency for larger vessels at Queensland's largest multi-commodity port, the benefits extending to trade throughout Queensland, supporting Queensland's future economic growth. The proponent has indicated that construction of the first stage of the project could commence as early as 2023, however I recognise that this depends on future trade needs, safety and efficiency requirements, the commercial and financial support needed to underwrite the delivery, and following completion and approval of a detailed business case through Building Queensland.

The Port of Gladstone has national significance as it is one of the few naturally sheltered deep water ports on the east coast of Australia, is internationally recognised as a major bulk commodity port and is critical to the State's economy. The Port's major function is to facilitate the export of Queensland resources and finished products from major industry established in the Gladstone State Development Area and Gladstone region, and the import of raw material for manufacturing and general cargo.

The Port handles more than 30 different products and exports to more than 30 different countries around the world. Key exports include coal, alumina and aluminium, cement, LNG, petroleum, chemicals and grain. Major local industries in the adjacent Gladstone State Development Area (GSDA) which are supported by the Port include three LNG plants, two alumina refineries and an alumina smelter, and cement and chemical (caustic soda) manufacturing plants. The GSDA and Port is also being investigated as potential location for future production and export of hydrogen.

Currently, large vessels which have a deep draft, including capesize ships that import and export commodities from Queensland and LNG tankers, can safely use the channels during higher tides. The project would allow two-way passage of these larger vessels in all weather and tides, improving the efficiency and safety of the Port and reducing ship queuing outside the Port within the Great Barrier Reef World Heritage Area.

The proponent has forecast that Port throughput is expected to increase by 6.25 per cent by 2030-31 under a low-growth scenario, and up to a 34.4 per cent increase by 2030-31 under a moderate to high growth scenario. The proponent estimates that without the project there may be potential lost opportunities to increase Queensland's exports and imports and generate higher economic returns for the State if the Port's throughput is limited by its 150 million tonne annual capacity.

Once fully delivered the project would mean fewer ships being delayed at anchor waiting to enter the Port and at berths waiting to exit, increasing the efficiency of shipping movements and reducing costs to the proponent. The proponent estimates that if trade continues to increase, the project could save between $9 million and $42 million annually in efficiencies, with the potential to reduce the average delays at the Port over time by between 60 to 80 per cent.

The new WBE reclamation areas created by placement of dredge material, would create approximately 276 ha of land which is expected to become productive port land in the future (subject to future assessment and approvals).

The proponent estimates that the project would require capital expenditure of at least $760 million and would create of 386 full time equivalent jobs during construction and 23 jobs during operations. Opportunities would be maximised for local employment and supply of goods and services during construction, dredging and operation.

Capital dredging works and dredge material transfer

Capital dredging of up to 12.6 Mm^3 of sedimentary seabed material is proposed within the Port's limits to duplicate the existing shipping channels. The total footprint of the duplicated channels would be approximately 382 ha, however the total area requiring dredging is only 247.8 ha. This is because approximately 134 ha of the shipping channels are already at the maximum required depth of 16.1 m below lowest astronomical tide. No dredging is proposed in the Commonwealth-controlled Great Barrier Reef Marine Park nor the state-controlled Great Barrier Reef Coast Marine Park.

Dredging in the main channel is proposed to be undertaken by a trailing suction hopper dredger (TSHD) which uses suction to extract material. The dredged material from the TSHD would be transported to the BUF via a series of four barges, working in cycles for the entire dredging campaign.

Two dredging campaign options, a staged approach or a single dredging campaign, were assessed in the EIS. For the staged campaign, stage 1 dredging could potentially commence in 2023 (or later) for a period of 33 weeks to reach a channel depth of 13.5 m below LAT, and the subsequent stage 2 dredging could potentially commence in 2026 (or later) for 25 weeks to reach the final design channel depth of 16.1 m below LAT. A single dredging campaign would take 58 weeks.

Dredging in the barge access channel is proposed to be undertaken by either a cutter suction dredger or TSHD and material is likely to be pumped from the dredger directly in the existing WB reclamation area. The exact type of dredger to be used is still to be confirmed.

The project also includes the removal, relocation and installation of new navigational aids for the duplicated channels.

Marine and coastal environment

Marine water quality is an important environmental asset in the Port of Gladstone due to the presence of ecological receptors within and surrounding the Port. Ecological receptors relevant at the Port include plants and animals, particularly seagrasses and corals, which are sensitive to altered water quality conditions.

The Port of Gladstone is considered a naturally turbid, deep-water port, located within a relatively sheltered environment due to the protection provided by Facing Island and Curtis Island from the rougher offshore conditions. The inner Port berths and existing WB reclamation area are exposed to locally generated waves and swells, while the Port's outer harbour and offshore areas are more exposed to larger waves and sea swells. Tidal forces and currents are the main drivers behind the movement of sediments from the seabed within the Port. Sediment collects within the existing channels of the Port, necessitating the requirement for annual maintenance dredging to maintain the required depths of the channels to allow ships to enter and exit safely.

The EIS assessed the potential marine water quality and coastal process impacts associated with dredging. These potential impacts primarily relate to reduced water quality impacting on sensitive

ecological receptors such as seagrass and coral by reducing light available for biological processes and the increasing sediment deposition.

I have stated conditions to require the proponent establish a Dredge Technical Reference Panel (DTRP) to provide recommendations and scientific advice for water quality management and oversee the development and implementation of the dredge management plan (DMP) for the duration of the project. The conditions set out the role and minimum membership requirements of the DTRP to include independent experts in seagrass and marine fauna, coastal hydrodynamics and sediment transport, and water quality. The DTRP will also ensure that appropriate water quality trigger levels to protect the values of the receiving environment are included in the application for an Environmental Authority (EA).

I have also stated conditions for the EA outlining the requirements of the project's DMP, which is to be provided to the Department of Environment and Science (DES) for review prior to the commencement of dredging. The requirements I have set for the DMP provide a dredging focussed environmental management plan to protect sensitive ecological receptors for the entirety of the dredging program. It will include a description of a sediment plume-associated monitoring program, to identify the locations for ongoing water quality monitoring, the water quality trigger values and alert values to be monitored and a description of the sampling methods and frequency.

The DMP that I have conditioned will also set out management actions to be initiated if the water quality trigger or alert values are exceeded, including the requirement to cease dredging where underwater light levels and/or turbidity do not meet the specific criteria. This will ensure that any changes in water quality due to sediment plumes from dredging are identified and managed to protect sensitive environmental receptors.

To address the potential impacts associated with tailwater releases during dredging, I have stated a condition for the EA requiring the preparation and implementation of a receiving environment monitoring program. This program will require the proponent to monitor, identify, describe and respond to any adverse impacts to surface water quality, water flows, aquatic flora and fauna, corals and any receiving waters associated with capital dredging. The receiving environment monitoring program that I have conditioned will need to be in place prior to the commencement of dredging and for the duration of dredging activities.

To ensure the risk of potential acidification of dredged sediment containing potential acid sulfate soils is adequately monitored and managed during dredging, I have stated a condition for the EA requiring the preparation of an Acid Sulfate Soil Management Plan. This will ensure that any potential acid sulfate soil that is encountered during dredging is identified and managed to prevent impacts to sensitive ecological receptors.

I consider that the maintenance dredging requirements during operation of the duplicated channels are unavoidable and necessary for the ongoing and efficient operation of the Port. The project's impacts on sediment deposition within the shipping channels will primarily be managed through an amendment to an existing EA for maintenance dredging. I note that the potential impacts associated with the increased maintenance dredging associated with the project do not exceed what is authorised under the existing statutory approvals for maintenance dredging held by the proponent.

Detailed evaluation of this topic can be found in section 5.2 and 5.3 of this report.

Matters of state environmental significance

Matters of state environmental significance (MSES) are environmental values that are protected under Queensland legislation. The MSES potentially impacted by dredging works include marine plants, protected wildlife habitat and wetlands.

The Port area supports significant coastal and marine ecosystems, including around 4,000 ha of seagrass, 26,000 ha of macroalgae, 22,000 ha of marine wetlands (mangroves, saltmarsh communities and tidal mudflats) and 952 ha of coral reefs. These ecosystems provide high value habitat for a range of coastal and marine fauna including marine mammals (dolphins, whales and dugong), marine turtles and shorebirds as well and many commercially, culturally and recreationally important fish species. These areas of habitat and many of the fauna which rely on these habitats are protected as MSES.

As the Port operates within the boundaries of the Great Barrier Reef World Heritage Area these areas of marine and coastal habitat and fauna are also MNES under the EPBC Act. Values which are MNES will be assessed as part of a separate, parallel EIS process by the Commonwealth Minister for the Environment under the EPBC Act. I anticipate that the Minister will require conditions to manage, mitigate and offset impacts to MNES.

As many of the MSES being assessed by the State are also MNES, any conditions proposed by the Commonwealth would also be relevant to any overlapping MSES values. DAWE was consulted throughout the EIS process in consideration of overlaps between MSES and MNES to ensure a complementary degree of assessment and evaluation. As a result, conditions stated to address MSES impacts complement, and do not conflict with or duplicate anticipated Commonwealth condition requirements for overlapping MNES, particularly with regard to environmental offsets.

Detailed evaluation of this topic can be found in section 5.4 of this report.

Marine plants and protected wildlife habitat

Dredging works in the main channel are expected to have a direct, permanent impact on up to 85.33 ha of marine plants (including up to 35.65 ha of seagrass and up to 49.68 ha of macroalgae) associated with the removal of sedimentary seabed material. This area of marine plants also provides potential foraging habitat for the Australian humpback dolphin, dugong (seagrass only) and marine turtles. Dredging works in the main and barge access channels are also expected to result in the permanent loss of other types of foraging habitat for the Australian humpback dolphin and marine turtles.

I consider the permanent loss of marine plants and other types of foraging habitat for Australian humpback dolphin, dugong and marine turtles is a significant residual impact. I have stated conditions to require offsets to compensate for the loss.

While water quality impacts can be adequately managed to ensure no long-term adverse impacts, dredging works in the main channel may have an indirect, short-term impact on up to 1,664.03 ha of marine plants as result of changes to marine water quality. In the long-term these marine plants may return to their pre-disturbance condition after capital dredging ceases.

While the loss of marine plants from this area may only be temporary (up to two years), its value as foraging habitat for the dugong, Australian humpback dolphin and marine turtles would be lost until the marine plants have recovered. I consider the loss of foraging habitat over this time period could be a significant residual impact for these species of fauna and I have stated conditions to require offsets to compensate for the loss.

Due to the transient nature of seagrass I have conditioned the requirement for the proponent to conduct monitoring after dredging to confirm whether marine plants return to the pre-disturbance condition within five years. I note that the results of any further survey work and monitoring would inform the project's final significant residual impact and offset obligations.

I have stated conditions to be attached to the EA requiring that the proponent provide an offset for any MSES which the project is confirmed to have a significant residual impact. The final offset strategy must include measures that appropriately compensate for any significant residual impact for MSES.

As the dugong, Australian humpback dolphin and marine turtles are also listed as MNES, the project's impacts and offset obligations for these matters will also be considered and addressed in the Commonwealth's assessment under the EPBC Act. To ensure best environmental outcomes for affected MSES, a complementary degree of assessment, prevention and offset has been applied to the evaluation and conditions set in this report. I consider my stated conditions for MSES would complement requirements in anticipated future conditions in the Commonwealth's separate, parallel assessment of MNES.

Wetlands

No wetlands of high ecological significance are expected to be directly impacted by capital dredging works and there are no intertidal vegetation communities within 500 m of the direct impact area. There are also no wetlands of high ecological significance mapped within the barge access channel dredging footprint.

There are wetlands of high ecological significance along the shorelines of Facing Island, South Trees Island and on Curtis Island near the barge access channel. I am satisfied that the EIS demonstrated that these wetlands are not expected to be adversely impacted by dredging works as changes to sediment deposition and hydrodynamics are expected to be negligible in these areas.

The conditions that I have stated for the EA to manage impacts on seagrass, including water quality limits, would also manage impacts on wetlands of high ecological significance.

Noise and Vibration

As a major industrial Port, the existing noise environment includes noise associated with shipping operations, handling commodities and industry construction and operational activities. The EIS identified the residential communities of Gladstone City, Boyne Island, Tannum Sands and Facing Island within 6 km of the project areas as sensitive receptors for the purpose of the noise impact assessment.

Modelling in the EIS indicated that noise levels at residential receptors would be below existing ambient daytime noise levels during dredging works. However, impact pile driving associated with navigational aid works could result in exceedances of existing daytime ambient noise levels at the closest residential receptors located on Facing Island, within 1 km of project activities. These potential exceedances of background noise levels would be short lived, and the proponent has committed to implement mitigation measures, such as the installation of piling cushions, to reduce and control noise during each impact event.

Night-time construction noise levels at residential receptors would comply with the Environmental Protection Policy (Noise) 2019 and would be below existing night-time background noise levels. However, where multiple items of equipment (TSHD and pushbuster) are operating simultaneously in close proximity to residential receptors (approximately 1 km away), exceedances of noise criteria have the potential to occur. I note this situation was assessed as a 'worst case scenario' in the EIS and would rarely occur.

I have set conditions to require that the proponent monitor noise from project activities when requested, and to not cause environmental nuisance to any sensitive residential or commercial place. The proponent has committed to manage noise generated from the project in accordance with a noise and vibration management plan to avoid noise exceedances.

The proponent has committed to proactively notify residences within 1 km of planned dredging activities prior to the activities commencing. I have also imposed a condition requiring the proponent respond to any complaints or feedback received from residential receptors and put in place measures to rectify

issues. I have included conditions in this report requiring the proponent to publish online a report that confirms how any complaints received about the project are managed and resolved.

Vibrations levels are predicted to be below vibration trigger levels for the duration of dredging works, with no human comfort impacts predicted.

Detailed evaluation of this topic can be found in section 5.6 of this report.

Air quality and greenhouse gases

The air quality assessment in the EIS identified the main potential air quality impacts would be dust from the movement of dredge material. The EIS concluded that the potential impacts of dredging activities would be below the Environment Protection Policy (Air) (EPP (Air)) quality objectives as all dredged material will be kept wet for transport. Ground level concentrations at all receptor locations, the closest being residential receptors on Facing Island approximately 1 km from dredging activities, are predicted to be below EPP (Air) quality objectives.

To ensure EPP (Air) quality objectives are achieved, I have set conditions on the EA requiring the proponent to monitor air quality from project activities when requested, and to not cause environmental nuisance to any sensitive residential or commercial place.

The greenhouse gas assessment in the EIS found that the majority of project emissions are associated with dredging and the transport by barge of dredge material to the WBE reclamation areas. The EIS included the proponent's commitments to minimise greenhouse gas emissions by using bio-diesel, connecting to mains power whilst docked instead of using fuel, increasing fuel efficiency by maximising payloads and reducing vessel operation idle times. I support these commitments.

Detailed evaluation of this topic can be found in section 5.7 of this report.

Placement of dredge material and reclamation works

The project includes two new WBE reclamation areas (northern and southern) to contain the capital dredged material from the channel duplication works. The project also includes the placement of the capital dredged material from the new 2.3 km barge access channel to the BUF adjoining the existing WB reclamation area. Dredge material would be unloaded from barges at the BUF using large excavators and loaded into trucks for transport to the placement sites within the reclamation areas.

The new WBE reclamation areas and the BUF must be constructed and ready to receive the dredge material prior to commencement of capital dredging for the channel duplication works. The bund walls for the new WBE reclamation areas would be constructed in accordance with industry best practice using hard rock from the existing Ticor quarry within the neighbouring Gladstone State Development Area.

The proposed reuse of the dredged material to reclaim land for future port growth is consistent with Queensland's *Sustainable Ports Development Act 2015* and the Reef 2050 Long-Term Sustainability Plan. The project proposal has been redesigned several times during the EIS process to ensure no off-shore disposal of the capital dredging material in the Great Barrier Reef World Heritage Area and to ensure the methodology for dredging and dredge material placement is consistent with the *Sustainable Ports Development Act 2015*.

Marine and coastal environment

As discussed previously, protecting marine water quality within the naturally turbid, sheltered, deep water Port is important to protect ecological values. Changes to water quality and the coastal environment may impact on seagrass, corals and other marine animals and plants. Tidal forces and currents are the main drivers behind the natural movement of sediments from the seabed within the Port.

The EIS assessed the potential marine water quality and coastal process impacts associated with the placement of dredge material and reclamation works and found that the key water quality impacts are from tailwater releases from the WBE reclamation areas during the placement of dredge material.

I have stated conditions to require the WBE reclamation bund walls be constructed in accordance with industry best practice. The proponent has committed to incorporating and responding to the findings and recommendations of the Independent Review of the Bund Wall at the Port of Gladstone (2014) in detailed design of the bund walls. I have stated conditions for the EA requiring water quality monitoring to be undertaken near the bund walls for the WBE reclamation areas, to confirm that they are effectively containing the dredge material and not impacting on marine water quality.

I have set conditions on the EA to ensure that sediment to be placed in the WBE reclamation areas is be tested prior to placement, with any sources of contamination, including acid sulfate soils, managed and controlled prior to any tailwater releases. I have stated a condition on the EA requiring the preparation of an Acid Sulfate Soil Management Plan for all potential acid sulfate soil that may be directly or indirectly disturbed by project activities. This will ensure that any potential acid sulfate soil is identified and managed to prevent impacts to sensitive ecological receptors.

The conditions I have stated for the EA require tailwater from licensed discharge points on the WBE reclamation areas to meet mandatory water quality requirements prior to release. To ensure that tailwaters are tested prior to release, the EA conditions I have set define water quality limits to be achieved prior to any release of tailwater from the WBE reclamation areas. Achievement of water quality limits for tailwater releases will ensure that environmental values are protected.

Tailwater releases from the WBE reclamation areas will be monitored in accordance with the project's receiving environment monitoring program. I have stated a condition for the project's EA identifying requirements for the program; specifically, that it will monitor, identify, describe and adaptively manage any adverse impacts to receiving waters.

The receiving environment monitoring program that I have conditioned will assess the condition of the receiving waters within the Port, identify the potential impacts of the project to the receiving environment and identify the environmental values to be protected. It will also confirm the monitoring locations, water quality indicators and provide for near real-time monitoring of the sediment plume-related indicators. I have required this monitoring program to be implemented prior to the commencement of dredging and construction activities and to not cease until after dredging activities are completed.

Detailed evaluation of this topic can be found in section 6.3 and 6.4 of this report.

Matters of state environmental significance

The MSES potentially impacted by construction of the WBE reclamation areas include marine plants, protected wildlife habitat and wetlands. EIS investigation areas for MSES spanned approximately 30 km to the north and south of project activities. As discussed in the previous section for the capital dredging components, the Port supports significant coastal and marine ecosystems and fauna which are both MSES and MNES.

The MNES values will be assessed as part of a separate, parallel EIS process by the Commonwealth Minister for the Environment under the EPBC Act. I anticipate that the Minister will require conditions to manage, mitigate and offset impacts to MNES.

As many of the MSES being assessed by the State are also MNES, any conditions proposed by the Commonwealth would also be relevant to any overlapping MSES values. DAWE officers were consulted throughout the EIS process in consideration of overlaps between MSES and MNES to ensure a complementary degree of assessment and evaluation. As a result, conditions stated to address MSES impacts complement anticipated Commonwealth condition requirements for overlapping MNES.

Detailed evaluation of this topic can be found in section 6.5 of this report.

Marine plants and protected wildlife habitat

Key MSES impacted by construction of the WBE reclamation areas include marine plants and protected wildlife habitat.

The construction of the WBE reclamation areas could result in a permanent loss of up to 364.64 ha of marine plants which includes:

- a direct impact on 275.23 ha of seagrass within the reclamation footprint
- an indirect impact on 99.41 ha of seagrass associated with changes to hydrodynamics which would affect the suitability of the seabed to support seagrass growth.

These areas of seagrass also provide potential foraging habitat for the Australian humpback dolphin, dugong, marine turtles and shorebirds. The construction of the WBE reclamation areas and the BUF is also expected to result in the permanent loss of other types of foraging habitat for the Australian humpback dolphin, marine turtles and shorebirds. I consider the permanent loss of marine plants and potential foraging habitat for the Australian humpback dolphin, dugong, marine turtles and shorebirds a significant residual impact requiring offsets to compensate for the loss.

Due to the transient nature of seagrass meadows in the Port, I have conditioned the requirement for the proponent to conduct monitoring after construction to confirm whether marine plants in the surrounding area return to their pre-disturbance condition within five years. This will determine the area of indirect significant residual impact and offset obligations.

I have stated conditions for the EA which set a maximum allowable significant residual impact for MSES. I have conditioned that the final offset strategy must include measures that appropriately compensate for any loss of habitat which constitutes a significant residual impact for MSES.

As the dugong, Australian humpback dolphin, shorebirds and marine turtles are also listed as MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment under the EPBC Act. To ensure best environmental outcomes for affected MSES, a complementary degree of assessment, prevention and offset has been applied to the evaluation and conditions set in this report. I consider my stated conditions for MSES would complement anticipated future conditions in the Commonwealth's separate, parallel assessment of MNES.

Wetlands

While most other project impacts can be adequately mitigated, the construction of the WBE reclamation areas are expected to impact on 73.61 ha of wetlands of high ecological significance, including:

- direct loss of 48.63 ha within the reclamation footprint

- indirect impact on 24.98 ha of surrounding wetlands associated with changes to hydrodynamics and water quality associated with the construction of the WBE reclamation area.

The impacted area of high ecological significance wetland also overlaps with some the predicted impact area for shorebird foraging habitat. I consider the impacts on 73.61 ha on wetlands of high ecological significance from the proposed reclamation a significant residual impact. The final offset strategy, that I have conditioned, must include measures that appropriately compensate for any loss of habitat which constitutes a significant residual impact for MSES.

Land use and tenure

The proposed reclamation works are consistent with the Gladstone Ports Corporation Limited's Land Use Plan, the Central Queensland Regional Plan and the *Sustainable Ports Development Act 2015*, which support a coordinated approach to the beneficial reuse of dredged material.

The project would expand the total area of land available for port-related industrial development through the establishment of the 276 ha WBE reclamation areas. The development of these activities would be subject to separate assessment and approvals.

Detailed evaluation of this topic can be found in section 6.2 of this report.

Noise and Vibration

Modelling in the EIS predicts that activities associated with the placement of dredge material and reclamation works at the WBE reclamation areas would be compliant with the noise limits for temporary construction activities at all sensitive receptors, the closest being residences in Targinnie approximately 4 km from the reclamation areas.

Whilst I do not envisage that noise from the work associated with the WBE reclamation areas would cause nuisance, I have stated standard conditions to require the proponent monitor and manage noise generated from the project in accordance with a construction noise and vibration management plan. I note vibration impacts are expected to be minimal due to maintenance of safe working distance between construction works and sensitive receptors.

Detailed evaluation of this topic can be found in section 6.7 of this report.

Air quality and greenhouse gases

The air quality assessment in the EIS for the placement of dredge material and reclamation works at the WBE reclamation areas concluded that air quality impacts (primarily dust) from these works would not exceed Environment Protection Policy (Air) (EPP (Air)) EPP (Air) quality objectives at sensitive receptor locations; the closest within Targinnie, approximately 4 km from the reclamation areas.

In order to ensure the EPP (Air) quality objectives are achieved, I have stated conditions for the EA requiring the proponent to monitor air quality from project activities when requested, and to not cause environmental nuisance to any sensitive residential or commercial place.

The greenhouse gas assessment in the EIS found that greenhouse gas emissions from placement of dredge material and reclamation works at the WBE reclamation areas would be associated with equipment used for bund wall construction and dredged material earthworks. To reduce emissions the proponent has committed to control emissions through the use of efficient equipment, the use of bio-diesel and compliance with maintenance and operational procedures.

Detailed evaluation of this topic can be found in section 6.8 of this report.

Traffic and transport

Quarry materials are required to build the bund walls for the reclamation areas. The haulage route for quarry materials (core and armour rock) from Ticor Quarry in the Gladstone State Development Area to the WBE reclamation areas will include local roads. The EIS assessment of traffic and transport impacts found that for the intersections analysed, the project would not result in significant degradation of pavement or a substantial change to existing traffic volumes.

I note that the transport of rock along the proposed haulage route from the Ticor Quarry is regulated by an existing development approval for the quarry held by the proponent, under the Gladstone State Development Area Development Scheme. This existing approval includes measures regulating major construction traffic-related impacts for the project related to the transport of rock. In addition to that existing approval, I have recommended a condition requiring the proponent to undertake a revised traffic impact assessment and finalise a road-use management plan during detailed design.

To maintain the safety of local and state-controlled road networks, I have recommended the proponent finalise and implement traffic management plans and a heavy vehicle haulage management plan in accordance with the Department of Transport and Main Roads, and Gladstone Regional Council requirements.

Detailed evaluation of this topic can be found in section 6.6 of this report.

Whole of project considerations

Social impacts

Overall, I consider that the project will deliver social benefits for the Gladstone region from increased employment and business opportunities during dredging and construction activities.

I consider it unlikely that the project workforce will create local skills shortages or impact on the availability or affordability of local housing due to the size of the project workforce relative to the resident population, and the current availability of affordable accommodation in the Gladstone local government area.

However, I note that the social landscape of a community can change over time. I have therefore set a condition to require the proponent review and finalise the social impact management plan for the project three months prior to construction, to ensure analysis of the project's social impacts and their proposed management strategies respond to the social landscape that is current at the time of construction.

The proponent has committed to use a local workforce, with up to 316 of the 386 potential full-time equivalent jobs during dredging and construction to be sourced from the Gladstone local government area. To ensure the implementation of this commitment, my condition for the finalised social impact management plan, requires the preparation and implementation of a workforce management plan to support local worker participation in the dredging and construction work. I have also required that the proponent's recruitment and training programs include actions to develop the local skills base and future local workforce capability.

I have also conditioned that the social impact management plan includes a communications and stakeholder engagement plan to require the proponent establish processes to ensure local stakeholders have advanced notice of construction activities. The communications and stakeholder engagement plan must also include a process for registering, managing and resolving community complaints and grievances, and publishing this information online.

Detailed evaluation of this topic can be found in section 7.2 of this report.

Cultural heritage

The EIS acknowledges the Port Curtis Coral Coast Traditional Owners (PCCC) for the project area. Cultural heritage investigations for the EIS were undertaken in consultation with PCCC representatives. The project is expected to have minimal impacts to cultural heritage values and any impacts will be managed through the existing Indigenous Land Use Agreement, Cultural Heritage Protocol and Cultural Heritage Management Plan in place for the project area.

The EIS identified that no heritage listed state or local government places or areas on Commonwealth, State and local government heritage registers are within a 5 km radius of project areas. The EIS also concluded that the project area has no areas of non-indigenous cultural heritage.

I am satisfied that the proponent's continued compliance with the Indigenous Land Use Agreement, Cultural Heritage Protocol and implementation of the Cultural Heritage Management Plan will ensure the adequate management of cultural heritage values by the proponent and the traditional owners as custodians of their cultural heritage.

Detailed evaluation of this topic can be found in section 7.1 of this report.

Coordinator-General's conclusions

I consider that the environmental impact assessment requirements of the SDPWO Act for the Port of Gladstone Gatcombe and Golding Cutting Channel Duplication project have been met and that sufficient information has been provided to enable my thorough evaluation of the potential impacts of the project.

The project provides for future growth and better safety and efficiency for larger vessels at Queensland's largest multi-commodity port, the benefits extending to trade throughout Queensland, supporting Queensland's future economic growth. I recognise that construction of the first stage of the project could commence as early as 2023, following completion and approval of a Detailed Business Case through Building Queensland.

The conditions I have set in this report will place stringent controls on the project's environmental impacts. These controls include strict water quality release limits, an extensive water quality monitoring program, containment trigger investigation levels and requirements to ensure the bund walls for the reclamation areas are constructed in accordance with industry best practice. I have also set maximum disturbance limits on habitat for marine animals of state significance and I have required that an offset strategy be finalised before the project can commence.

Matters of national environmental significance for the project are being assessed separately by the Commonwealth DAWE under the *Environment Protection and Biodiversity Conservation Act 1999*.

I conclude that there are significant benefits to be derived from the project, and that any adverse environmental impacts can be adequately avoided, minimised, mitigated and/or offset as required through the conditions I have set, the recommendations made in this report and the proponent's commitments outlined in the EIS.

Accordingly, I recommend that the project proceed, subject to conditions and recommendations included in this report. I expect that the commitments made by the proponent in the EIS will be fully implemented.

In accordance with section 35A of the SDPWO Act, this report will lapse six years following the publication date of this report, unless I set another date at a future time that extends the report.

1. Introduction

This report has been prepared pursuant to section 34D of the *State Development and Public Works Organisation Act 1971* (SDPWO Act) and provides an evaluation of the environmental impact statement (EIS) for the Port of Gladstone Gatcombe and Golding Cutting Channel Duplication project (the project).

It is not intended to record in this report all the matters that were identified and subsequently addressed during the assessment. Rather, it concentrates on the substantive issues identified during the EIS process and the measures and conditions required to address the impacts. The report:

- summarises the key issues associated with the potential impacts of the project on the natural, physical, social and economic environments at the local, regional, state and national levels
- presents an evaluation of the project, based on information contained in the EIS (including the draft EIS and revised draft EIS), submissions made on the EIS during public and advisory agency consultation periods and information and advice from advisory agencies and the proponent
- states, recommends and imposes conditions under which the project may proceed
- makes recommendations
- documents the proponent's commitments.

2. About the project

2.1 The proponent

The Gladstone Ports Corporation Limited (GPC) (ACN: 131 965 896), is the proponent for the project. GPC is a government-owned corporation under the *Government Owned Corporations Act 1993* and is a declared port authority under the *Transport Infrastructure Act 1994* (TI Act). The Port is located within a shallow, semi-enclosed estuarine system and includes 4448 hectares (ha) of land that is under the control and management of GPC. Under the TI Act, GPC is responsible for operating the ports of Gladstone, Rockhampton and Bundaberg.

2.2 Location

The project is located within the port limits of the Port of Gladstone (the Port) and is adjacent to the Gladstone Regional Council (GRC) Local Government Area (LGA).

The Port is located within Port Curtis on the central Queensland coast approximately 525 kilometres (km) north of Brisbane and 100 km south of Rockhampton. It consists of six major port facilities – Boyne Smelter Wharf, South Trees Wharf, Barney Point Terminal, Auckland Point Terminal (Port Central), RG Tanna Coal Terminal and Fisherman's Landing (Figure 2.1).

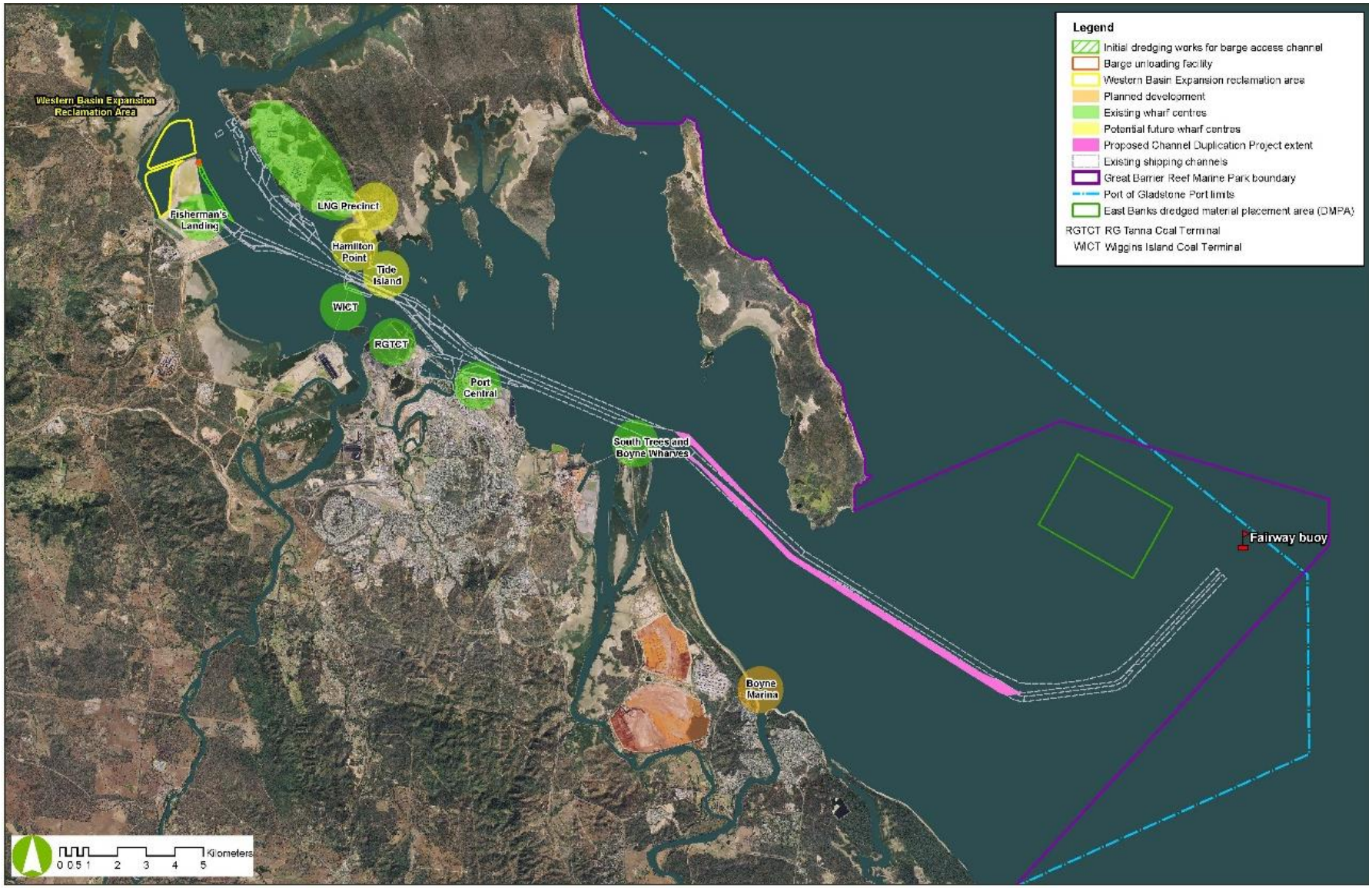


Figure 2.1 Locality plan and major wharf centres for the Port of Gladstone

The Port is bordered by the mainland to the west and south, Facing Island to the east and The Narrows and Curtis Island to the north. Access to the port is via the Gatcombe, Golding Cutting, Boyne and Wild Cattle shipping channels; the latter of which extend to the outer harbour and into the Coral Sea.

The project proposal is to duplicate (by widening and deepening) the existing Gatcombe and Golding Cutting channels to provide two-way all-weather passage between the outer harbour and the existing inner harbour channel, and to use the dredged material to reclaim land for future port growth (refer Figure 2.1).

The Port is Queensland's largest multicommodity port and is nationally significant as one of the few naturally sheltered deep water ports on the east coast of Australia. The EIS identified that the project is needed to reduce the average delays of vessels queuing to enter the Port, support increased capacity and efficiency of the Port and generate employment and economic activity. It would also support future growth in coal (primarily metallurgical) and liquid natural gas (LNG) exports and is expected to support the establishment of hydrogen exports from the Gladstone region.

The Port is listed a as priority port under the *Sustainable Ports Development Act 2015* (Ports Act). Master planning for priority ports is required under the Ports Act, and to meet requirements of the Reef 2050 Long-Term Sustainability Plan[1] (Reef 2050).

The proposed dredge material placement location for the project is within the mapped Marine Infrastructure Precinct in the master planned area for the priority Port of Gladstone (refer Figure 2.2).

The project is wholly located within the Great Barrier Reef World Heritage Area (GBRWHA) but outside the Great Barrier Reef Marine Park (GBRMP) boundary, which is around 4.3 km from the end of the Golding Cutting Channel (at the closest point).

[1] *Reef 2050 Long-Term Sustainability Plan*, Commonwealth of Australia 2015. Accessed January 2020, https://www.environment.gov.au/system/files/resources/d98b3e53-146b-4b9c-a84a-2a22454b9a83/files/reef-2050-long-term-sustainability-plan.pdf

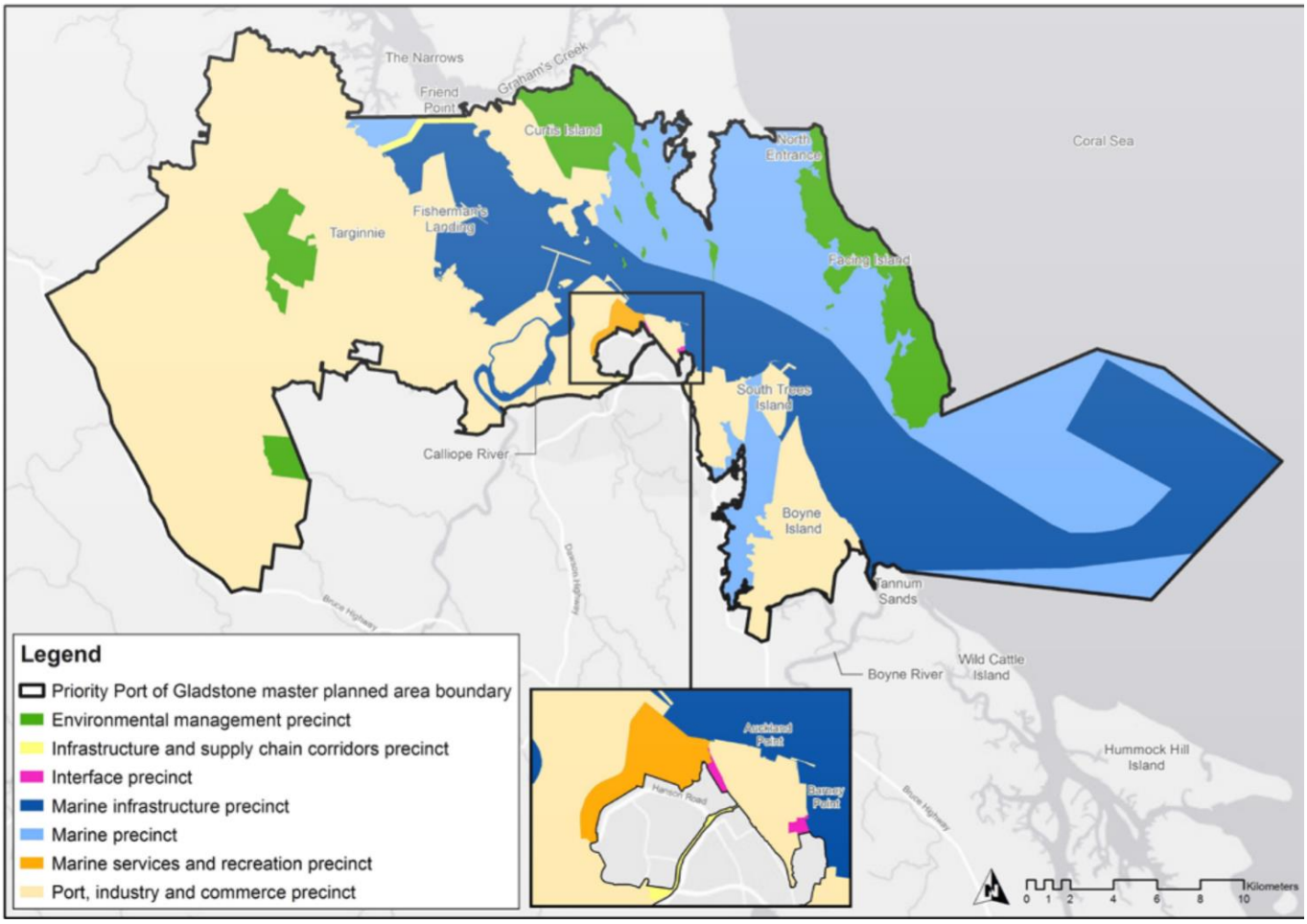


Figure 2.2 Priority Port of Gladstone precinct plan

2.2.1 Port of Gladstone pilotage areas

Pilotage areas have been gazetted around designated ports and maritime areas to ensure the safe and efficient movement of shipping, and encompass the approaches, main shipping channels and waters of the Port. The Port contains navigational aids, leading lights, beacons and buoys to assist ships' masters, owners and agents of vessels arriving at and traversing the Port.

State shipping legislation in Queensland is controlled by Maritime Safety Queensland (MSQ), a State government agency that reports to the Queensland Department of Transport and Main Roads[2] (DTMR).

MSQ, through the authority of the Regional Harbour Master (RHM) has jurisdiction over the safe movement of all shipping within the Port pilotage area (refer Figure 2.3).

The *Transport Operations (Marine Safety) Act 1994* (TOMSA) and regulation defines the pilotage area for the Port, and states where compulsory pilotage is required. Pilotage service is provided by the Gladstone Marine Pilot Service, an entity of GPC. Collectively, the RHM and GPC have responsibility for managing the safe and efficient operation of the Port.

[2] Port Procedures and Information for Shipping – Gladstone, Department of Transport and Main Roads, February 2020, Accessed March 2020, https://www.msq.qld.gov.au/Shipping/Port-procedures/Port-procedures-gladstone

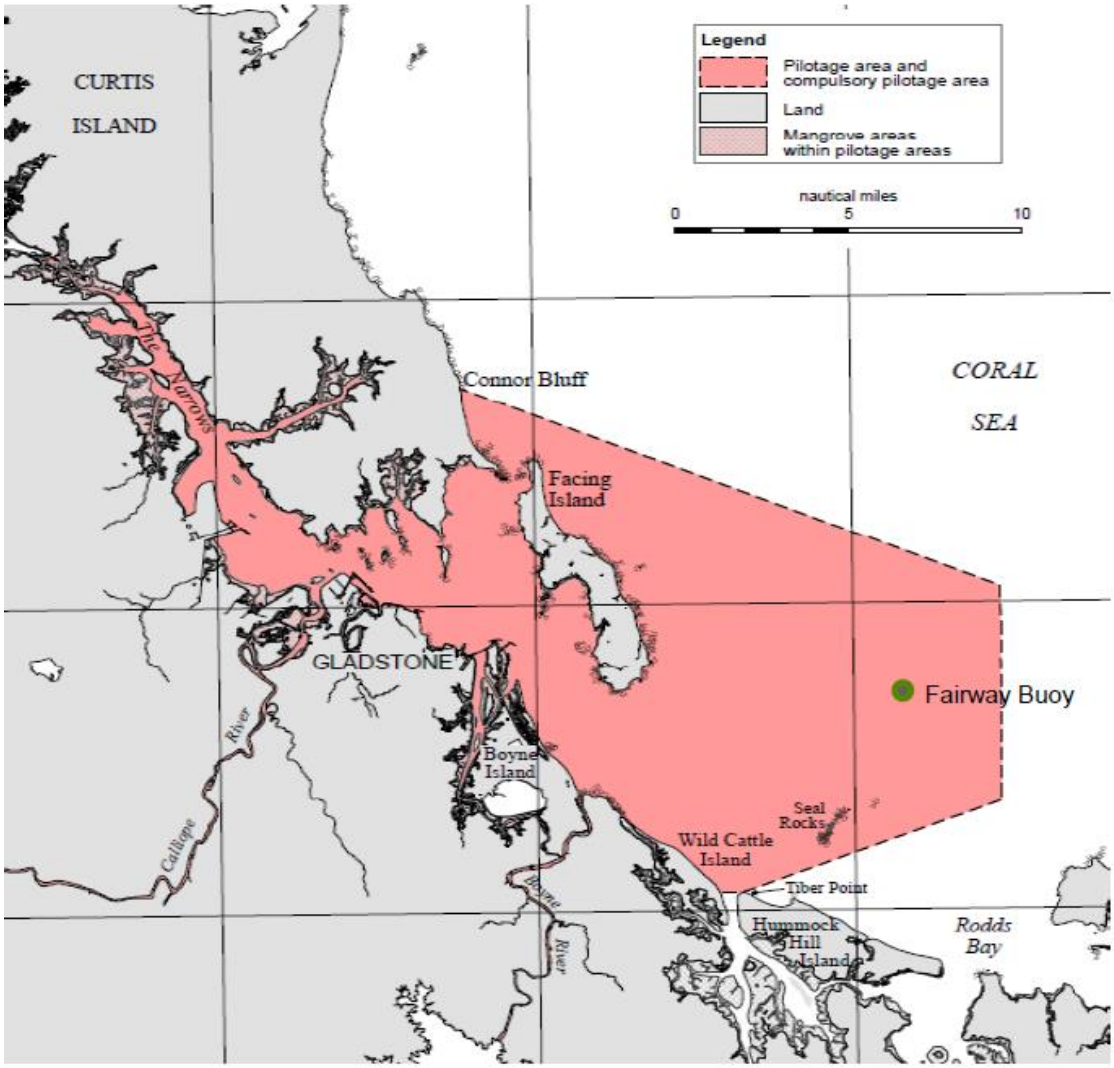


Figure 2.3 Port of Gladstone pilotage area

2.3 Project description

The proponent proposes to duplicate the existing Gatcombe and Golding Cutting shipping channels in the Port. The intention is to improve two-way passage of ships through the outer harbour, under all weather and tidal conditions.

The Port is Queensland's largest multi-commodity port and the world's fourth largest coal export terminal. The project will support future, forecast expansion of production of the resource industry and other industrial activities and provide a direct benefit of $160 million for the state's economy. The project is expected to employ 386 full time equivalent (FTE) workers during the up to four year construction phase and create 23 new FTE jobs for operations. The duplication of a section of the outer harbour shipping channel into the Port will facilitate better safety and operational efficiency in the Port.

GPC has designed the project to meet the objectives of the State Government's Ports Act and the Reef 2050, by beneficially reusing the dredged material to reclaim land for future port growth.

This has resulted in updates to the original project proposal from when it was declared a coordinated project in 2012. The project updates have resulted in increases to the capital expenditure from the initial estimate of $400 million, up to $760 million. Updates to the project proposal during the EIS process are discussed further in the section below discussing dredge material placement options investigations.

Key project activities include:

- capital dredging[3] to deepen and widen the existing Gatcombe and Golding Cutting shipping channels to a depth of approximately 16.1 metres (m) and a width of 200 m; the Gatcombe Channel is approximately 6 km long and the Golding Cutting Channel is approximately 9 km long
- construction of bund walls to create the Western Basin Expansion (WBE) reclamation areas and a barge unloading facility (BUF) adjacent to the existing Western Basin (WB) reclamation area
- dredging a 2.3 km-long barge access channel to allow barges to transport dredged material from the duplicated channels to the BUF
- dredging a total of 12.85 million cubic metres (Mm^3) of seabed material including 12.6 Mm^3 from the duplicate channels and 0.25 Mm^3 from the barge access channel
- placement of dredged material within the proposed WBE reclamation areas and the existing WB reclamation area (for reuse)
- removal, relocation and installation of new navigational aids for the duplicated channels.

2.3.1 Project components

The project consists of two key groups of activities which are considered in this evaluation:

- capital dredging and dredge material transfer
- placement of dredge material and reclamation works.

The key project components are shown in Figure 2.4 below.

[3] The term 'Capital dredging' refers to a one-off removal of sediment to expand the shipping channels and is defined by the *Sustainable Ports Development Act 2015*.

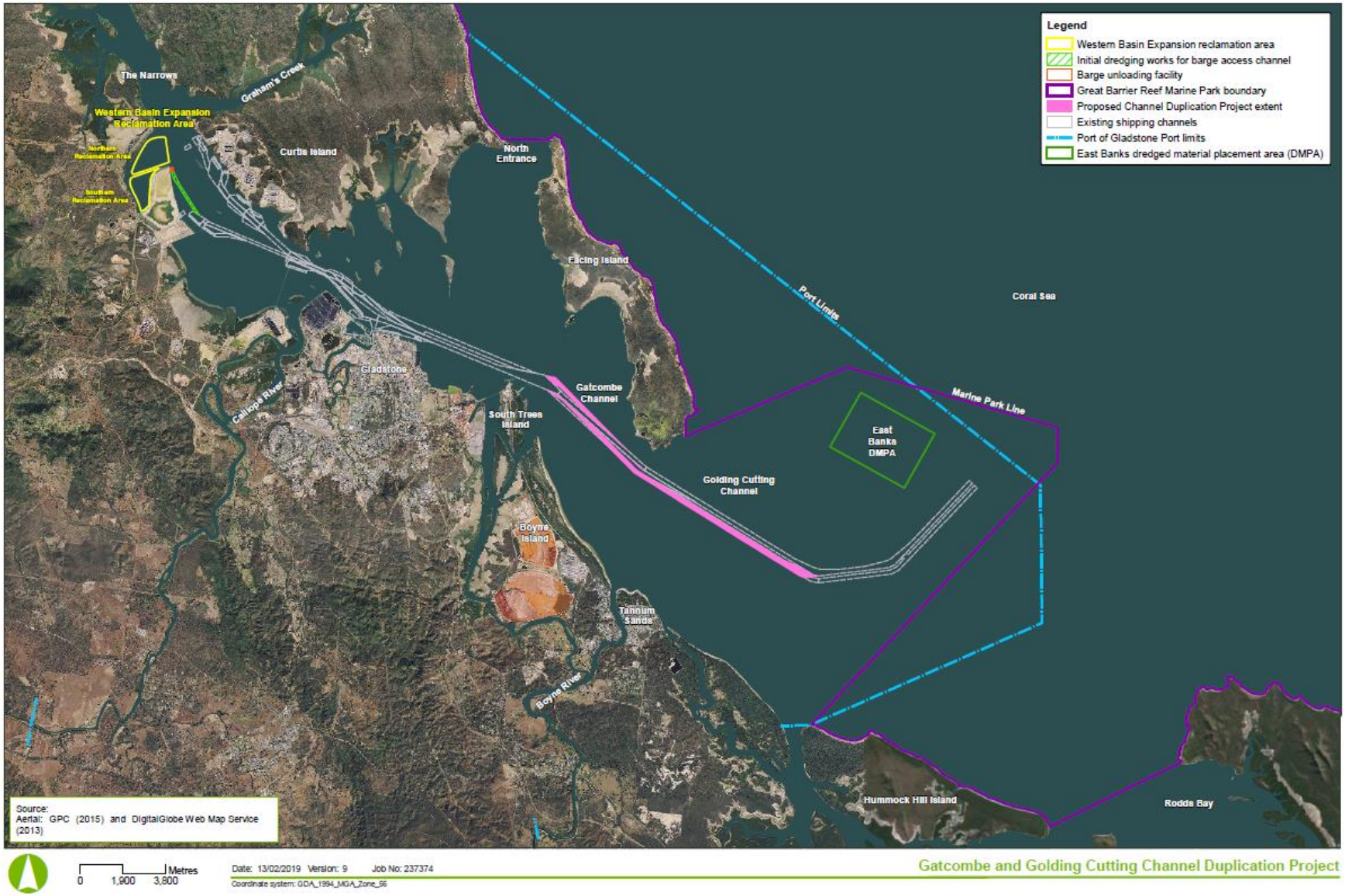


Figure 2.4 Project components

Capital dredging and dredge material transfer

Capital dredging to duplicate existing shipping channels

The term 'capital dredging' is defined in the Ports Act, and for this project the term refers to the removal of sediment to duplicate existing shipping channels.

The duplicated channels, parallel to the existing shipping channels, will have a combined length of approximately 15.23 km and a depth of 16.1 m below the lowest astronomical tide (-16.1 m LAT) which is sufficient depth to allow two-way shipping passage for the Port under all weather and tidal conditions. At present, the depth of areas to be dredged vary between -8 m LAT and -16.1 m LAT.

Capital dredging of up to 12.6 Mm^3 of sediment material is required. The total footprint of the duplicated channels is approximately 382 ha, however the total area requiring dredging is 247.8 ha. This is because 134 ha of the shipping channels are already at the maximum required depth.

Due to the composition of the seabed material to be dredged (a combination of highly saline sand, silt and clay material with potential presence of contaminants), dredging is proposed to be undertaken by a trailing suction hopper dredger (TSHD). This dredging method uses suction to extract material which minimises muddying of the surrounding waters.

Two dredging campaign options were considered in the EIS. Channel duplication dredging may be undertaken over two stages depending on how soon the full channel depth is required to provide for increases in shipping movements. If necessary, these stages will comprise:

- a 33-week first stage removing 7.25 Mm^3 of material to achieve a -13.5 m LAT channel depth
- a 25-week second stage removing an additional 5.35 Mm^3 of material to achieve a -16.1 m LAT channel depth.

Alternatively, the two stages may be combined into a single 58-week dredging campaign removing 12.6 Mm^3 of material to achieve the ultimate -16.1 m LAT channel depth.

The initial dredging works discussed below will be required prior to either Stage 1 of dredging or prior to a singular campaign. Dredging of seabed material to duplicate the existing Gatcombe and Golding Cutting channels is to be conducted by a TSHD operating 24 hours per day, seven days a week for either a 33-week first stage and 25-week second stage, or a combined 58-week campaign.

The final dredging methodology adopted for the project, whether staged or a combined campaign, will be subject to acceptance by the RHM of the successful dredging contractor's detailed Marine Execution Plan. The dredging contractor will also need to comply with MSQ's Standard for Commercial Marine Activities – Gladstone Region[4].

Capital dredging to establish a barge access channel to the barge unloading facility

Capital dredging works of approximately 0.25 Mm^3 of seabed material is required to establish a 2.3 km-long access channel to allow barges to transport dredged material from the Gatcombe and Golding Cutting shipping channels to the BUF for unloading.

Dredging over a six and a half-week period is required for the barge access channel to achieve the depth of -7 m LAT between existing Port shipping channels and the location of the BUF. A TSHD will remove approximately 150,000 m^3 of material from the southern portion of the channel, while a cutter suction dredger (CSD) will remove approximately 100,000 m^3 of material from the northern portion of the

[4] *Standard for Commercial Marine Activities – Gladstone Region*, Maritime Safety Queensland 2019, accessed January 2020, https://www.msq.qld.gov.au/Shipping/Gladstone-region

channel. A CSD has a rotating head that cuts into harder materials, which are then sucked to the surface through pipes for placement.

The dredged material removed from the barge access channel will be placed directly into the existing WB reclamation area by the TSHD and CSD. Dewatering and management of this dredge material will be managed in accordance with existing environmental authority (EA) conditions for the WB reclamation area.

Delivery of dredge material via barge

The dredge material removed from the Gatcombe and Golding Cutting channels by the TSHD will be transported to the BUF via four barges with a capacity of 7000 m^3 to 10,000 m^3, working in cycles for the dredging campaigns. Pushbusters, powerful boats designed to push and manoeuvre larger vessels, will be used to navigate barges carrying dredge material between the dredging location and the BUF.

Removal, relocation and installation of new navigational aids for the duplicated shipping channels

Operation of the duplicated channels will require the removal of two navigational aids (i.e. one front lead light and one rear lead light), the relocation of five existing navigational aids and installation of five new navigational aids (beacons and lead lights). The removal of existing navigational aids will be undertaken using a barged pile extractor, a crane on a barge and delivery to a port facility. Installation of relocated and new navigational aids will require the necessary piles to be transported from a port facility by barge and installed using a barged crane and pile driver. It is estimated all navigational aid works will take up to three months.

The navigational aid relocation and installation methodology will be confirmed and approved by the RHM prior to work commencing.

All floating plant and associated moorings will be kept clear of navigational channels when working or moored. The moorings will be marked in accordance with the requirements of MSQ. All navigational aids will be constructed and operated in accordance with the requirements of MSQ. Navigational lights, buoys, marks and any warning signs which the RHM considers necessary, will be supplied, installed and maintained.

Placement of dredge material and reclamation works

Site establishment, construction of the BUF and the WBE reclamation areas is required prior to commencement of capital dredging in the Gatcombe and Golding Cutting channels. The EIS identified that construction is expected to take approximately three years; 18 months for each of the reclamation areas.

Establishment of barge unloading facility

The construction of the BUF will involve the installation of sheet piles or similar earth retaining structure to form a ‘U’ shaped barge dock (Figure 2.5). The footprint within the enclosed structure will be filled with approximately 200,000 m^3 of dredged material from within the existing WB reclamation area. This will allow excavators and trucks to transport material from the barges docked at the BUF into the reclamation areas.

Figure 2.5 Establishment of barge access channel and barge unloading facility

While the project's EIS considered a three-year construction period for the establishment of the BUF, a shorter construction period may be adopted if commencement of dredging is earlier than expected due to port throughput requirements. The construction period for the BUF will be confirmed during the detailed design phase. Warning lights will be installed every 100 m along the outer BUF and seaward bund wall of the WBE reclamations areas in accordance with MSQ requirements.

The eastern side of the barge dock wall within the BUF is intended to remain when it is no longer required for unloading dredged material from port dredging, to form a wharf line for a future shipping berth.

Establishment of the Western Basin Expansion reclamation areas (southern and northern)

In preparation for placement of capital dredge material, construction and establishment of two new WBE reclamation areas (southern and northern) will be undertaken in the three years prior to channel duplication dredging commencing. The WBE reclamation areas are to be located immediately adjacent to the existing WB reclamation area (Figure 2.6). Both WBE reclamation areas are required to accommodate the volume of dredge material resulting from the channel duplication dredging which exceeds the capacity of the southern WBE reclamation area alone.

The total dredged volume for this part of the project is expected to be 12.85 Mm^3 which includes the barge access channel and the channel duplication dredging. Dredge material increases in volume once removed from its location, which is referred to as 'bulking'. An average bulking factor of 1.25 has been adopted based on experience with similar dredged material at the Port. The total volume of the bulked dredged material to be placed within the WB and WBE reclamation areas is estimated at 16.06 Mm^3.

The majority of the capital dredge material will be placed within the WBE reclamation areas, and a minimal amount will be placed in the existing WB reclamation area.

Figure 2.6 Western Basin Expansion reclamation area

Reclamation area design

The design for the WBE reclamation areas considered the limited remaining capacity of the existing WB reclamation area and the volume of the dredge material, including bulking, for each stage of dredging.

To establish a bund height of +7 m above LAT for the WBE reclamation areas, the layout of the bund wall concept design allowed for a storm tide and sea level change allowance of +1.88 m above the existing highest astronomical tide (HAT) level at the nearby Fisherman's Landing. The WBE reclamation areas are proposed to have a maximum height of +8 m LAT for dredged material placement.

A connection structure (either a bridge or series of culverts) will be constructed between the southern and northern WBE reclamation areas. The location and design of the connection structure will be determined during the detailed design phase.

Bund wall construction methodology

The bund wall construction methodology for the WBE reclamation areas involves the following components:

- delivery of core and rock armour material for the bund walls sourced from existing local quarries
- placement of core material for the reclamation bund walls directly over the existing sediment by truck, bulldozer or end loader and shaped by bulldozer, grader or long-arm excavator

- placement of rock armour to create a shore protection structure along the seaward exposed face to protect the reclamation area from erosion, wave energy, tides and currents
- topping off of core material and rock armour structure with additional core material to bring the bund walls to final design levels (+7 m LAT)
- installation of geotextile material on the inner face of the bund wall to reduce the passage of dredged material fines through the rock structure; placement of the geotextile material will be secured to prevent slippage, wrinkles, gaps, folds or deformations in the material and to conform to the appropriate Australian Standard[5]
- installation of drainage control structures/weir boxes to manage water flow within the WBE reclamation areas.

Equipment, plant and other materials for the construction of the WBE reclamation areas will be transported via the existing road network.

Placement of dredged material

Dredged material would be transported into the WBE reclamation areas for placement when the reclamation area bund walls are established and the geotextile material lining the bund walls is in place.

Due to the increase in volume of dredged material when it is excavated from its in-situ location, referred to as 'bulking', the total volume of dredged material from channel duplication dredging to be placed in the WBE reclamation areas was considered in the EIS to be 15.75 Mm^3.

Dredge material would be unloaded from barges at the BUF using large excavators and loaded into trucks that would transport material to the placement areas within the WBE reclamation areas. Dredged material placed within the WBE reclamation areas will be mounded to the final profile as much as possible directly from the trucks. Due to the high clay content, there will be limited space for movement of trucks and equipment within the southern WBE reclamation area as this area as it reaches capacity.

A series of internal decant ponds (primary, secondary and final) will be constructed inside the outer bund walls to create a system of settlement ponds. This system is designed to store dredge material tailwater for a sufficient period to allow for the progressive settlement of suspended particles as it moves through the series of ponds to an ultimate discharge point.

Dredge material will initially be placed in the primary pond to allow for dredge material tailwaters to settle. Internal roads will be established for trucks to place dredged material and water mix into the primary pond. This tailwater will then be pumped into the secondary and then final polishing ponds to ensure suspended particles have settled to acceptable water quality levels prior to discharge into Port Curtis.

Discharge of tailwater will only be released into the Port from licensed discharge points. The final decant pond will also capture stormwater discharges from within the reclamation area and the final land use. Tailwater from the northern WBE reclamation area can be pumped into the southern WBE reclamation area for discharge, if required.

2.3.2 Project development stages

The project involves pre-construction, construction, dredging, demobilisation of dredging and operations stages. Activities associated with each stage are described below.

[5] AS3706 - Geotextiles – Methods of Test

Pre-construction

Pre-construction includes:

- detailed design
- obtaining all necessary approvals
- establishing site offices
- establishing necessary access points to begin construction of the reclamation bund walls
- procurement, including securing dredgers and dredging personnel, transit of dredges and specialised operators to the project location.

Construction and dredging

The proponent intends to progress project construction and dredging in the following order:

(1) construction of the WBE reclamation area (southern area)

(2) construction of the BUF

(3) initial dredging works for the barge access channel

(4) construction of the WBE reclamation area (northern area)

(5) Stage 1 and 2 capital dredging including removal/relocation/installation of navigational aids.

The timing of this project sequencing will be dependent on how soon the full channel depth is required to provide for increased shipping movements in the Port. The project will capitalise on this increase in trade to maximise Queensland's resource industry and export growth.

Two dredging campaign options have been considered and the preferred option will be selected based on predicted Port throughput and associated vessel movements.

The first option would see capital dredging of channels undertaken over two separate stages with Stage 1 dredging expected to commence in 2023 (or later) with a required channel depth of -13.5 m LAT, and Stage 2 dredging expected to commence in 2026 (or later) to reach the final design channel depth of -16.1 m LAT. The second option is to combine Stages 1 and 2 into a singular dredging campaign to commence in 2023 (or later) if required.

Demobilisation of dredging and operation

Activities following completion of capital dredging and placement of dredge material in the reclamation areas will include:

- demobilisation of dredging operations
- commencement of maritime operations within duplicated channels
- stabilisation of reclaimed land surface and maintenance activities, leading ultimately to final land uses on reclaimed land (subject to separate assessment and approvals)
- maintenance dredging within duplicated channels (under existing port-wide maintenance dredging programs, with existing approvals).

2.3.3 Dependencies and relationships with other projects

There is a long history of development involving dredging and material placement/use in the Port. Dredging for both capital and maintenance works has occurred since the 1960s, utilising land-based

reclamation and offshore (at sea) dredge material placement locations. Both capital and maintenance dredging continue to occur within the Port in response to industry demand, and to ensure the safety and operational efficiency of the harbour.

The Master plan for the priority Port of Gladstone (the master plan) was released in November 2018. Gladstone is the first of Queensland's priority ports to have a master plan prepared under the Ports Act. The master planned area encompasses land and marine areas considered important for the efficient development and operation of the Port. It considers issues beyond the Port boundary to ensure port-related development is sustainably managed while protecting the Great Barrier Reef (GBR). The master plan identifies port and supply chain efficiency and capital and maintenance dredging as critical for the ongoing operation and the growth of the Port.

Existing WB reclamation area as a component of the Western Basin Dredging and Disposal Project

An objective of the Western Basin Dredging and Disposal Project (WBDDP) project was to accommodate dredge material placement to provide safe and efficient access to the Gladstone Western Basin port facilities (in Port Curtis, from Auckland Point to The Narrows). In particular, the project was developed to service the LNG industry in the Gladstone region.

The EIS identified that there is limited remaining capacity in the existing WB reclamation area to accept dredge material from the project, as existing approved and future port dredging projects have been planned to utilise the remaining capacity in the WB reclamation. This includes the yet to be completed stages of the WBDDP project (Stages 1B, 2, 3 and 4).

The WBDDP has approval for capital dredging of 46 Mm^3 of material. The approval for the WBDDP under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) authorises the dredging of 25 Mm^3 for Stages 1A and 1B with a further 21 Mm^3 for Stages 2 ,3 and 4 to the satisfaction of approval conditions. Dredging for the WBDDP Stage 1A commenced on 20 May 2011 and concluded on 18 September 2013, involving the dredging of approximately 22.56 Mm^3 of material with placement within the WB reclamation area (17.45 Mm^3), and the East Banks Dredge Material Placement Area (DMPA) at sea (5.11 Mm^3).

Future dredging campaigns associated with Stages 1B, 2, 3 and 4 of the WBDDP are proposed to occur between 2020 (or later) and 2037. Condition 4 of the approval under the EPBC Act for that project requires the development, submission and approval of a Long-Term Sediment Disposal Plan prior to the commencement of dredging for Stages 2, 3 or 4.

The requirement for the WBDDP to proceed is independent of this project (the Gatcombe and Golding Cutting Channel Duplication project).

Gladstone Bund Wall Independent Review

Between June 2011 and July 2012 during the construction of the WBDDP, the performance of the outer bund wall of the reclamation area was inadequate and material leaked into the surrounding waters. The Gladstone Bund Wall Independent Review[6] was commissioned by the Australian Government in February 2013 to examine the design, construction and functioning of the outer bund wall of the WBDDP, and the adequacy of monitoring requirements.

The independent review found that aspects of the design and construction of the WBDDP bund wall were not consistent with industry best practice. Inadequate restraint of a geotextile liner, piping of water

[6] *Independent Review of the Bund Wall at the Port of Gladstone – Report on Findings*, Australian Government April 2014, accessed February 2020, **https://www.environment.gov.au/system/files/resources/82279d41-cb4d-4bae-bcc4-c068577d0d31/files/report-findings.pdf**

and sediment through paleochannels under the wall and the erosion of mud outside the wall all contributed to changes in turbidity in the vicinity of the bund wall.

The EIS for the project confirms the design and construction methodology for the bund walls of the WBE reclamation areas has been developed, and will continue to be refined, in consideration of the findings of the independent review.

Fisherman's Landing Port Expansion project

The Fisherman's Landing Port Expansion project was a component of the Port of Gladstone Western Basin Master Plan. The expansion of the existing Fisherman's Landing facility at the Port included a land reclamation component of approximately 170 ha adjacent to the existing port facility for additional wharves, and allocation to dispose of dredged material when constructed.

The Fisherman's Landing Port Expansion project involved construction of a bund wall, followed by progressive infilling with dredged material, decant of tailwaters during infilling and final capping and stabilisation of the surface. The Fisherman's Landing Port Expansion project included capital dredging to deepen and widen the Targinnie Channel and Fisherman's Landing swing basin, to provide shipping access to the Fisherman's Landing reclamation area. The reclamation area also provided a disposal location for other port-related dredging activities.

The Fisherman's Landing reclamation area is located adjacent to the WB reclamation area, south of the proposed location for this project's WBE reclamation areas.

Clinton Vessel Interaction Project

The proponent has recently secured State and Commonwealth approval for the Clinton Vessel Interaction Project (CVIP) to widen the Clinton Channel to improve safety and increase port efficiency to accommodate the increased size of vessels using the Port. The major driver for this project is to avoid vessels passing too closely to each other when using the Clinton Channel and/or vessels berthed at the RG Tanna Coal Terminal.

The CVIP dredging project commenced works in early 2020 and is likely to be completed several years before the commencement of dredging for this project. Material to be dredged as part of CVIP is proposed to be placed within the existing WB reclamation area.

Ongoing maintenance dredging program

Maintenance dredging associated with the project will be undertaken as part of the overall maintenance dredging program for the Port and in accordance with the Queensland Government's 'Maintenance Dredging Strategy for Great Barrier Reef World Heritage Area Ports'[7]. The EIS found that the project will result in a seven per cent increase to existing maintenance dredging requirements within the Port.

2.4 Project rationale

The Port is Queensland's largest multi-commodity port and is nationally significant as one of the few naturally sheltered deep water ports on the east coast of Australia. The EIS identified that the project is needed to reduce the average delays of vessels queuing to enter the Port, support increased capacity and efficiency of the Port and generate employment and economic activity. It would also support future

[7] *Maintenance Dredging Strategy for Great Barrier Reef World Heritage Area Ports'*, Department of Transport and Main Roads 2016, accessed February 2020, **https://www.tmr.qld.gov.au/business-industry/Transport-sectors/Ports/Dredging/Maintenance-dredging-strategy**

growth in coal (primarily metallurgical) and LNG exports and is expected to support the establishment of hydrogen exports from the Gladstone region.

The Port has been identified by the Queensland Government as a major industrial centre for the future of Australia. Major exports from the Port include coal, LNG, bauxite, alumina, cement, petroleum, ammonia and grain. The commencement of shipping from the Queensland Curtis LNG plant from 2015 and the commencement of shipping from the Wiggins Island Coal Export Terminal in 2015 has substantially increased the throughput of the Port. Between 2010 and 2018 exports through the Port increased by an average of 5.6 per cent each year.

The duplication of the Gatcombe and Golding Cutting channels is needed to allow for ongoing increases in shipping movements and larger vessels and to improve safety and efficiency in the Port. The project will allow improved passage for larger vessels including capesize vessels and LNG tankers, under all weather and tidal conditions.

It is proposed that duplicate channels would be developed adjacent to the existing channels, thereby providing a two-way passage from the outer harbour, to the western side of Facing Island where it would connect with the existing inner harbour channel. The staging of dredging will be dependent on how soon the full channel depth is required to provide for increased shipping movements in the Port.

The EIS states not proceeding with the project would impact on the safety of commercial vessel movements within the Port. The future growth of the Port vessel movements, including capesize (import and export) vessels would continue to increase vessel incident risk, and increase port traffic congestion and delays thereby limiting the Port's throughput capacity. The EIS estimated low growth and moderate/high growth scenarios for the Port, with predictions from a base operational capacity port throughput of 120 million tonnes per annum (Mtpa) in 2017-18, with 270 of 1785 total vessel movement being large capesize vessels. A low-growth scenario is predicted of 136 Mtpa Port throughput in FY 2030-31, with 309 of 1959 total vessel movement being large capesize vessels. A high-growth scenario is predicted of 172 Mtpa Port throughput in FY 2030-31, with 385 of 2069 total vessel movement being large capesize vessels.

Due to the Port's location within the GBRMP and adjoining the GBRWHA, any vessel queuing or risk of vessel incident at the entrance to the Port increases the likelihood of impact to these state and national heritage values. The proponent has undertaken vessel simulation modelling for the Port under various throughput scenarios to determine the average length of vessel delays queuing to enter the port. It is estimated that this project, once fully delivered, has the potential to result in a 60 to 80 per cent reduction in average delays by FY 2023-24. The benefits of the project to Port efficiency and safety are also expected to lead to additional benefit of reducing potential risks to the GBR.

While there are some predicted impacts to environmental values associated with this project (as considered later in this report), the concentration of shipping activities in a priority port provides strategic environmental benefit. This evaluation report considers the potential for environmental impacts against strategic economic and environmental benefits of consolidated shipping activity and improved operational safety and efficiency of the Port.

Accordingly, the focus for the evaluation in this report is to evaluate the impacts to the natural environment, built environment, social and economic values associated with the proposal and the proposed mitigation and management measures.

2.4.1 Dredge material placement options investigation

The EIS proposes capital dredging for the expansion of the Gatcombe and Golding Cutting channels, with dredged material generated by the project to be beneficially reused to establish the WBE

reclamation areas. The location and methodology for placement of dredged material has been the subject of detailed review throughout the EIS process, as discussed below.

Declaration and early development of the draft EIS

When the project was first declared a coordinated project under the SDPWO Act, GPC had not yet confirmed the preferred option for disposing of the capital dredge material generated by the project. The Initial Advice Statement (IAS) for the project which was considered as part of the coordinated project declaration indicated that both onshore and offshore options would be investigated as part of the EIS assessment. During early development of the draft EIS material, assessment of sea-disposal of capital dredge material was still permitted within the GBRMP and GBRWHA subject to Government approval.

GPC undertook an initial Dredge Material Placement Options Investigation (DMPOI) between 2013 and 2015 to determine a suitable option for the placement of capital material generated by the project. The investigations considered offshore (sea-based) disposal, land-based disposal and beneficial reuse options including beach nourishment and reclamation.

As part of these investigations, a series of workshops were conducted involving relevant State and Commonwealth government agencies who provided advice regarding potential suitability of the potential options including environmental constraints. At the completion of the final workshop, three potential dredge material placement sites, including two onshore sites and one offshore site were selected to be taken forward to be assessed as part of the EIS. The sites included:

- Port Central Expansion
- West Banks Island Reclamation
- East Banks DMPA Expansion (at sea).

These options were based on only accommodating capital dredge material generated the project. At this stage of the process the WBE reclamation areas were not a preferred option, as it was considered more appropriate to meet the longer-term strategic needs of the Port for use by other dredging projects in the inner harbour.

Policy and legislation change and revision of DMPOI for the draft EIS

In 2015 there were significant changes to Commonwealth and State Government policy and environmental regulation regarding port development in the GBR which necessitated a changed focus on land based and beneficial reuse options. This included:

- the release of the Reef 2050, which includes management measures to protect the outstanding universal value (OUV) of the GBRWHA and a commitment to restrict port-related capital dredging in the GBRWHA
- amendments to the Great Barrier Reef Marine Park Regulations 1983 (Cwlth), which introduced prohibitions and limitations on the sea-based placement of capital dredged material within the GBRMP
- the commencement of the Ports Act. The key policy objective of the Ports Act is to provide for the protection of the GBRWHA through managing port-related development in and adjacent to the area. One of the key outcomes of the Ports Act are provisions which prohibit sea-based disposal of port-related capital dredged material within the GBRWHA, unless it is beneficially reused.

Due to the additional constraints placed on the development within the Port as result of these provisions, in 2015 GPC began to re-evaluate the dredge material placement options for the project and review the long-term dredge material placement needs of the Port. GPC also re-evaluated the methodology for

placing capital dredge material to ensure it was consistent with the new policy objectives and legislation requirements.

Whilst the DMPOI originally sought to address the long-term dredging needs of the Port in terms of the appropriate and efficient use of dredged material placement areas, the new legislative requirements resulted in greater consideration being given to long-term needs by giving increased weighting to:

- the dredged material placement needs of other capital dredging projects within the Port
- potential opportunities to utilise a single dredged material placement area for the project that also has sufficient additional capacity to accommodate dredged material from other future dredging projects/campaigns (i.e. up to 2050, to be consistent with the priority Port of Gladstone master planning timeframe).

Considering the new objectives, further investigations were undertaken between 2017 and 2018 to determine a suitable dredge material placement option and a supplementary DMPOI was prepared and submitted as part of the draft EIS which was then released for public notification. While the supplementary DMPOI report builds on the previous investigations undertaken between 2013 and 2015, the alternative beneficial reuse dredge material placement options considered by these investigations were consistent with the new policy and legislative requirements for port development in the GBR.

During supplementary investigations, four sites were identified as appropriate and a supplementary multi-criteria analysis process was undertaken to select a preferred option. These sites included:

- WBE reclamation areas
- Fisherman's Landing South
- Port Central expansion
- West Banks Island reclamation.

The four options were scored and ranked in terms of:

- site availability and economic feasibility
- ecological, social and cultural heritage considerations
- ability to address the longer-term dredge material placement needs of the Port.

At the conclusion of the supplementary DMPOI multi-criteria analysis process, GPC selected the WBE reclamation areas (northern and southern) as the preferred option for managing material generated by the project. The key reasons for selecting the WBE reclamation areas as the preferred site are that it has:

- the highest potential to accommodate the long-term dredged material placement (beneficial reuse) objectives for the Port when compared to all other options able to be used in conjunction with the use of the existing WB reclamation area
- the lowest potential impact to intertidal vegetation (i.e. mangroves) when compared to all other options
- comparable potential impacts on terrestrial vegetation and fauna to the Fisherman's Landing Expansion (South) option and lower potential impacts on these values than Port Central Expansion and West Banks Island reclamation options
- comparable potential impacts to social and cultural heritage values (land use intent, community and recreational activities, amenity and traffic) to the Fisherman's Landing Expansion (South) and lower

potential impacts on these values than the Port Central Expansion and West Banks Island reclamation options, and comparable to those of Fisherman's Landing Expansion (South)

- potential impacts to aquatic environmental values that are lower than that of Fisherman's Landing Expansion (South)
- potential impacts to economic values and objectives that are lower than that of the Port Central Expansion and West Banks Island reclamation options, and comparable to that of Fisherman's Landing Expansion (South).

Public notification of the draft EIS and submissions response

During the public notification of the draft EIS, advisory agencies raised a number of issues with the project proposal as described in the draft EIS and the supplementary DMPOI report including:

- consistency with the objectives of Reef 2050 and the Port's current 50-year strategic plan
- demonstration of the avoid, minimise and mitigate impact hierarchy in relation to impacts to matters of state environmental significance (MSES), particularly for impacts on marine plants and migratory birds
- the request for further investigation of alternative terrestrial land-based placement options and options not necessitating removal, destruction or damage of marine plants and impacts to fisheries resources and fish habitats
- potential for increased mortality, disease or injury of marine fauna
- potential restrictions on public access to tidal lands
- potential impacts on commercial and community access to fisheries resources and fish habitats, including recreational and Indigenous fishing access
- potential impacts on commercial fishing access, linkages and services.

Following the public notification of the draft EIS, the proponent prepared a revised DMPOI to address comments raised by advisory agencies and other submitters on the draft EIS. In addition to matters related to impact assessment of environmental values, as considered elsewhere in this report, the revised DMPOI considered the following matters.

Demand for material and long-distance transport limitations

As part of the DMPOI, the beneficial reuse options investigated by the proponent include:

- engineered uses–land creation/reclamation; land improvement; beach nourishment and offshore berms; capping; replacement fill; and parks and recreation
- agricultural/product uses–topsoil; aquaculture; construction materials
- habitat creation or restoration.

Preliminary DMPOI revealed limited demand for the use of dredge material for many of the options as the composition of the dredge material was a key limiting factor. There were also limitations on how far dredge material could be pumped using pipelines, meaning that any use of dredge material would require transport via the road network or using barges to coastal areas.

Availability of land and costs to end users

The DMPOI states there is a lack of availability of sufficiently sized and commercially available terrestrial land within the region on which to place the dredge material, and these potential placement sites could only accommodate approximately half of the total volume of dredge material. The use of multiple

placement sites was considered to overcome the limitations of using a single site, however this would result in greater overall environmental impacts and significant increase in costs to transport the dredge material and establish multiple sites. The DMPOI indicates other potential intertidal or offshore areas considered would likely have similar or greater environmental impacts than the current proposal.

The lack of suitably sized land also limits the ability to manage the significant volume of saltwater and fine sediment that would be removed as part of the dewatering process. This process will require land additional to the placement area for secure containment areas, settlement ponds and licensed discharge points. Accordingly, landowners would need to accept the timeframes and limitations associated with the use of land as a primary placement site. Placement of dredged material in terrestrial environments also carries considerable risks of impacts to groundwater, surface water and numerous terrestrial environmental values.

The DMPOI indicated that the dredge material is not suitable for placement on land as an earthworks/fill material due to the lengthy process required to dewater and decontaminate (if required) the sediments for use. This lengthy process required would result in increased costs to purchase the material for the end user when compared to other more readily available earthworks materials (e.g. from local quarries).

Use of the existing WB reclamation as a staging area for placement of dredge material

The EIS identified that there is limited availability in the existing WB reclamation to accept dredge material from the project, as existing approved and future port dredging projects have been planned to utilise the remaining capacity in the WB reclamation area. This includes the yet to be completed stages of the WBDDP project (Stages 1B, 2, 3 and 4) and the CVIP.

Approval conditions for the WBDDP limit the size and height of the WB reclamation to be no more than 300 ha and 27 m above LAT; therefore, mounding of project-generated dredge material on the existing WB reclamation prior to final placement would not be permitted.

It is also considered that the existing WB reclamation area may not also be available at the time of dredging given the proposed timing of the project (expected to commence in 2023). This would further constrain the capacity of the southern placement area as there would be at least 6.25 Mm^3 surplus that could have been placed in the existing WB reclamation area.

Based on the information provided in the EIS, the combined area of the existing WB reclamation area capacity and both proposed WBE reclamation areas (northern and southern) would be required to accommodate dredge material from the Stage 1 capital dredging works for this project. Given the volume of material, it is considered that both the northern and southern WBE reclamation areas would be required to provide enough space to appropriately dewater the material to ensure that the required tailwater discharge water quality limits during the dewatering process are achieved. The EIS also indicates that the combined area would also be required to accommodate the limited space for trucks and equipment to place and manage the material.

Conclusion on dredge material placement options analysis investigation

I am satisfied that the DMPOI undertaken by the proponent has adequately identified and assessed all potential dredge material placement options available at this point in time for the purposes of this assessment and considered the limitations and feasibility of each.

Legislative changes prohibiting sea-based disposal of dredge material within the GBRWHA influenced the selection of the final dredge material placement option.

I support the proponent's conclusions in the EIS, particularly the DMPOI, that the proposed WBE reclamation areas provide the most suitable location for dredge material placement for the purposes of this assessment and to meet long-term dredge material placement for the Port. The EIS adequately

considered the potential impacts on environmental values and the availability of feasible alternative locations.

3. Environmental impact statement assessment process

In undertaking this evaluation, I have considered the following:

- the IAS
- the EIS documentation and technical reports, including the draft EIS and the revised draft EIS
- issues raised in submissions on the EIS
- advice from the following state government agencies:
  - Department of Aboriginal and Torres Strait Islander Partnerships
  - Department of Agriculture and Fisheries (DAF)
  - Department of Environment and Science (DES)
  - Department of Housing and Public Works
  - Department of Natural Resources, Mines and Energy (DNRME)
  - Department of Transport and Main Roads (DTMR)
  - Queensland Ambulance Service
- advice from the former Commonwealth Department of the Environment and Energy, now the Department of Agriculture, Water and the Environment (DAWE)
- advice from the Gladstone Regional Council (GRC)
- additional information and advice from the proponent as requested during evaluation of the project EIS.

The stages of the project's EIS process are documented on the project's webpage at **www.dsdmip.qld.gov.au/gladstonechannel**.

3.1 Coordinated project declaration

On 25 September 2012, the Coordinator-General declared the project to be a 'coordinated project' under section 26(1)(a) of the SDPWO Act. This declaration initiated the statutory environmental impact evaluation procedure of Part 4 of the SDPWO Act, which required the proponent to prepare an EIS for the project.

3.2 Commonwealth assessment

As this project will have a significant impact on a matter of national environmental significance (MNES), the project was referred to the Commonwealth Minister for the Environment under the provisions of the

EPBC Act. The minister determined the project is a controlled action on the 23 October 2012 under the EPBC Act.

The Commonwealth Minister for the Environment is conducting a separate assessment process in accordance with the EPBC Act. As such, this report does not evaluate potential impacts on MNES or recommend conditions for a decision under the EPBC Act. The project will require separate approvals from both the Queensland and Australian governments before it can proceed.

3.3 Terms of reference

The draft terms of reference (TOR) for the EIS for the project were released for public and advisory agency comment from 6 October 2012 to 5 November 2012. Comments were received from 19 submitters, including advisory agencies, a government-owned corporation, local government, non-government organisations, businesses, industry associations and the public.

The final TOR were prepared, having regard to comments received, and issued to the proponent on 8 December 2012.

3.4 Review of the draft EIS

The preparation of the draft EIS was delayed by changes to state and Commonwealth government policy and legislation. In response to these changes, the proponent redesigned key project elements and activities which then necessitated considerable updates to the early draft EIS documents and supporting technical studies.

The complete draft EIS was provided to the Office of the Coordinator-General on 29 March 2019 and was released for public and agency comment from 8 April 2019 to 23 May 2019.

A total of 13 submissions were received on the draft EIS comprising 11 from advisory agencies and local government, one from a non-government organisation and one from a member of the public.

The most prominent issues raised in advisory agency and local government submissions on the draft EIS included the need for:

- an updated options analysis for dredge material placement sites
- further assessment of impacts to marine habitat and other ecological values from dredging and dredge material placement
- further sediment sampling and assessment of water quality impacts
- an offsets strategy to be developed to address predicted project impacts
- consideration of potential impacts on the road network.

Key issues raised by the non-government organisation and the member of the public included:

- the need for further information on impacts to marine habitat and other ecological values from dredging and dredge material placement, and for an offset strategy to be developed
- potential water quality impacts and relationship of the project with existing reclamation areas.

3.5 Additional information to the EIS

On 9 July 2019, the Coordinator-General requested that the proponent submit additional information to the EIS to provide:

- a response to issues raised in submissions on the draft EIS
- an updated analysis of alternative locations for the disposal of dredge material generated by the project
- further assessment of impacts to marine habitat from dredging and dredge material placement
- further assessment of water quality impacts
- updated information on how reclamation area design considers coastal processes
- an offsets strategy to address predicted project impacts, including updated detail on avoidance, minimisation or mitigation of impacts
- updates to proponent commitments and management plans to reflect additional information.

On the 25 September 2019, the proponent lodged a revised draft EIS, following agency feedback on an earlier version during August 2019.

On the 30 September 2019, the Coordinator-General accepted the draft EIS, together with the revised draft EIS, as the final EIS. This documentation is referred to in this report collectively as 'the EIS'.

4. Project approvals

Following the release of this evaluation report, the proponent will need to obtain statutory approvals from Australian, state and local government agencies before the project can proceed. Table 4.1 provides a list of key approvals required for the project, for some of which this evaluation report includes stated recommended conditions.

Table 4.1 Key approvals required for the project to proceed

Project components	Permit/approvals	Legislation	Assessment Manager
Commonwealth approvals			
Whole of project	Controlled action (EPBC 2012/6558)	EPBC Act	DAWE
State approvals			
Capital dredging of Gatcombe and Golding Cutting Channels (Stage 1 and Stage 2 dredging works)	EA for an environmentally relevant activity (ERA – 16(1)(d) dredging more than 1,000,000 t in a year)	*Environmental Protection Act 1994* (EP Act), Environmental Protection Regulation 2008 (EP Regulation)	DES
	Development permit for a material change of use (MCU) - ERA 16(1)(d) – dredging more than 1,000,000t in a year	*Planning Act 2016* (Planning Act) *and* Planning Regulation	Port Authority State Assessment Referral Agency (SARA)

Project components	Permit/approvals	Legislation	Assessment Manager
		2017 (Planning Regulation)	
	Development permit for Operational Work – Tidal Works within a Coastal Management District	Planning Act and Planning Regulation	Port Authority SARA
	Allocation of quarry material notice (dredging)	*Coastal Protection and Management Act 1995* (CPM Act)	DES
	Matters regulated under the *Fisheries Act 1994* (Fisheries Act) (material change of use, reconfiguration of a lot, operational works)	Planning Act and Planning Regulation, Fisheries Act	DTMR/SARA/ DAF
WBE reclamation areas (southern and northern) and BUF	Preliminary approval for operational work – tidal works within a coastal management district	Planning Act and Planning Regulation	Port Authority SARA
	Preliminary approval for matters regulated under the *Fisheries Act 1994* (material change of use, reconfiguration of a lot, operational works) – works within a coastal management district	Planning Act and Planning Regulation, Fisheries Act	DTMR/SARA/ DAF
	Perpetual lease application - unallocated State land	*Land Act 1994*	DNRME
	Perpetual lease - Indigenous Land Use Agreement (ILUA)	*Native Title Act (Qld) 1993, Native Title Act 1993 (Cwlth)*	DNRME and the National Native Title Tribunal (Cwlth)

4.1 Australian Government approvals

On 23 October 2012, a delegate for the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities determined that the project is a 'controlled action' under the EPBC Act (EPBC ref. 2012/6558).

On 15 March 2019, the proponent submitted to the Department of Energy and Environment a request to vary the proposed project in response to EIS submissions and changes to legislation since the preparation of the EIS. On 25 March 2019, a delegate of the Minister for the Environment accepted the variation. On 9 April 2019, the draft EIS was publicly notified in accordance with the requirements of the EPBC Act.

As discussed in section 3.2, DAWE will assess impacts on MNES and will make a separate project approval decision under the EPBC Act.

4.2 State government approvals

4.2.1 Environmental Protection Act 1994

A key management tool under the EP Act is the regulation of environmentally relevant activities (ERAs). An EA is required to carry out any ERA. In accordance with section 47C of the SDPWO Act, I have stated conditions in Appendix 2 for inclusion in an EA for ERA – 16(1)(d) dredging (for more than 1,000,000 tonnes per year).

4.2.2 Planning Act 2016

In accordance with section 37 of the SDPWO Act, I have stated conditions for a development permit for an MCU for an ERA (dredging) (Stage 1–2 dredging works).

In addition, in accordance with section 39 of the SDPWO Act, I have stated conditions for a preliminary approval for operational work for tidal works within a coastal management district for the WBE reclamation areas (southern area and northern), the BUF and Stage 1-2 dredging works.

Stated conditions are provided in Appendix 2, of this report. The port authority (Gladstone Ports Corporation Limited) is the assessment manager for these approvals as the works occur within port limits.

4.2.3 Coastal Protection and Management Act 1995

Under section 73 of the CPM Act, the proponent would be required to hold a current allocation of quarry material notice (allocation notice) that authorises the removal and use of the dredged material from state land under tidal waters.

I have stated conditions to address the potential impacts to the marine environment through both the EA and a development permit for operational works (tidal works in a coastal management district). Accordingly, I have recommended conditions for the allocation notice (Appendix 2).

4.2.4 Fisheries Act 1994

The Fisheries Act, administered by DAF, provides for the management, use, development and protection of fish habitats and resources, together with the management of aquaculture activities.

The project will result in temporary and permanent disturbance of marine plants and will therefore trigger the requirement to obtain a development permit for operational works that are the removal, destruction or damage of a marine plant associated with the placement of bund rock wall material and dredged material within the WBE reclamation areas.

I have stated conditions in Appendix 2 requiring the proponent to consult with DAF and enter into an agreed delivery arrangement to offset any significant residual impact on MSES (marine plants) from the establishment of the WBE reclamation areas.

In accordance with section 39 of the SDPWO Act, I have stated conditions for preliminary approvals for matters regulated under the Fisheries Act for the WBE reclamation areas (southern and northern), the BUF and channel duplication (Stage 1-2 dredging works) (Appendix 2). The port authority (Gladstone Ports Corporation Limited) is the assessment manager for these approvals as the works occur within port limits.

Any marine offset requirements for significant residual impacts on a prescribed environmental matter (MSES) must be offset in accordance with the *Environmental Offsets Act 2014*, Environmental Offsets

Regulation 2014 and the Queensland Government Environmental Offsets Policy and will be considered by DAF.

4.3 Local government approvals

The project is located within the GRC LGA.

The project activities are exempt from assessment against the local government planning scheme (Our Place Our Plan Gladstone Regional Planning Scheme Version 2) where activities are on located on Strategic Port Land (SPL), as per the provisions of the TI Act.

Permits for project activities would be required if any activities occur on council-owned land, roads or using council's infrastructure including the provision of any local laws that have been gazetted under the *Local Government Act 2009*.

5. Capital dredging works and dredge material transfer

5.1 Introduction

This section evaluates key environmental impacts associated with capital dredging, dredge material transfer and navigational aid works for the project.

Activities associated with capital dredging, dredge material transfer and navigational aid works could affect marine water quality, coastal processes, MSES, maritime transport, noise and vibration, and air quality. My evaluation of these impacts is discussed in the following sections.

For a description of the pre-construction, construction and decommissioning activities refer to section 2.3 (About the project).

5.2 Marine water quality

Capital dredging works and the transfer of dredge material has the potential to change marine water quality around the WBE reclamation areas. This section evaluates the potential impacts associated with the potential changes to marine water quality and the mitigation and management measures proposed in the EIS.

5.2.1 Existing environment

The Port is a naturally turbid, deep-water port. The Port's location, 95 km south of the Tropic of Capricorn, means that the local conditions are typical of a sub-tropical marine climate, with high rainfall in the summer months and regular flooding events.

The Port is well connected to the Boyne and Calliope Rivers, from which it receives freshwater flows, as well as flows from The Narrows and the Fitzroy River. These freshwater flows, combined with a number of industrial uses upstream, supply dissolved metals, nutrients and contaminants directly into the Port.

In addition to the freshwater flows, the turbidity (clarity of the water) and levels of total suspended solids (TSS) particles suspended within the water at the Port are directly influenced by wind direction and wind speed, which generate waves and tidal currents that mobilise and transport sediments in the water column as well as stirring up sediments from the seabed. Water quality within the Port is also heavily influenced by extreme weather events such as cyclones and flooding, which typically increase the occurrence of nutrients and contaminants, and increase the temperature, salinity and pH of the water.

Past water quality monitoring programs undertaken at the Port have found that water quality results for turbidity and TSS are regularly above the relevant Australian Water Quality Guideline (AWQG) values, with some contaminants (e.g. herbicide, pesticide, cadmium and nutrients), metals, metalloids and ammonia also exceeding the relevant water quality objectives (WQOs). The EIS stated that dissolved metals and contaminants do not readily disperse through the Port into the offshore environment, as Facing Island acts as a barrier between the Port and open coastal waters.

The EIS states that elevated levels of metals and metalloids, particularly arsenic, mercury, manganese and nickel, are known to be naturally present within the sediments of the Port. Many of the metals present in the sediments have been derived from the natural underlying geology of the Port, rather than from an anthropogenic source, although the history of surrounding industrial and agricultural land uses has also likely influenced the nature of the sediments.

According to the EIS, acid sulfate soil (ASS) covers an area of approximately 3471 ha within Gladstone, consisting of 1466.5 ha of actual ASS and 2004.5 ha of potential ASS (PASS). ASS, naturally occurring in soils and sediments, typically occurs within the coastal zone and when left undisturbed and saturated with water, generally has limited environmental impacts. However, when ASS is disturbed through activities such as dredging and excavation and is exposed to the open air, it reacts with oxygen and produces sulfuric acid. This can result in the acidification of water and soil, and poor water quality, which in turn can result in fish kills and other detrimental environmental effects.

5.2.2 Issues raised in submissions

Key marine water quality issues raised in submissions on the EIS included the following:

- potential water quality impacts to marine flora and fauna and surrounding environments (including the GBRWHA) from dredging
- potential impacts resulting from the removal and handling of sediments containing ASS
- the need for additional sediment sampling to be undertaken prior to the commencement of dredging, to ensure the data is representative of current conditions.

I have considered each submission and the responses provided by the proponent in my evaluation of the project.

5.2.3 Methodology

Baseline water quality monitoring and modelling

A baseline water quality monitoring program was undertaken by the proponent for the EIS assessment from June 2014 to July 2015. The assessment analysed water quality conditions at a number of locations within and surrounding the Port across both the wet and dry seasons to both understand the current condition of marine water quality within the Port and to determine how the project could potentially change marine water quality during dredging.

The baseline water quality data collected by the proponent was used to develop WQOs and turbidity trigger levels for the project. It will be used to monitor when and how the project is influencing marine water quality and to determine appropriate management and/or mitigation strategies in response.

Baseline water quality monitoring data was also used by the proponent to undertake modelling of the project's potential impacts during capital dredging works and dredge material transfer. The modelling was undertaken for the 'expected case', 'worst case' and 'cumulative case' dredging scenarios, to demonstrate the full range of impacts potentially resulting from the project:

- the 'expected case' scenario represents the average potential change in turbidity and sediment deposition (build-up) during dredging activities across all modelled dredging scenarios
- the 'cumulative case' scenario represents the potential impacts of the project combined with typical port-wide annual maintenance dredging (dredging undertaken within the established shipping channels each year to allow ships to continually safely enter and exit the Port) and a 1 in 100-year flood event

  I note that the EIS states that dredging operations would not be undertaken during a significant weather event, including during floods. As capital dredging works are unlikely to be undertaken during a flood event, the level of impact predicted for this scenario is highly conservative and unlikely to materialise; therefore, this scenario is not considered further in this report.
- the 'worst case' scenario represents the highest potential change in turbidity and sediment deposition during dredging activities across all the modelled dredging scenarios.

I note that the 'worst-case' scenario is a conservative assessment based on the highest modelled change in turbidity and sediment deposition rates, with actual impacts likely to be lesser in magnitude than predicted. As such this scenario is also not considered further in this report.

Based on the modelling undertaken by the proponent, predicted water quality zones of impact for seagrass and corals for the project were developed. Zones of impact were developed based on the modelling of turbidity impacts to provide an indication of the potential level and extent of impacts to ecological receptors, such as seagrass and corals, from changes in turbidity as a result of dredging. The zones of impact and their corresponding level of impact are summarised in Table 5.1.

Table 5.1 Water quality zone of impact definition and corresponding level of impact for the project

Zone of impacts	Definitions	Level of impact for seagrass and corals
Zone of influence	Full extent of detectable plume (as measured by instrumentation)	No predicted ecological impacts
Zone of low impact	Excess turbidity from dredging activities **may** cause water quality to deteriorate beyond natural variation	Sub-lethal impacts to ecological receptors
Zone of medium impact	Excess turbidity from dredging activities **likely** to cause water quality to deteriorate beyond natural variation	Some mortality with recovery <12 to 24 months
Zone of high impact	Excess turbidity from dredging activities **most likely** to cause water quality to deteriorate beyond natural variation	Mortality of ecological receptors with recovery >24 months

Based on the information provided in the EIS, I am satisfied that the baseline water quality monitoring program, combined with the modelling undertaken for the EIS, is appropriate for this assessment.

Additional water quality monitoring sites

Due to data deficiency for some new water quality monitoring sites identified during the EIS assessment, the EIS states that turbidity trigger values for the new monitoring sites will be calculated as part of the water quality monitoring program prior to the commencement of project activities.

Water quality monitoring will also be used to inform the final DMP which will ensure that up-to-date water quality data metrics are reflected in management plans if there is a significant lag between project approval and construction start.

Sediment sampling

Baseline sediment sampling for a number of contaminants (including but not limited to arsenic, chromium, nickel and manganese) was undertaken between February and May 2015 within both the proposed channel duplication area and the WBE reclamation areas. Previous geotechnical assessments undertaken for the WBDDP were also considered as part of these investigations.

The proponent compared geochemical analysis results of the sediment to be dredged against the National Environment Protection Measure (NEPM) objectives (for onshore re-use of dredged material) and the National Assessment Guidelines for Dredging (NAGD) (for offshore disposal of dredged material). This found that the sediment is suitable for both on-shore re-use and off-shore disposal, as per the requirements of the NEPM and NAGD. The EIS concluded that as the contaminants within the dredge material are within the NAGD guidelines, the disturbance of the sediments during dredging is unlikely to pose any significant risk to water quality and the receiving environment.

I note that submitters raised concerns regarding the sediment sampling undertaken for the project, specifically its consistency with the NAGD and NEMP currency requirements and the need for further sediment sampling to be undertaken closer to the commencement of dredging.

The proponent has committed to performing additional sediment sampling prior to the commencement of dredging, where dredging is undertaken past the project sample validity period (five years). Additionally, I have stated a condition for the EA that requires results of updated sediment sampling to be provided to the administering authority (Appendix 2).

I am satisfied that, through the implementation of the commitment and conditions, any changes in sediment quality up to the commencement of dredging activities will be identified and addressed by the proponent, where necessary.

Based on the information provided in the EIS, I am satisfied that sediment sampling and analysis undertaken for the EIS are appropriate and adequate.

5.2.4 Impacts and mitigation

This section discusses the key potential changes to marine water quality that may arise during dredging, and evaluates the potential impacts associated with those changes as well as the mitigation and management measures proposed in the EIS.

The project has the potential to change marine water quality within and surrounding the Port, through the disturbance of sediments (and potentially contaminants, if present, within those sediments) from the sea floor during dredging. The project also has the potential to result in changes to existing marine water current speeds, wave activity and sediment build-up and erosion within the Port.

Potential impacts from the disturbance or release of sediments into the marine environment during dredging include the release of contaminants to the marine water column, increased algal blooms and toxicity to marine and intertidal flora and fauna. Zones of impact, which depict spatial areas of impact for ecological receptors (including seagrass and corals) are also discussed.

With regards to the removal and installation of navigational aids, the EIS predicted that the potential water quality impacts associated with the removal and installation of navigational aids would be minimal and localised. There may be a small amount of sediment disturbed during the removal and replacement process, however the EIS considers that any impact would not result in significant or ongoing changes to water quality. I am satisfied with the conclusions drawn in the EIS regarding potential impacts associated with the removal and installation of navigational aids. In consideration of the predicted level of impacts and the temporary nature of the work associated with the proposed removal and installation of navigation aids, no further discussion is provided in this report.

Expected case and zones of impact mapping

The proposed dredging to be undertaken for the project is as follows:

- Initial dredging works, undertaken over a period of six and a half weeks, to establish the barge access channel for the BUF
- Stage 1 dredging works, undertaken over a period of 33 weeks
- Stage 2 dredging works, undertaken over a period of 25 weeks.

The activities that have the potential to change marine water quality during dredging activities include the direct disturbance of sediments on the sea floor by the dredger head of the TSHD and CSD (where a CSD is utilised during the initial dredging works), overflow dredging by the barges (where excess water is drained from the dredged sediment and released back into the marine water from the barges) and propwash (water deflected off a propeller) generated by the TSHD.

The EIS predicted that during dredging, there would be increases in turbidity levels and sediment deposition rates within and surrounding the Port's limits, primarily within the shipping channels when they are being dredged and in the water in the immediate vicinity of the dredging work. Generally, the severity of impacts will decrease with distance from the dredge site.

Increases in turbidity levels and sediment deposition rates are also predicted to occur in areas outside of the Port and the outer shipping channels, where wave activity is higher. The EIS also predicted that wind and wave activity may move the sediments disturbed during dredging to the north of the Port along the eastern shores of Facing Island and Curtis Island. This would result in changes in water quality due to increased turbidity and sediment deposition in these locations (compared to natural conditions).

In terms of impacts to sensitive ecological receptors, the EIS predicted that the initial dredging works would result in a large zone of influence and relatively small zone of low impact, as shown in Figure 5.1. Based on the figures in the EIS, the zone of low impact would occur only within a small area immediately adjacent to the eastern face of the WBE and WB reclamation areas, while the zone of influence would extend beyond the initial dredging works footprint to the north and south within the Port (but still mostly within the Port's limits).

Sediment plumes are likely to be visible as a result of the initial dredging works, and there may be some sub-lethal impacts to ecological receptors such as seagrass and corals, if present, within the small zone of low impact shown in Figure 5.1. Sub-lethal impacts may include impacts to the ability of seagrass/corals to continue growing and reproducing, without resulting in death. The potential marine water quality impacts would be limited to a short duration (six and a half weeks) and would cease following the completion of the BUF and barge access channel.

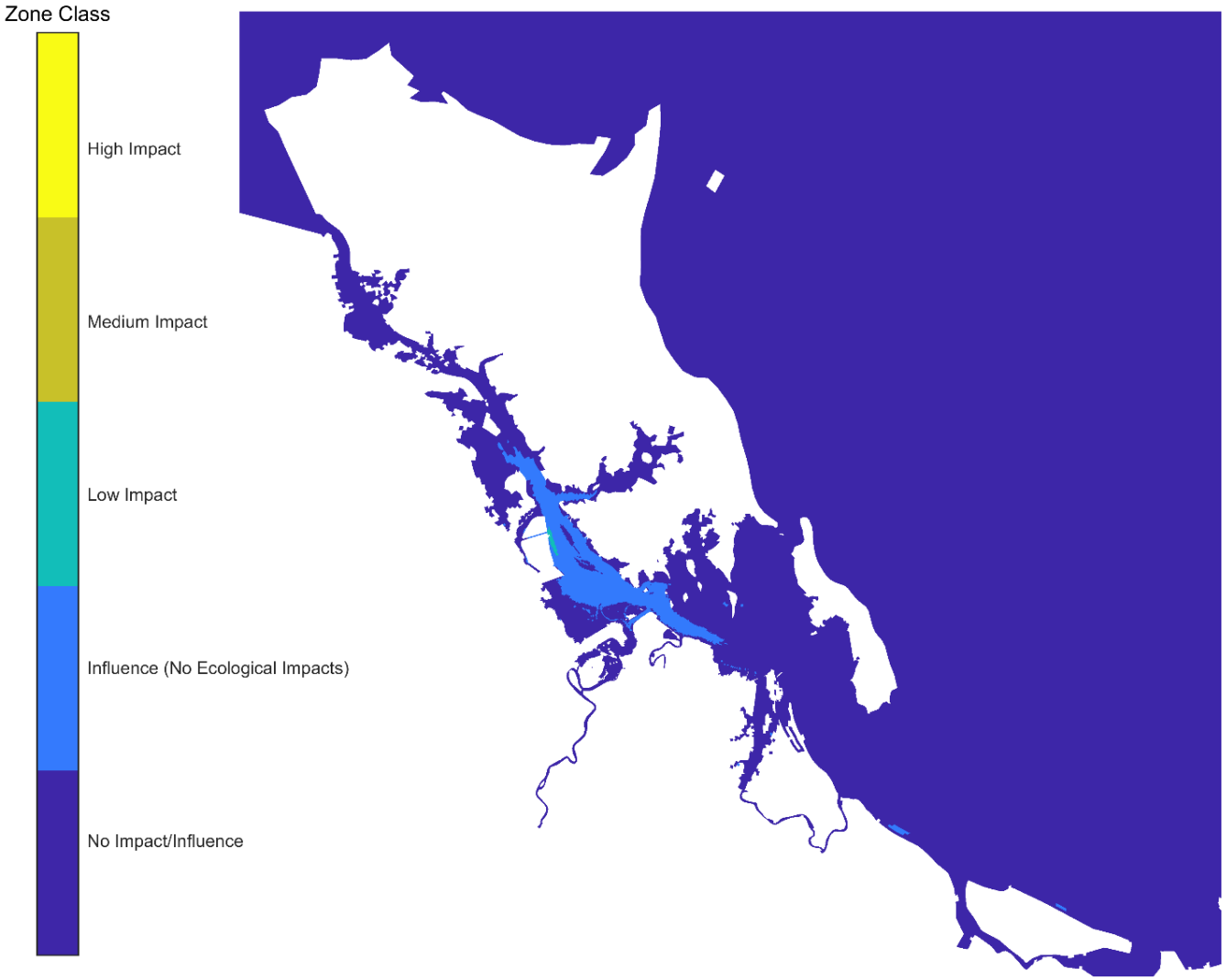


Figure 5.1 Initial dredging works water quality zones of impact

Sediment plumes are likely to be visible in these locations, however no ecological impacts to seagrass or corals are expected within this zone (outside of where it coincides with the low/medium/high zones of influence). The change to turbidity and TSS in this zone as a result of the project would not be enough to impact the ability of any seagrass and coral present within these areas to absorb light and continue surviving.

The EIS predicts that mortality of seagrass and corals is likely to occur, with recovery predicted to take from 12 to 24 months following the initial impact, within the zone of low impact and zones of medium and high impact. These zones are predicted to occur in the outer parts of the shipping channels (but still within the Port's limits), extending east and west from the proposed dredging works. The predicted extent of the zones of impact for Stage 1 and Stage 2 dredging is shown in Figure 5.2 and Figure 5.3.

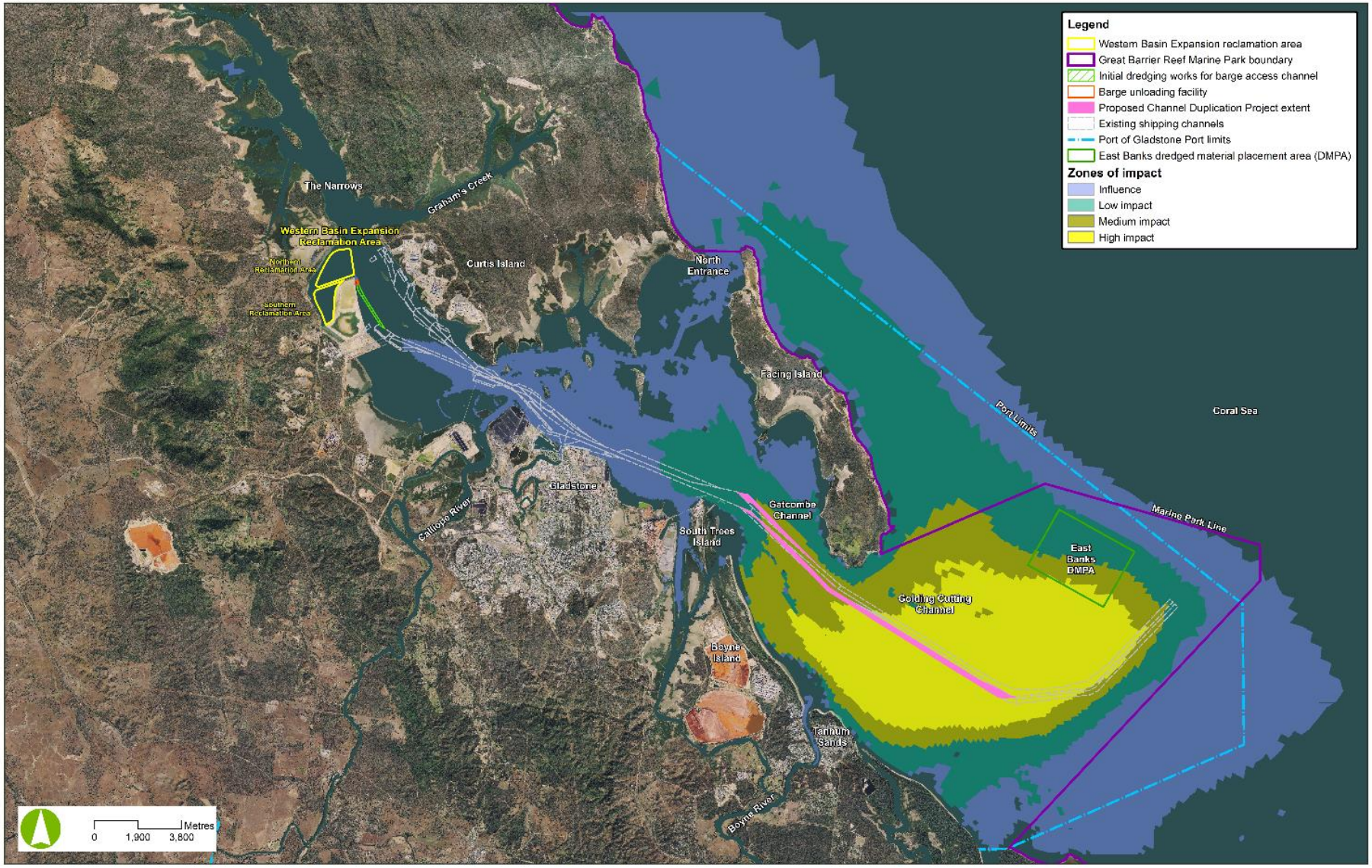


Figure 5.2 Stage 1 dredging water quality zones of impact

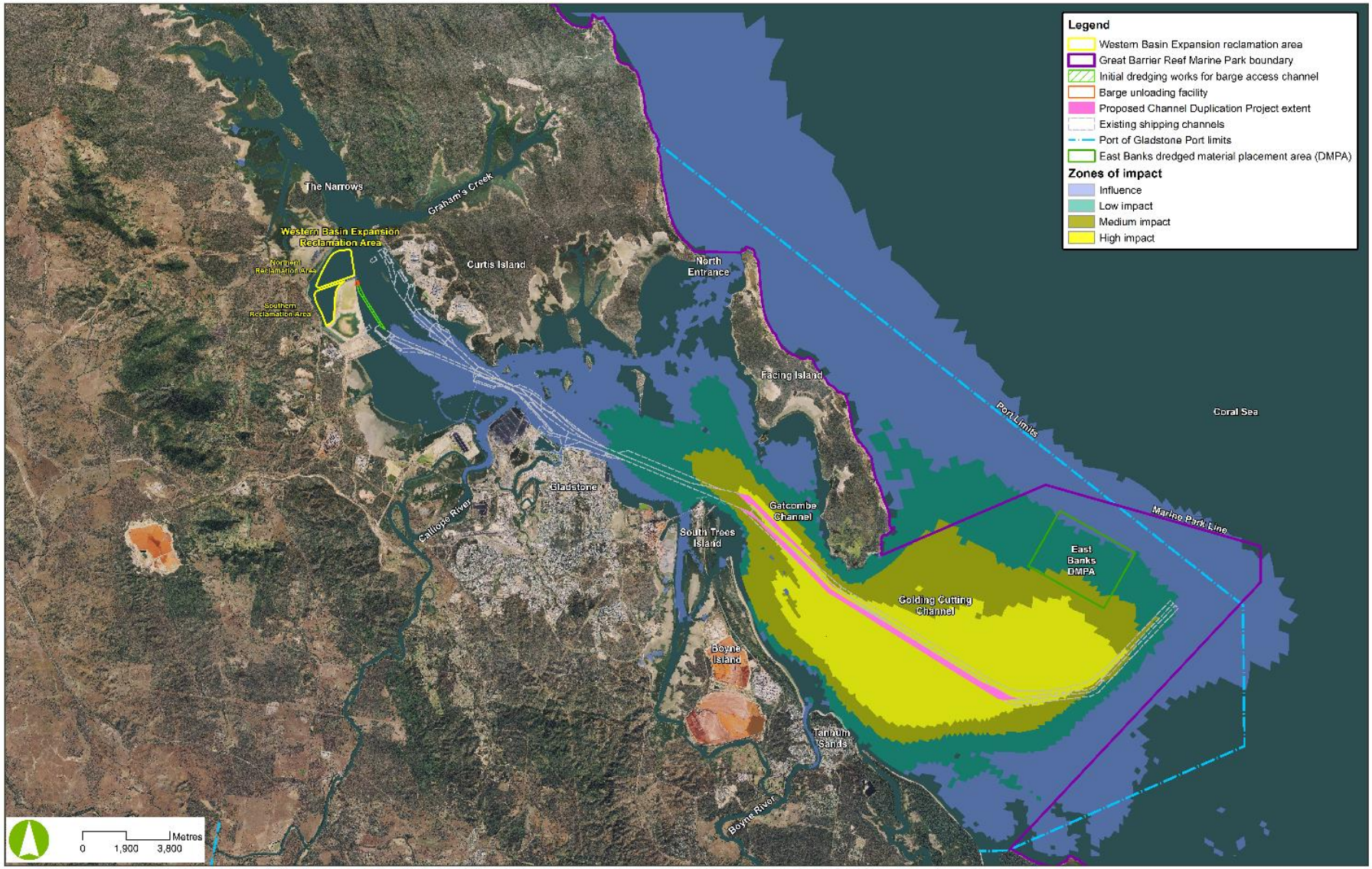


Figure 5.3 Stage 2 dredging water quality zones of impact

I note that submitters on the EIS raised concerns regarding the potential impacts of the project to marine animals and plants and the marine environment during capital dredging. The changes to turbidity and sediment deposition rates during dredging will impact any ecological receptors, including seagrass and corals, that are located within the low, medium and high zones of impact identified in the EIS. Further evaluation of the potential impacts to ecological receptors, including seagrass and corals, is provided in section 5.4 (MSES).

Cumulative impact assessment – capital dredging and maintenance dredging combined

The potential impacts associated with the proposed capital dredging works combined with a typical port-wide maintenance dredging campaign was also assessed. The EIS predicted that the project's impacts on cumulative turbidity and sediment deposition rates under this scenario would be slightly greater than the 'expected case' at the following locations:

- at the offshore East Banks DMPA, due to the maintenance dredge material being placed within the DMPA at the same time as capital dredging works under this scenario
- in offshore areas (due to wave-driven sediment resuspension and movement from the placement of maintenance dredge material in the East Banks DMPA) and the Jacobs Channel area
- in the vicinity of the WBE reclamation areas and in certain areas within the estuary.

Consequential impacts to port maintenance dredging requirements

The EIS states that the Port's average annual maintenance dredging volumes are currently around 260,000 m^3, where 65 per cent of the maintenance dredging regime occurs within the outer shipping channels and 35 per cent occurs within the inner channels. Maintenance dredge material is placed offshore within the existing East Banks DMPA, an area of approximately 1050 ha located within port limits outside of the GBRMP.

The EIS predicted that current maintenance dredging volumes are predicted to increase by approximately seven per cent as a result of the project, and that the water quality impacts associated with the additional maintenance dredging would be similar to current port maintenance dredging water quality impacts. Potential impacts associated with PASS in the increased maintenance dredge volumes are not predicted.

The increased maintenance dredging required as a result of the project would be regulated through an amendment to the Port's existing maintenance dredging EA, which allows for up to 1 Mm^3 of maintenance dredge material to be removed annually.

Acid sulfate soils

I note that submitters raised concerns with the potential for the project to encounter PASS during dredging activities, and the potential for impacts to occur while dredge material is being handled prior to its placement in reclamation areas. The EIS reported that there is a low presence of ASS in the material to be dredged and that there is sufficient self-neutralising capacity within the sediment to neutralise any acid generated during dredging activities. However, the EIS also identified that sediment sampled from two borehole locations within the channel duplication area to be dredged contained an elevated amount of net acidity and will likely require management.

Mitigation measures

Dredging – general

The proponent has committed to managing changes in water quality during capital dredging works through implementing a project-specific DMP and Environmental Monitoring Procedure. The project's Environmental Monitoring Procedure will detail trigger values for turbidity, benthic photosynthetically available radiation ((BPAR) the amount of light reaching the seabed) and toxicants (metals/metalloids), and implemented as part of the project's EA conditions, to assess the ongoing water quality within the Port during the capital dredging works.

The EIS confirms a Dredge Technical Reference Panel (DTRP) will be established before construction to provide recommendations and scientific advice for water quality management in the initial stages of the project, and to oversee the development and implementation of the Environmental Monitoring Procedure within the DMP. The DTRP will comprise experts in water quality, seagrass and benthic habitat as well as management, regulators and dredging technical advisors. The DTRP will be responsible for overseeing the dredging activities undertaken and the development and implementation of the DMP. The DTRP will also ensure that appropriate trigger levels are included in the application for an EA.

The DMP would provide a dredge-plant focussed environmental management plan to protect sensitive receptors for the entirety of the dredging program. It will include a description of a sediment plume-associated monitoring program, which will identify the locations in which ongoing water quality monitoring is to be undertaken, the water quality trigger values and alert values to be monitored and a description of the sampling methods and frequency. The DMP will also set out management actions to be initiated if the water quality trigger or alert values are exceeded, including the requirement to cease dredging where underwater light levels and/or turbidity do not meet the specific criteria. This would ensure that any changes in water quality due to sediment plumes from dredging are identified and managed to protect sensitive environmental receptors.

To address the potential impacts associated with sediment laden tailwater releases during dredging, the proponent will also be required to prepare and implement a receiving environment monitoring program (REMP). The REMP will monitor, identify, describe and respond to any adverse impacts to marine water quality, water flows, aquatic flora and fauna, corals and any receiving waters associated with capital dredging. The REMP will assess the condition of the receiving waters within the Port, identify the potential impacts of the project to the receiving environment and identify the environmental values to be protected. It will also include a description of the monitoring locations, water quality indicators and provide for near real-time monitoring of the sediment plume related indicators.

The Dredging EMP provided by the proponent as part of the EIS requires that, if external notification trigger levels at a designated monitoring site are exceeded continuously for a 24-hour period (or threshold levels for BPAR), DES and DAWE will be notified. Written advice will also be provided to DES and DAWE regarding the nature and likely causes of the exceedance of the trigger levels, and details of the management measures implemented by the proponent, if the changes to water quality are determined to be project-related.

Based on the information within the project's Environmental Monitoring Procedure submitted as part of the EIS, turbidity and BPAR levels will be monitored during dredging activities. When monitoring indicates that the relevant trigger levels (pre-determined values that once exceeded, initiate an alert) are being continuously exceeded over a 36-hour period, an investigation will be initiated to:

- validate the exceedance through investigating the monitoring equipment (to determine if the equipment is operating as it should)

- analyse and compare the monitoring data with background turbidity levels and the project's dredge plume modelling to further investigate whether the project is resulting in the changes to water quality.

  This will consider recent weather conditions, turbidity levels at monitoring sites located in areas that are not being impacted by the project (outside of the dredge plume extent), upstream monitoring and any anthropogenic influences.

Management measures will then be implemented and will remain in place until the water quality and/or BPAR levels are no longer above the relevant trigger level. Management measures would include (but may not be limited to):

- decreasing the average rate of dredging to reduce the amount of turbidity being released back into the environment
- the material being dredged will be assessed and where practical the dredger will be relocated or sequenced to dredge coarser material, to allow the finer sediment causing the exceedances of trigger levels to settle on the sea floor
- barges will reduce the overflow rate or stop working in overflow mode
- dredging equipment will be relocated to alternative areas of the channel duplication area to be dredged, to allow respite for sensitive receptors (such as seagrasses and corals) in the locations where trigger values are being exceeded.

Following this, if the change in water quality is found to be due to project activities, an environmental investigation will be undertaken by the DTRP and additional management measures will be implemented and a timeframe for their implementation will be agreed by the DTRP. This may include additional seagrass health assessments undertaken on the seagrass communities, to determine if the increased turbidity has caused a decrease in seagrass productivity and health.

A review of the implementation of the additional management measures will follow, and in the event that turbidity trigger levels continue to be exceeded or BPAR is reaching 'impact levels', the DTRP will consider further management measures to reduce turbidity. In the event that the additional measures fail to improve BPAR levels at seagrass monitoring locations, dredging activity will stop until BPAR levels return to acceptable levels.

Additional mitigation measures and commitments identified in the EIS include (but are not limited to):

- within three months of the commencement of dredging, the proponent will prepare a report validating the hydrodynamic modelling of the dredge plume, to ensure that the potential impacts of the project have been accurately predicted and considered
- the proponent will undertake a due diligence water sampling program during the three phases of the dredging program (pre, during and post) at all the project water quality monitoring sites. This data will be used to examine if any changes in water quality have been observed following the baseline monitoring undertaken for the EIS
- scheduling the timing of dredging, where practical, to reduce the likelihood for dredge plumes to impact on sensitive ecological receptors (including seagrass and corals), such as avoiding the late spring and early summer periods which represent key periods for seagrass growth
- dredging operations are to be undertaken in suitable conditions (i.e. within the operational parameters of the dredger, for example not during extreme weather events such as storm surges). If a severe weather warning is issued for the Port, project dredging works within the affected area are to cease

- ensuring the dredger always operates within the approved dredging footprint, therefore limiting the potential for impacts to occur outside of the predicted zones of impact identified in the EIS assessment
- barges are not to be overloaded to avoid dredge material spilling over the sides of the vessels into the marine environment and generating additional sediment plumes
- dredgers are maintained in good condition to ensure sediment-laden water is not unlawfully discharged back into the marine environment
- barges are to be fitted with 'green valves' to reduce turbidity. This would be done via reducing the amount of air in the water that is discharged from the barges during dredging, resulting in less turbulence as sediments move more quickly back to the sea floor.

Once the water quality and BPAR levels are within acceptable limits, a report will be provided to DES and DAWE within one month, describing the nature of the exceedance, the management measures implemented and any proposed amendments to the Dredging EMP and Environmental Monitoring Procedure.

Further discussion of the proposed mitigation measures to address potential impacts to sensitive ecological receptors, including MSES, resulting from changes in water quality during dredging are provided in section 5.4.

Acid sulfate soils

To address the potential impacts associated with encountering PASS and actual ASS (AASS) during dredging, the proponent has identified a number management actions in the EIS, including:

- dredging of identified PASS 'hot spot' areas during the early stages of dredging (where practicable) to allow strategic placement of PASS material to avoid environmental harm (i.e. placing the PASS deep within the reclamation area where it is likely to remain saturated and therefore become AASS)
- ensuring dredged material remains in a saturated state in the barges and during placement in the WBE reclamation areas to minimise the potential for oxidation
- decant water that is to be discarded into the Port will be done in accordance with approval conditions to avoid causing environmental harm
- placing maintenance dredged sediments in the East Banks DMPA within a period of less than 12 hours to limit the potential for oxidation and the generation of AASS.

Maintenance dredging

To address the potential consequential impacts to maintenance dredging from the project, the proponent has committed to:

- preparing and implementing a sediment sampling and analysis plan to determine the suitability of maintenance dredged material for marine placement. Contaminated material will be assessed to determine management options under the NAGD and sea dumping permit process
- undertaking a water quality monitoring program throughout maintenance dredging activities to ensure that WQOs are achieved.

5.2.5 Coordinator-General's conclusions: marine water quality

I am satisfied that the EIS has assessed the potential impacts associated with changes to marine water quality that would result from capital dredging works and dredge material transfer.

I note that the EIS predicted that the project would result in changes to water quality, with associated impacts to sensitive ecological receptors. Across the scenarios modelled for the assessment, capital dredging (initial dredging works, Stage 1 and Stage 2 dredging) would result in an increase in the natural turbidity and TSS levels across the Port, with the greatest impacts predicted to occur within the immediate vicinity of the Stage 1 and Stage 2 dredging works.

For the initial dredging works, sediment plumes are likely to be visible in the vicinity of the area in which the dredging works are undertaken, and there may be some sub-lethal impacts to ecological receptors. However, these sub-lethal impacts are only predicted to occur immediately adjacent to the eastern face of the WBE and WB reclamation areas and not extend outside of the Port's limits. The potential marine water quality impacts would also be limited to a short duration (six and a half weeks) and would cease following the completion of dredging for the barge access channel.

For Stage 1 and 2 dredging, sediment plumes will be visible within and surrounding the immediate vicinity of the capital dredging works, and wind and waves will cause the sediment plume to extend north within the Port, as well as beyond the inner Port channel areas towards to open ocean and north along the eastern side of Facing and Curtis Islands.

In these areas, there would be increases in turbidity levels and sediment deposition rates above the natural background levels. In terms of impacts to sensitive ecological receptors, the EIS predicted that there would be areas, primarily in the vicinity of the outer channels but still within Port limits, in which mortality of seagrass and corals (if present at the time of dredging) is likely to occur, with recovery predicted to take from 12 to 24 months following the initial impact. I find that this is an unavoidable impact associated with the capital dredging activities. Where the project will result in significant, unavoidable impacts to sensitive ecological receptors, the proponent will be required to provide offsets. Further analysis of the offsets required as a result of the impacts from dredging is provided in section 5.4.

To mitigate the project's impacts, any project generated changes in water quality during capital dredging will be managed through implementing the DMP incorporating the Environmental Monitoring Procedure. The Environmental Monitoring Procedure will require the assessment of the water quality within the Port on an ongoing basis during capital dredging. The Environmental Monitoring Procedure will outline a comprehensive procedure for ongoing monitoring of marine water quality and a program for investigating and responding to any exceedances of the project's water quality trigger levels. The mitigation measures that are to be applied in the event of any ongoing exceedances of water quality trigger levels will be subject to review and approval by the DTRP, which will comprise experts in water quality. In the event that the mitigation and management measures implemented by the DTRP fail to address any exceedances, dredging activity will cease until water quality returns acceptable levels.

The proponent has indicated that any ASS encountered during dredging would be managed through the development and implementation of a detailed site-specific project ASS management plan (ASSMP) which will be prepared in accordance with the Queensland Acid Sulfate Soil Technical Manual. Mitigation measures in the ASSMP are likely to include dredging ASS hotspot areas early in the dredging program, keeping PASS submerged to limit the potential for oxidation and formation of AASS.

The project is also predicted to result in a seven per cent increase in the Port's current annual maintenance dredging requirements; this will be managed through an amendment to the Port's current maintenance dredging EA.

In order to manage the project's impacts during capital dredging activities, I have stated a number of conditions (Appendix 2) for the project's EA that:

- limit the extent and duration of capital dredging activities

- require a report validating the hydrodynamic modelling of the dredge plume to be prepared and submitted to the DTRP and administering authority within three months of the commencement of dredging
- require the development and implementation of a DMP prior to the commencement of dredging, which is to include a description of dredging operations, a sediment plume monitoring program and trigger and alert values to be used to identify whether sediment plumes extend beyond the predicted zones of impact
- set water quality trigger levels and limits and require water quality monitoring at defined sensitive ecological receptor locations
- require a REMP to be developed and implemented to monitor, identify and describe and respond to any adverse impacts to surface water quality, water flows, aquatic flora and fauna, corals and any receiving waters. The REMP must be implemented prior to the commencement of project activities and not cease until after dredging is completed
- outline the minimum membership requirements for the DTRP and requirements for the membership and roles to be submitted to the administering authority.

I am satisfied that the potential changes to marine water quality and associated impacts during capital dredging and dredge material transfer can be managed through the conditions I have set in this report (Appendix 2) and the proponent's commitments at Appendix 4, the implementation of the DMP and Environmental Monitoring Procedure (including the mitigation measures identified in the EIS) and the establishment of the DTRP.

5.3 Coastal processes

Capital dredging works and the transfer of dredge material has the potential to impact on coastal processes, including wave activity, water currents and tides and hydrodynamics within and surrounding the port limits. This section evaluates these potential impacts and the mitigation and management measures proposed in the EIS.

5.3.1 Existing environment

Tidal hydrodynamics (horizontal and vertical movement of water caused by tides), sediment dynamics (motion of sediment particles during transport and deposition on the seabed), water levels and wave climate (wave characteristics in a particular location over a period of time) are natural coastal processes that influence coastal zones. These processes directly influence the physical form of coastlines, and for the Port, directly influence water quality and sediment erosion and accumulation patterns within the Port. The proposal to dredge over 12.85 Mm^3 of sediment and construct the WBE reclamation areas for the project may impact the existing coastal processes within the Port.

Facing Island and Curtis Island protect the inner port areas from the rougher offshore ocean wave conditions. As such, the inner port berths are considered to be within a sheltered estuarine environment, exposed only to locally generated waves, while the Port's outer harbour and offshore areas are exposed to larger waves and greater sea swells. Waves enter the Port from east and north-east directions, and the wind direction is mainly north-easterly to south-easterly with the strongest winds coming directly from the east of the Port.

The EIS states that the wave climate in the vicinity of the existing Fisherman's landing and WB reclamation area is relatively calm, which has resulted in the adjacent shoreline forming into a flat intertidal zone fringed by mangroves. The Boyne Island shoreline, located approximately 2 km to 4 km

west of the Gatcombe Channel, is more open to the ocean to the east and is exposed to higher energy wave conditions than the inner port.

Facing Island is also more exposed to the rougher open ocean conditions. The shoreline of Facing Island is characterised by rocky headlands and sandy beaches, with some intertidal mudflats and mangroves present on the more sheltered inner (harbour) side of the island.

Tides flow into the Port from the north (from Keppel Bay into The Narrows), east (between Facing Island and Curtis Island) and from the south of Facing Island, while the Calliope and Boyne Rivers and the Auckland and South Trees Inlets discharge water from inland into the central section of the Port.

Within the Port, tidal forces and currents are the main drivers behind the movement of sediments from the seabed. The highest current speeds are typically found in the vicinity of the existing shipping channels, particularly in the vicinity of the Gatcombe and Golding Cutting channels. Within the channels, the currents generally travel in parallel with the channel.

Sediment collects within the channels of the Port, as they are deeper than the surrounding seabed and less exposed to ocean currents and waves which move the sediments around. Because of this, the proponent is required to maintenance dredge approximately 260,000 m^3 of sediment from the existing shipping channels each year, to maintain sufficient depths within the channels to allow vessels to safely enter and exit the Port.

Material that is removed from the channels via maintenance dredging is placed in the existing approved offshore East Banks DMPA (located north of the outer harbour shipping channels within port limits, refer to Figure 2.1 in project description), where over time, wind and waves move the sediments placed within the DMPA gradually back into the Port's limits. Sediment sampling undertaken for the EIS revealed that the sediments to be dredged for the project are a mixture of gravels, sands, silts and clays.

To determine the potential coastal processes and hydrodynamics impacts of the project, the proponent prepared a suite of numerical models, validated by data collected in the field, to understand the existing wave, wind and sediment movement conditions and to simulate potential project related impacts to coastal processes and hydrodynamics.

5.3.2 Issues raised in submissions

Key coastal processes and hydrodynamics issues raised in submissions on the draft EIS included the potential for the project to result in increased sediment movement resulting in additional maintenance dredging requirements.

I have considered each submission and the responses provided by the proponent in my evaluation of the project. My response is provided below.

5.3.3 Impacts and mitigation

The project has the potential to result in changes to existing marine water current speeds, wave activity and sediment build-up and erosion within the Port. Potential impacts during dredging and dredge material transfer that may arise due to changes in marine water currents, wave activity and sediment build-up and erosion include changes to the depths of the existing shipping channels and the sea floor, and alterations to the form of adjacent coastlines.

Impacts to the established shipping channels

Water velocity impacts

In the vicinity of the Gatcombe and Golding Cutting Channels, the EIS predicted that, depending on the exact location, the project would result in slight reductions (approximately -0.25 to -0.15 metres per second (m/s)) or increases (approximately 0.25 to 0.2 m/s) in current speeds within and surrounding the existing shipping channels, as shown in Figure 5.4. A reduction in current velocity has the potential to result in increased sediment accumulation, while increases in water velocities may result in increased erosion of sediments, where those impacts are precited to occur. Further discussion is provided in the sediment dynamics section below.

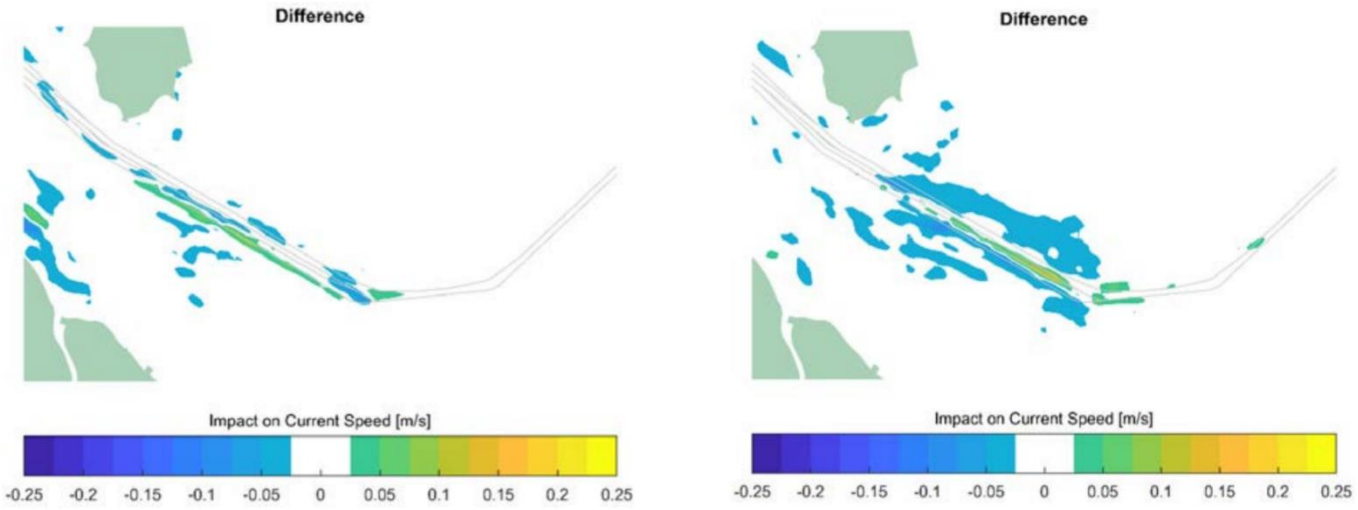


Figure 5.4 Change to the flood tide (incoming tide) peak spring velocity (let) and ebb tide (outgoing tide) peak spring velocity (right)

I note that based on the modelling shown in the EIS, the predicted changes in current velocities in the vicinity of the shipping channels would occur in areas that are already either naturally slow or fast flowing. Therefore, any changes (either marginal increases or decreases in current speed, depending on the location) would not be significant in terms of variation from the existing conditions within the Port's limits.

Wave climate

The project is predicted to slightly modify significant wave heights (the average height of the highest waves over a given period) in the immediate vicinity of the channels. The EIS predicted that the deepening of the channels would cause some additional wave refraction (movement and bending) for waves from the east, a very slight reduction in wave height to the southwest of the duplicated channels and a corresponding increase in wave height within the duplicated channels.

The EIS concluded that these impacts would occur primarily within or in the immediate vicinity of the shipping channels and therefore would not result in significant impacts such as changes to wave-driven sediment movement or changes to the form of adjacent shorelines, including the Facing Island and Boyne Island shorelines.

Sediment dynamics

The EIS assessed the potential change in sediment erosion and accretion (build-up) rates within the existing shipping channels, finding that sediment build-up would increase within the Golding Cutting section of the channel as a result of the project. This is due to the project increasing the depth of the

channel, which will reduce the ability of tidal currents to erode sediment from the bottom of the channel at the sea floor.

Following the duplication of the Gatcombe and Golding Cutting channels, the EIS predicted that annual sedimentation rates will increase by approximately seven per cent, which will result in an associated increase in the amount of sediment to be dredged during current typical annual port maintenance dredging campaigns. Annual maintenance dredging removes approximately 260,000 m^3 of sediment each year at the Port. The proponent has estimated that future maintenance dredging requirements for the Port, following the completion of the project, would total approximately 278,200 m^3.

I note that submitters raised concern with the project's potential impacts on the annual maintenance dredging requirements for the Port, and that the EIS reported that residents of Facing Island have previously expressed concerns regarding ongoing siltation issues in the small harbour at the southern end of the island. Disposal of dredge material is permitted under the Ports Act and the proponent holds a current *Sea Dumping Permit under the Environment Protection (Sea Dumping) Act 1981* (Cwlth). The additional maintenance dredging required for the project will also be regulated through an amendment to the proponent's existing EA for maintenance dredging activities.

The EIS predicted that, with the exception of areas within and in the immediate vicinity of the shipping channels, the project is unlikely to result in changes to existing sedimentation rates which are easily detectable above the natural variation within the Port, including at the small boat harbour at the southern end of Facing Island.

The proponent has committed to monitoring sedimentation rates at the Facing Island Harbour before, during and after the project to ensure any potential impacts from dredging to sedimentation are identified and addressed where required. Measures to address any potential impacts may include increasing the use of a drag bar (which drags sediment from areas of 'high' build-up to areas to 'low' build-up) to maintain the desired depth of the harbour, as is currently periodically undertaken by the proponent.

5.3.4 Coordinator-General's conclusions: coastal processes

I am satisfied that the EIS has assessed the project's potential coastal processes and hydrodynamics impacts as a result of capital dredging works.

I note that the EIS predicted that the project would result in changes to existing current speeds and wave activity within and immediately outside of the established shipping channels. Sediment build-up would increase within the Golding Cutting section of the channel as a result of the project's impacts to current speeds and wave activity, which will necessitate a seven per cent increase in the Port's annual maintenance dredging requirements. Despite this, none of the predicted impacts to current speeds or wave climate are expected to change significantly from the existing characteristics within port limits, nor result in significant changes to adjacent shorelines. The additional maintenance dredging required for the project will be regulated through an amendment to the proponent's existing EA for maintenance dredging activities.

For areas within the Port's limits that are outside of the shipping channels, including the small boat harbour at the southern end of Facing Island, the project is not expected to have impacts which are easily detectable above the natural variation. The proponent has committed to monitoring sedimentation rates at the Facing Island Harbour before, during and after the project to ensure any potential impacts are identified and addressed.

I am satisfied that, through the implementation of the proponent's commitments at Appendix 4 and the mitigation measures outlined in the EIS, potential impacts to coastal processes and hydrodynamics will be managed to avoid unacceptable impacts.

5.4 Matters of state environmental significance

This section addresses the potential impacts of dredging works and material transfer on prescribed environmental matters that are MSES.

The MSES potentially impacted by dredging works and the transfer of dredge material to the proposed reclamation area include:

- marine plants:
  - a marine plant within the meaning under the Fisheries Act
- wetlands:
  - a wetland that occurs in a wetland protection area (WPA) shown on the map of referable wetlands
  - a wetland of high ecological significance (HES) shown on the map of referable wetland
  - a wetland in high ecological value (HEV) waters
- protected wildlife habitat:
  - a habitat for an animal that is listed as endangered or vulnerable wildlife, or a special least concern animal under the *Nature Conservation Act 1992* (NC Act)
- fish habitat areas:
  - an area declared under the Fisheries Act to be a fish habitat area.

Four submissions on the draft EIS identified issues associated with impacts to MSES as a concern. The detail of submission have been considered by topic throughout this section.

5.4.1 Overlaps with Commonwealth matters

The Port operates within the GBRWHA and is known to support a diverse range of marine and coastal flora and fauna which contribute to its local expression of OUV and are also listed threatened and migratory species under the EPBC Act which are MNES.

This includes marine plants (mangroves, seagrass and macroalgae); marine mammals (dolphins, whales and dugongs); marine turtles, fish and sharks; and marine birds (seabirds and shorebirds).

As all these values are MNES, they will be assessed as part of a 'controlled action decision' by the Commonwealth Minister for the Environment. See chapter 4 of this report for more details about the Commonwealth assessment process.

As many of the matters being assessed by the State which are MSES are also MNES, any conditions proposed by the Commonwealth will also be relevant to any overlapping MSES values.

For example, seagrass is both MNES and MSES, as it is:

- an attribute that contributes to the OUV of the GBRWHA
- a foraging resource for listed threatened and migratory species under the EPBC Act
- a prescribed environmental matter that is an MSES under State legislation (i.e. subject to assessment under State Code 11 (Removal, destruction or damage of marine plants) of the State Development Assessment Provisions (SDAP) of the Queensland Planning Act).

For this project the Commonwealth Minister will assess the project's impacts on seagrass, as both a value that contributes to the OUV of the GBRWHA and as a foraging resource for listed threatened and migratory species.

In their assessment the Minister will also consider the principles of ecological sustainable development. This would include the project's potential impact on seagrass regarding the ecosystem services it provides including a source of food for humans through fisheries, carbon sequestering and nutrient cycling that support the health of marine ecosystems and the planet.

This chapter only evaluates potential impacts to environmental values which are MSES; however, links to where matters may overlap with MNES are discussed where relevant.

It should be noted that under the *Environmental Offsets Act 2014* the State cannot duplicate conditions for offsets for prescribed environmental matters that are MSES where the Commonwealth has provided conditions requiring offsets for the same or substantially the same impact and the same or substantially the same prescribed environmental matter.

As such, to ensure best environmental outcome for affected values, the analysis in this chapter has included considerations of both Commonwealth and State laws and protocols about environmental impacts and a complementary degree of consent, control, prevention and offset has then been applied in conditions set in this report.

As such, conditions included in this chapter complement and do not conflict with anticipated future conditions that will be included in the Commonwealth's separate assessment of MNES. This would ensure the best environmental outcome for the impacted matters by aligning the regulatory requirements.

5.4.2 Marine plants

Marine plants as defined under the Fisheries Act include the following:

- a plant (a tidal plant) that usually grows on, or adjacent to, tidal land, whether it is living or dead, standing or fallen
- the material of a tidal plant, or other plant material on tidal land
- a plant, or material of a plant, prescribed under a regulation or management plan to be a marine plant.

Marine plants include mangroves, seagrass, samphire, salt-couch and saltmarsh, algae and other tidal plants growing adjacent to the tidal zone.

Issues raised in submissions

Key issues raised in the submissions on the EIS regarding impacts to marine plants include:

- the need to revise impact values provided in the EIS for marine plants
- lack of appropriate reference sites (i.e. in an area that would be not impacted by dredging activities) for proposed water quality monitoring sites

I have considered each submission and the responses provided by the proponent in my evaluation of the project in the sections below.

Presence and distribution in the project area

Intertidal plants (mangroves, samphire and saltmarsh)

There are no mangroves, samphire or saltmarsh plants within the proposed dredging footprints within the main and barge access channels.

However, these types of marine communities are present along the shoreline on the inside of Facing Island and intertidal areas on South Trees Island which are located to the north and south of the proposed dredging works in the main channel.

These communities are also present along the shoreline on Curtis Island adjacent to the barge access channel. The location of these communities is shown in Figure 5.5.

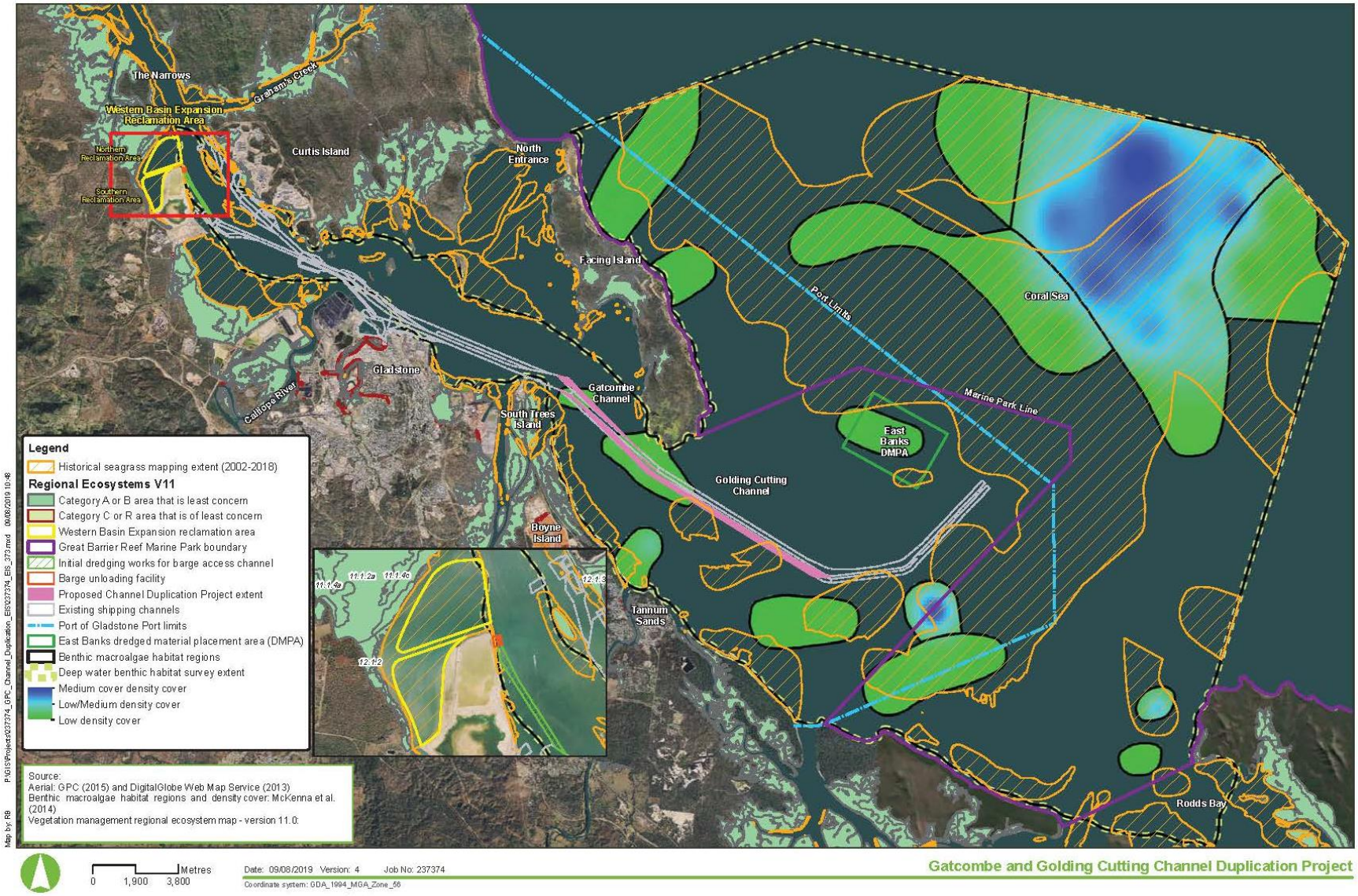


Figure 5.5 Location of marine plants in the project area

Seagrass

Due to the presence of Curtis and Facing Islands and Rodds Peninsula which protect the inner areas of the Port from wind and wave action, the Port provides optimal growing conditions and supports large areas of seagrass.

Seagrass has been well studied in the Gladstone region and annual monitoring undertaken by the James Cook University TropWATER seagrass group in partnership with GPC has been ongoing since 2002.

The data captured by this monitoring indicates that seagrass meadows are widely distributed across the Port from The Narrows in the north; to Rodds Bay in the south.

The largest and historically densest areas of seagrass are found in the mid-harbour around Pelican Banks and South Trees Island to the north and south of the proposed dredge footprint.

Seagrass surveys in 2009 indicated that seagrass meadows in the Port and Rodds Bay covered an area up to 12,000 ha; however, this area has declined significantly due to repeated extreme weather and flooding events which occurred between 2010 and 2011 and again in 2013, which resulted in large scale losses of seagrass across the region.

Seagrass surveys in 2013 indicated that within the Port there had been more than a 50 per cent reduction in the area of coastal seagrass and a 75 per cent reduction in the area of deep-water seagrass post flooding events.

While some recovery of the seagrass meadows in the Port has occurred since, some areas still appear to be recovering almost a decade later.

During 2018, 3,558 ± 466 ha of seagrass meadows were mapped within the limits of the Port, with an overall satisfactory health score (based on extent, density and species composition) which is an improvement from recent years. Recovery of seagrass beds in the Port has been slow due to the reduced resilience of seagrass from flooding events and the small area of seagrass that was left remaining to recover following these events.

The seagrass meadows in the Port (Figure 5.5) are considered to be of regional significance as they:

- are the only known major area of seagrass between Shoalwater Bay and Hervey Bay which are approximately 170 km north and 170 km south of this area respectively
- have high ecological and economic value, providing important habitat for:
  - a range threatened and migratory marine fauna (i.e. key food source for dugongs and green turtles)
  - commercial, indigenous and recreational fishery species (i.e. nursery ground for fish, prawns and crabs).

Five species of seagrass, including coastal shallow water species (*Halodule uninervis* and *Zostera muelleri*) *and* deep-water (*Halophila decipiens*, *Halophila. ovalis*, *Halophila spinulosa*) have been recorded throughout the Port, with *Zostera muelleri* being the most dominant species recorded in coastal meadows during the most recent surveys in 2018. This species has the highest light requirements and is most sensitive to increased turbidity.

Long-term survey data indicates that the extent and distribution of seagrass within the Port is highly variable, and that seagrass meadows in the Port undergo distinct seasonal changes as well as significant inter-annual changes in distribution, abundance and species composition.

The high variability can be attributed to the seasonal nature of seagrass growth between wet and dry seasons, and susceptibility to extreme weather events (flooding and cyclones) which can result in substantial declines in seagrass biomass and changes in species composition.

It is considered that there are two generalised seasons characterised for seagrass in the Gladstone region including the:

- growing season between July and January (during the dry season) when the biomass typically increases in response to favourable conditions for growth (i.e. less turbid conditions due to less rainfall and runoff from the land)
- senescent season between February and June (during the wet season) when seagrass stop growing and rely on stores and/or seeds when growing conditions are typically poor as a result of poor water quality associated with high rainfall and flooding events.

Annual surveys indicate that seagrass is present in the main channel in some years and absent in other years. For example, in 2018, seagrass was not recorded in the area proposed to be dredged in the main channel; however, has been previously recorded in this area during other earlier surveys.

No seagrass was identified in the proposed barge access channel and BUF during 2018 surveys; however, has been observed in this area historically (but not since 2002).

While there are historic records, the EIS concludes the impact area for the proposed BUF and barge access channel was included in the approval for the WBDDP and is therefore excluded from the project impact assessment.

It is considered that this meadow was included in the 84 ha of potential seagrass proposed to be permanently removed as part of the Fisherman's Landing Port Expansion Project (which formed part of the broader WBDDP). While I have accepted this conclusion, I have required the proponent to undertake additional seagrass surveys in the Port prior to dredging to determine the area of seagrass that would be impacted by the project.

The historical distribution of seagrass in the Port between 2002 and 2018 based on long-term survey work in the Port is shown in Figure 5.6.

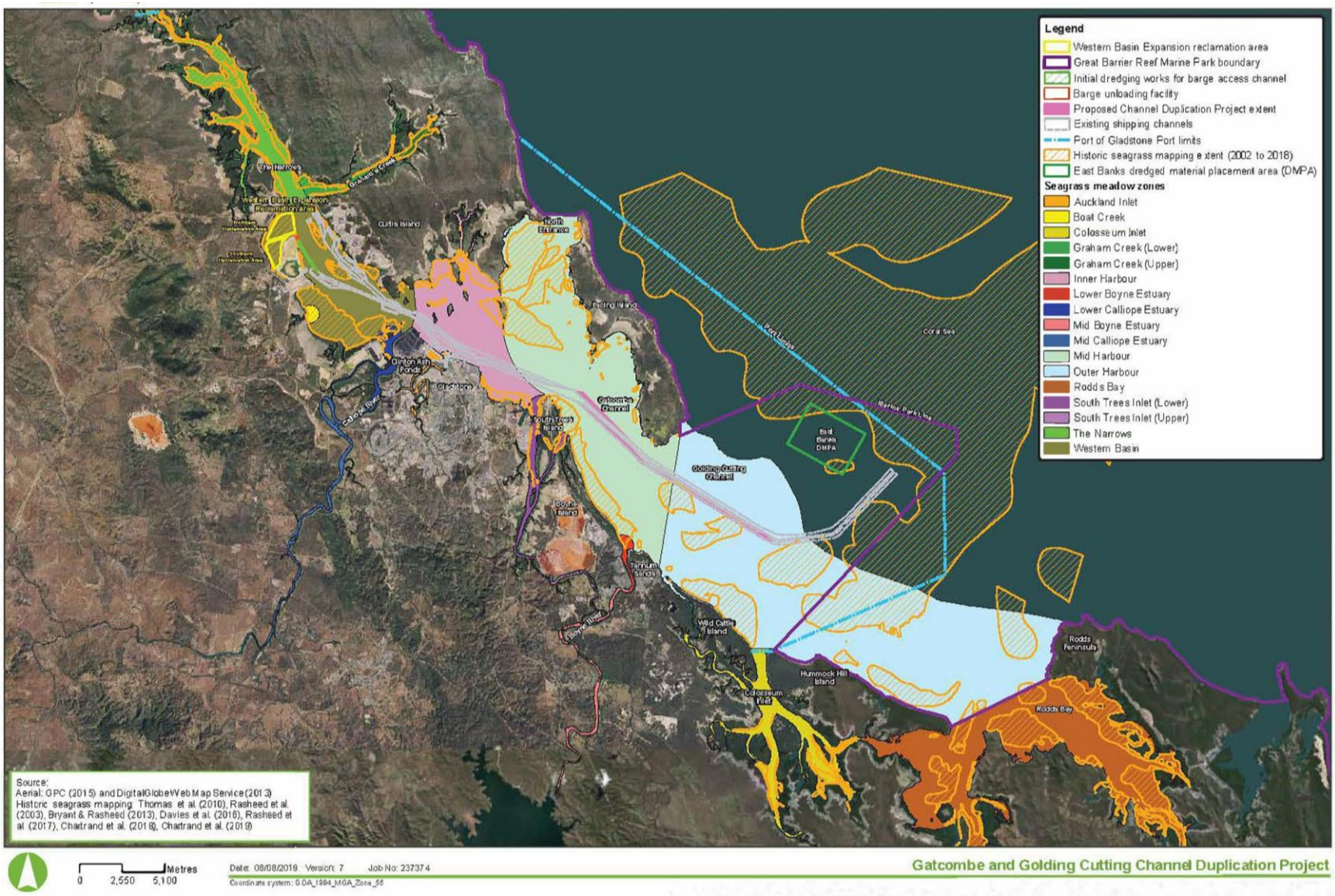


Figure 5.6 Historical extent and distribution of seagrass in the Port (2002 to 2018)

Macroalgae

Macroalgae is a collective term for seaweeds and other benthic (occurring on the seabed) marine algae that are visible to the naked eye. Macroalgae differ to other marine plants such as mangroves and seagrass in that they don't have roots, leafy shoots, flowers or vascular (water and nutrient conducting) tissues.

These marine plants are found in a wide variety of habitats, including coral reefs, inter-reef areas, sandy bottoms, seagrass beds, mangrove roots, and rocky intertidal zones. With a few exceptions macroalgae typically grow attached to hard surfaces and are also known to grow attached to seagrass leaves.

Based on desktop analysis and benthic macroalgae surveys undertaken as part of deep-water surveys in 2002 and 2013, macroalgae was identified at various locations within the Port including the main shipping channel.

Surveys undertaken in 2013 mapped 26,008 ha of macroalgae in the Port. These macroalgae communities were found occurring in aggregated patches throughout the survey area and were of a low to medium density within and surrounding the shipping channels.

No macroalgae have been recorded within the proposed barge access channel and BUF footprints. The location of the macroalgae communities in the project area are shown in Figure 5.5.

Impacts and mitigation

The EIS indicates that the project would result in the permanent loss and alteration of seagrass and macroalgae habitat associated with the direct removal of seabed material within the main channel.

The project would also be expected to have an indirect impact on seagrass and macroalgae as a result of changes to water quality and rates of sediment deposition and hydrodynamics associated with dredging activities.

A detailed evaluation of the potential water quality impacts and impacts on coastal processes and hydrodynamics is provided in chapters 5.2 and 5.3 of this report.

Direct removal or/loss of marine plants

In this section the 'direct removal of/loss of' means an activity that will involve irreversible loss of marine plants, where irreversible means 'lacking a capacity to return or recover to a state resembling that prior to being impacted within a timeframe of five years or less'.

Direct impacts occur predominantly within and immediately adjacent to the dredging footprint where dredgers excavate the seabed.

Intertidal plants (Mangroves, samphire or saltmarsh)

Dredging works within the main and barge access channels are not expected to directly impact on mangroves, samphire or saltmarsh plants. The areas proposed to be dredged are offshore and not located within the intertidal zone where these types of marine plants occur.

Seagrass and macroalgae

The proposed area to be dredged in the main channel is approximately 247.8 ha, which increases the area of the channel to 382 ha. Only a portion of the channel will be dredged as part of the project as parts of the existing channel (approximately 134 ha) are already at the maximum required depth of -16.1 m LAT.

Submitters on the draft EIS raised concern regarding the estimated impact figures provided for seagrass. The impact figures were based on the area of seagrass habitat recorded in the Port during 2017 surveys, which is not considered to be appropriate given that the distribution and extent of seagrass is highly variable.

In response to the submissions, the proponent revised the estimated impact figures, based on the historical distribution of seagrass (i.e. between 2002 and 2018). Based on the revised estimates, capital dredging works within the main channel could have a direct impact on a total of 85.33 ha of marine plants comprising 35.65 ha of deep-water seagrass and 49.68 ha of macroalgae.

This area is also predicted to be disturbed annually/or as required during future maintenance dredging campaigns which is likely to impact on the recovery of marine plants in this area.

As discussed in chapter 5.3 of this report, the overall net annual increase in siltation within the new channels is expected to increase by seven per cent (18,200 m^3) and maintenance dredging of this material would be required to maintain the new channel depth. This impact is therefore expected to be a permanent loss.

To ensure these permanent impacts are minimised, I have stated conditions to be attached to the EA and the preliminary approval for any development permit for removal, destruction or damage of a marine plan which require that dredging is only permitted within the area proposed in the EIS.

Due to the transient nature of seagrass meadows in the Port, I consider that the total impact area on marine plants may be different at commencement of dredging activities. The EIS included a commitment to resurvey seagrass and macroalgae in this area prior to dredging works to determine the impact at the time of dredging.

I have agreed that this approach is acceptable and have also stated conditions to be attached to the preliminary approval (marine plant permit) requiring the proponent to undertake additional seagrass surveys in the Port prior to dredging to determine the actual area of seagrass that would be impacted by the project.

As marine plants are also an MNES, the project's direct impacts will also be considered and addressed in the Commonwealth's assessment.

Indirect impacts on marine plants

In this section indirect impacts refer to the effects of dredge-generated sediments which generally extend over areas surrounding dredging footprints, and occur when elevated turbidity and/or sediment deposition rates exceed the natural tolerance levels of marine plants that are exposed to those pressures.

The indirect effects of dredge-generated sediments may restrict or inhibit key ecological processes and may be either irreversible or reversible.

Water quality impacts

Dredging works in the main channel

The Port is a naturally turbid environment with highly variable turbidity levels both temporally and spatially. The turbidity levels in the Port generally range from 0 to 20 Nephelometric Turbidity Units (NTU) with the potential to increase above 50 NTU during the wet season.

These turbidity levels are influenced by a combination of factors including season, tidal range, wind speed/direction and catchment runoff.

Due to the large tidal range and high tidal current velocities the port experiences levels of flushing which maintain good water quality and optimal conditions for seagrass most of the time.

The mechanical removal of seabed material from the main channel by the TSHD would be expected to increase suspension of suspended solids in the water column, with:

- approximately 4 per cent of fines in the material being dispersed at the dredger head as material is disturbed and resuspended by propeller wash.
- approximately 80 per cent of the fines in the dredged material being released as overflow from the dredger as the sediment/seawater mix fills the hopper of the dredging vessel.

Impacts on marine plant communities (e.g. seagrass and macroalgae) and other sensitive receptors (e.g. coral) caused by sediments released to the water column from dredging activities can be divided into two broad categories:

- sediment in the water column (turbidity)–can reduce the quantity and quality of light available at the seabed for photosynthesis (a process where marine plants turn sunlight into energy for biological processes). A significant reduction in light for extended periods can limit growth or result in mortality
- sediment deposited on the sea-bed–settlement of suspended solids out of suspension can also result in the burial and smothering of these communities which can limit growth or result in mortality.

The extent, severity and persistence of impacts on ecological communities associated with the suspended sediment plumes generated by dredging is dependent on the intensity, duration and frequency of the sediment-related pressure imposed by dredge plumes, and the tolerances/susceptibilities of the impacted communities.

The proponent collected 13 months of continuous baseline water quality data at various locations in the Port between 1 June 2014 to 5 July 2015 to inform the EIS.

This baseline data has been used to describe the existing environment; calculate water quality trigger values for use during dredging and material placement works, and to potentially refine the WQOs assigned to the area.

The monitored sites were strategically positioned over eight locations to ensure baseline data was collected at suitable locations including near sensitive receptors that are likely to be impacted by dredge plumes generated by the capital dredging works.

Using dredge plume modelling with the baseline data input, the proponent was able to predict the modelled zones of high, medium, and low impact and the zone of influence for seven scenarios including ‘expected case’, ‘worst-case’ (highest potential change in turbidity and sediment deposition) and ‘cumulative case’ dredging scenarios.

This chapter only evaluates the predicted impacts under the expected case scenario, as the other scenarios are highly conservative and unlikely to materialise. The other scenarios are discussed in more detail in chapter 5.2 of this report.

The predicted water quality zones of impact provide an indication of the potential level and extent of impacts to ecological receptors, such as seagrass, macroalgae and corals associated with changes to turbidity levels.

For the purposes of the assessment these zones of impact only relate to potential impacts from suspended sediment (turbidity) in the water column.

The zones of impact and their corresponding level of impact are summarised in Table 5.2, and the predicted extent of these zones in context to the location of seagrass meadows is shown in Figure 5.7.

Table 5.2 Water quality zone of impact definition and corresponding level of impact for the project

Zone of impact	Definition	Level of impact for seagrass and corals*
Zone of influence	Full extent of detectable plume (as measured by instrumentation)	No predicted ecological impacts
Zone of low impact	Excess turbidity from dredging activities **may** cause water quality to deteriorate beyond natural variation	Sub-lethal impacts to ecological receptors
Zone of medium impact	Excess turbidity from dredging activities **likely** to cause water quality to deteriorate beyond natural variation	Some mortality with recovery < 12 to 24 months
Zone of high impact	Excess turbidity from dredging activities **most likely** to cause water quality to deteriorate beyond natural variation	Mortality of ecological receptors with recovery > 24 months

Table note: *The recovery time outlined for the various zones of impact should be considered indicative only, noting that recovery timeframes are dependent on a range of factors.

Zone of high impact

The predicted zone of high impact includes the areas in the immediate vicinity of the dredging in the main channel and extends approximately 1 km in a north-west direction of the Gatcombe Channel and approximately 2 km south-east from the Golding Cutting Channel.

The zone of high impact also extends 6 to 7 km in both east and west directions from the Golding Cutting Channel. Predicted turbidity levels in this zone are high enough (8 to 16 NTU above ambient levels under the 50th percentile) to cause light levels to drop below the biologically tolerable limits for deep water seagrass.

Based on the modelled zone of high impact it is predicted that dredging works in the main channel could indirectly impact on approximately 1664.03 ha of marine plants including 876.98 ha of seagrass and 787.05 ha of macroalgae.

While some temporary losses of seagrass may occur in this area, the EIS considers that recovery could potentially occur over a period greater than 24 months after dredging has ceased.

The permanent loss of deep-water seagrass and macroalgae within the zone of high impact is unlikely due to the implementation of adaptive management measures contained in the Environmental Monitoring Procedure (such as halting dredging works or moving the dredger to another location).

Zone of medium impact

The predicted zone of medium impact extends to the seagrass meadows east of South Trees Island and Boyne Island and small sections of the seagrass meadows near Quoin Island.

While short-term increases in turbidity levels in this zone (6 to 8 NTU above ambient under the 50th percentile) may result in some losses of seagrass within this area, dredging works are not expected to have a long-term impact on these meadows and seagrass would be expected to recover within 12 to 24 months after dredging has ceased.

The permanent loss of seagrass and macroalgae within the zone of medium impact (i.e. indirect impact area) is unlikely due to the implementation of adaptive management measures contained in the Environmental Monitoring Procedure.

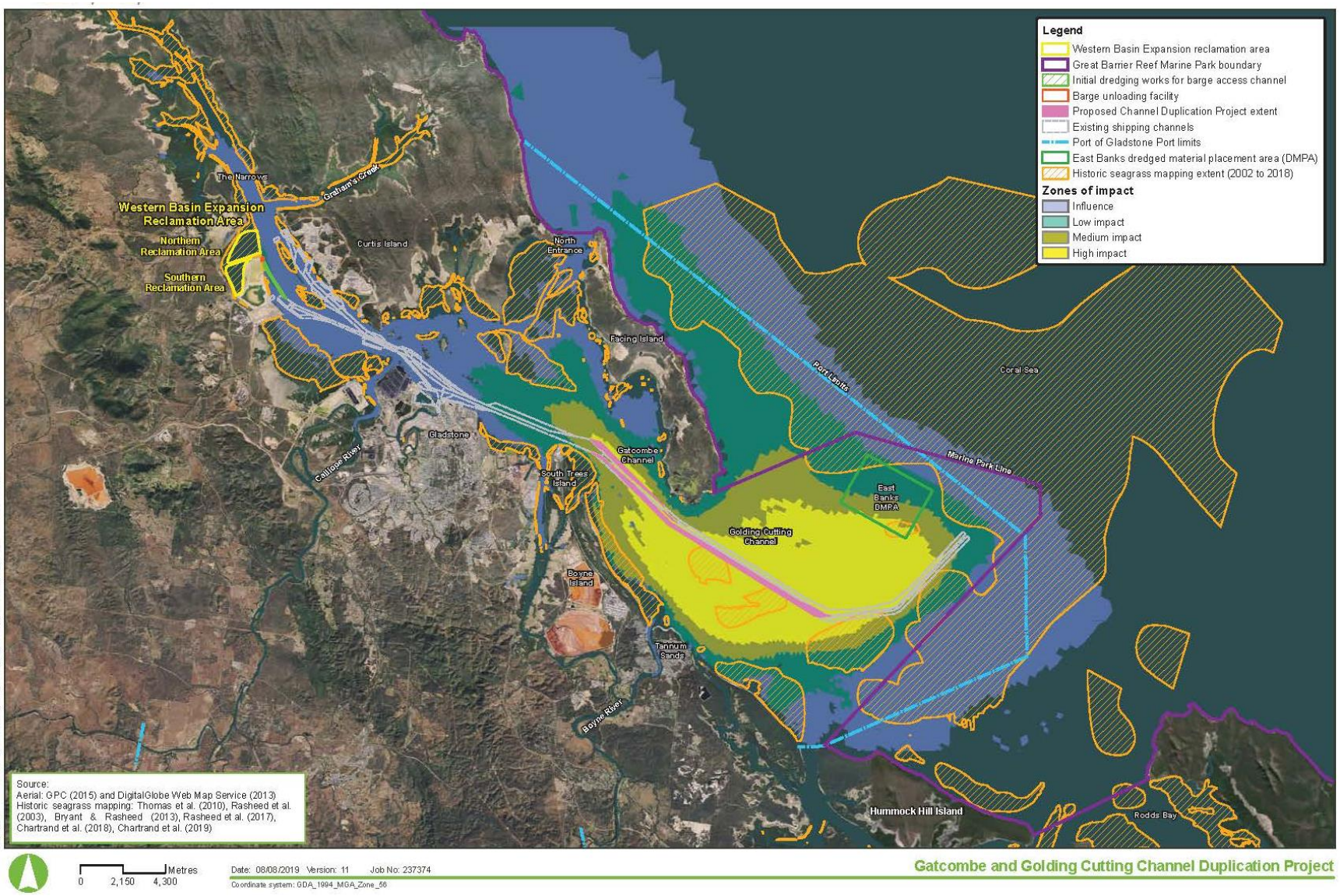


Figure 5.7 Seagrass meadows within the predicted zones of impact for stages 1 and 2 dredging

Zone of low impact

The predicted zone of low impact extends northwards along the coastline of Facing Island and into the central part of the Port.

Changes to light availability in this zone may cause water quality to deteriorate beyond natural variation and result in sub-lethal effects on sensitive receptors such as seagrass.

Sub-lethal effects may include impacts to the ability of seagrass/corals to continue growing and reproducing, without resulting in mortality.

The EIS concludes that that predicted increases in turbidity levels (2 to 6 NTU above ambient under the 50th percentile) in this zone are not expected to have significant effect on light availability for seagrass during the growing season and no permanent or temporary loss of seagrass meadows are expected.

Zone of influence

The predicted zone of influence extends from the dredging area northwards along the coastline adjacent to Facing and Curtis Islands and into the central part of the Port. Based on modelling, increases in turbidity levels (0 to 4 NTU above ambient under the 50th percentile) are not expected to have significant effect on light availability for seagrass. The availability of light for seagrass beds within this zone is expected to be sufficient during the growing season and no permanent or temporary loss of seagrass meadows are expected.

Dredging for the barge access channel

As discussed in chapter 5.2, water quality impacts associated with initial dredging works for the barge access channel would be limited to a short duration (six and a half weeks).

Based on modelling, these works are expected to result in a small zone of low impact immediately adjacent to the eastern face of the WBE and WB reclamation areas, and a large zone of influence extending north and south of the dredge footprint.

These zones of impact are shown in Figure 5.8. Based on the modelled zones of the impact, no seagrass is expected to be adversely impacted by the initial dredging works.

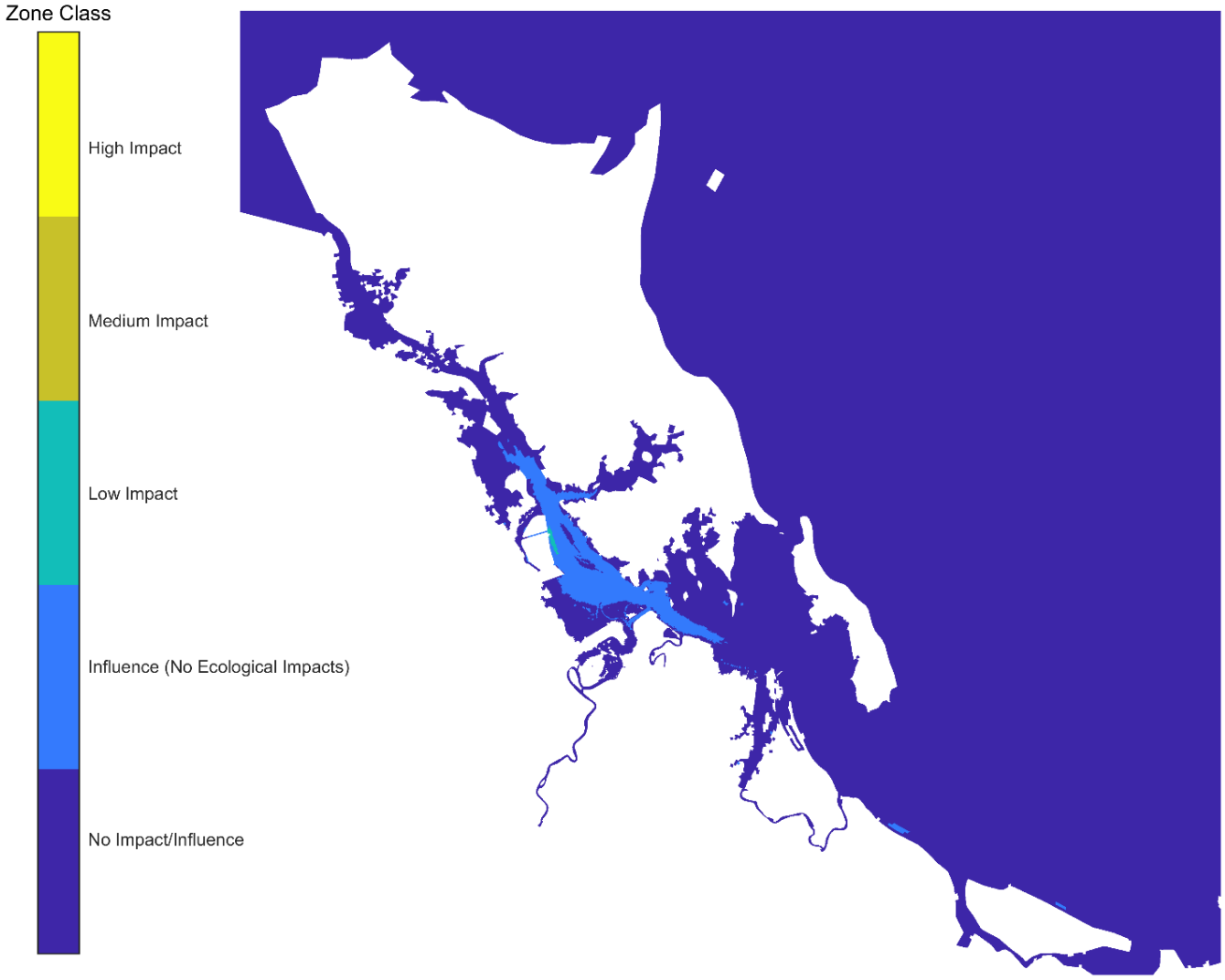


Figure 5.8 Initial dredging works water quality zones of impact

Water quality management

The EIS concludes that the sediment plumes generated by dredging activities could be managed to avoid long-term impacts on marine plants.

As part of the project's management strategy the proponent has proposed to implement a sediment-plume monitoring program which would employ continuous logging at sites of concern within the modelled zones of impact and zone of influence (i.e. where the sediment plume may encroach on a sensitive ecological receptor (e.g. seagrass)).

The monitoring locations which have informed the EIS assessment will be used as part of this program. The location of the monitoring sites is shown in Figure 5.9.

The monitoring program would include turbidity and BPAR trigger limits which, if breached, would initiate a series of adaptive management responses (such as halting dredging works or moving the dredger to another location) to be undertaken before an adverse impact occurs.

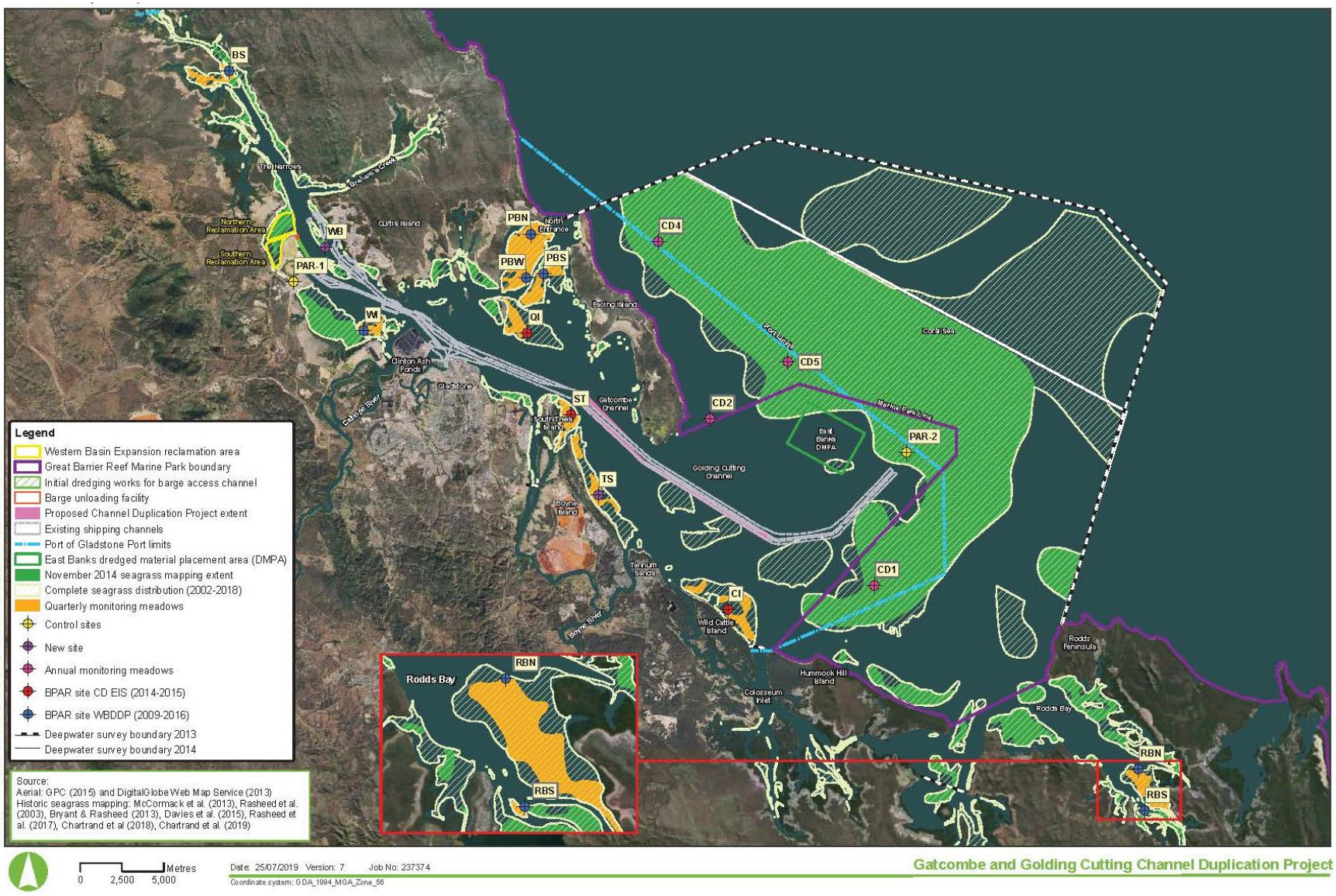


Figure 5.9 Seagrass and BPAR monitoring locations

During the public notification of the draft EIS, a submitter raised concern regarding the proposed water quality program for the project, noting that the water quality monitoring sites proposed to be used to assess and manage water quality during project activities do not include appropriate reference sites (i.e. sites located outside of the zone of influence that would be unimpacted by the dredging).

In response to the submission the proponent added a reference water quality monitoring site to the program at Rodds Bay (i.e. RB1) which is located beyond the anticipated zone of influence and other sources of environmental impacts (e.g. land runoff). This site would be used to compare any variation in data to determine if changes to WQ are natural variations or project-related. I consider this approach to be acceptable. Additionally, I have stated conditions to be attached to the EA requiring the proponent to monitor turbidity and BPAR at the proposed reference site in addition to the sites that fall within the zone of impact and influence.

The EIS also states that seagrass monitoring would also be undertaken to determine any broad-scale changes to seagrass meadow condition and extent and complement management and monitoring of the turbidity and BPAR seagrass thresholds.

In addition, the proponent has made the following commitments which would avoid and assist in managing dredging impacts on marine plants:

- restricting dredging activities to approved areas and depths, and ensuring that dredging activities are only undertaken during suitable conditions (i.e. calm weather conditions and not during storm surges or other severe weather events)
- undertaking all dredging works in accordance with an approved DMP and Project Environmental Monitoring Procedure. The Environmental Monitoring Procedure outlines the system proposed for monitoring and managing potential impacts on marine plants associated with dredging. This procedure document would be updated once all the required monitoring data has been collected and analysed to ensure that the most appropriate water quality and light trigger limits have been adopted to protect and/or reduce impacts on seagrass
- monitoring the health and extent of seagrass meadows and benthic macroalgae during and post dredging within areas potentially impacted in accordance with the Environmental Monitoring Procedure
- scheduling the timing of dredging where practical to avoid key periods for seagrass growth and resilience building when seagrass is most susceptible to increased turbidity
- ensuring no exceedances of time to impact light threshold levels for seagrass as specified in the Environmental Monitoring Procedure, and undertaking an appropriate response where monitoring determines water quality trigger levels have been exceeded or seagrass light thresholds are found to be compromised by project activities
- undertaking adaptive management measures in response to water quality monitoring results to ensure impacts to sensitive receptors, as a result of dredging related turbidity, are avoided, minimised or mitigated (e.g. reducing overflow, moving location)
- ensuring that below-keel discharge of tailwaters is undertaken via anti-turbidity ‘green’ valves
- ensuring that the barges transporting material from the dredging area to the reclamation area are fitted with green valves and computer-based equipment to prevent excessive overflow discharge to reduce turbidity
- optimising dredger and work boat sailing routes to minimise propeller wash and resuspension of the suspended solids

- undertaking regular inspections and maintenance of turbidity minimising equipment to ensure the equipment is working optimally
- establishing a DTRP for the project which comprises of scientific experts on water quality, seagrass and benthic habitat; regulators and dredging technical advisors. The proponent has also committed to develop the TOR for the DTRP in consultation with relevant state and Commonwealth agencies including DES, DAF and DAWE.

Additionally, I have stated conditions for the EA for capital dredging to ensure water quality impacts on marine plants and other sensitive ecological receptors are adequately managed.

These conditions set water quality limits for turbidity and BPAR which are key parameters for seagrass. The conditions also require monitoring to be undertaken at defined sites to ensure potential dredge-related exceedances are identified and rectified early before an adverse impact occurs.

While the stated conditions in my report include water quality limits for turbidity, I note that the limits are likely to be revised as more data is collected.

I have also stated a condition for the EA requiring the proponent to submit a report validating the hydrodynamic modelling of the dredge plumes to the DTRP and the administering authority within three months of the commencement of dredging.

I am satisfied that this would validate the modelling of potential dredge plume impacts at the time of dredging. I require the validation modelling to be undertaken in consultation with the DTRP.

Sediment deposition/burial and changes to hydrodynamics

Seagrass

Seagrasses grow in dynamic sedimentary environments where burial by sediments is a common occurrence. Different species of seagrass have varying tolerances and adaptations to sediment burial.

Based on modelling, the EIS indicates that the highest rates of sediment deposition (settling of suspended sediments) during dredging activities are predicted to occur in close proximity to the dredge footprint, and some small increases in sedimentation are also predicted in the central Port area.

Based on the modelling, the predicted change in deposition rate above the ambient levels (background) associated with the dredge plumes is less than 0.5 mg/cm^3/day.

The combined rate of sediment deposition (i.e. rates associated with dredging combined with ambient rates) is predicted to be up to up to 2.5 mg/cm^3/day). These are shown in Figure 5.10.

Based on known burial tolerances (i.e. more than 10 mm depth) for the dominant species of seagrass in the modelled impact area (*Zostera muelleri* and *Halophila ovalis*)[8], the proposed dredging activities are unlikely to result in deposition rates that would adversely impact on the growth of these species.

As this increase is directly related to sediment deposition from dredge plumes this impact would only be temporary and would cease after dredging activities have been completed.

Mangroves and saltmarsh

Given the mangroves and saltmarsh plants have higher tolerances to sediment burial than seagrass, the predicted increases in the rate of sedimentation associated with dredging activities is unlikely to result in adverse impacts on the mangrove and saltmarsh communities on the shoreline of Facing Island and

[8] C.F. Benham, S.G. Beavis, R.A. Hendry, E.L. Jackson 2016, Growth effects of shading and sedimentation in two tropical seagrass species: Implications for port management and impact assessment, Marine Pollution Bulletin, Issue 109, pp 461-470.

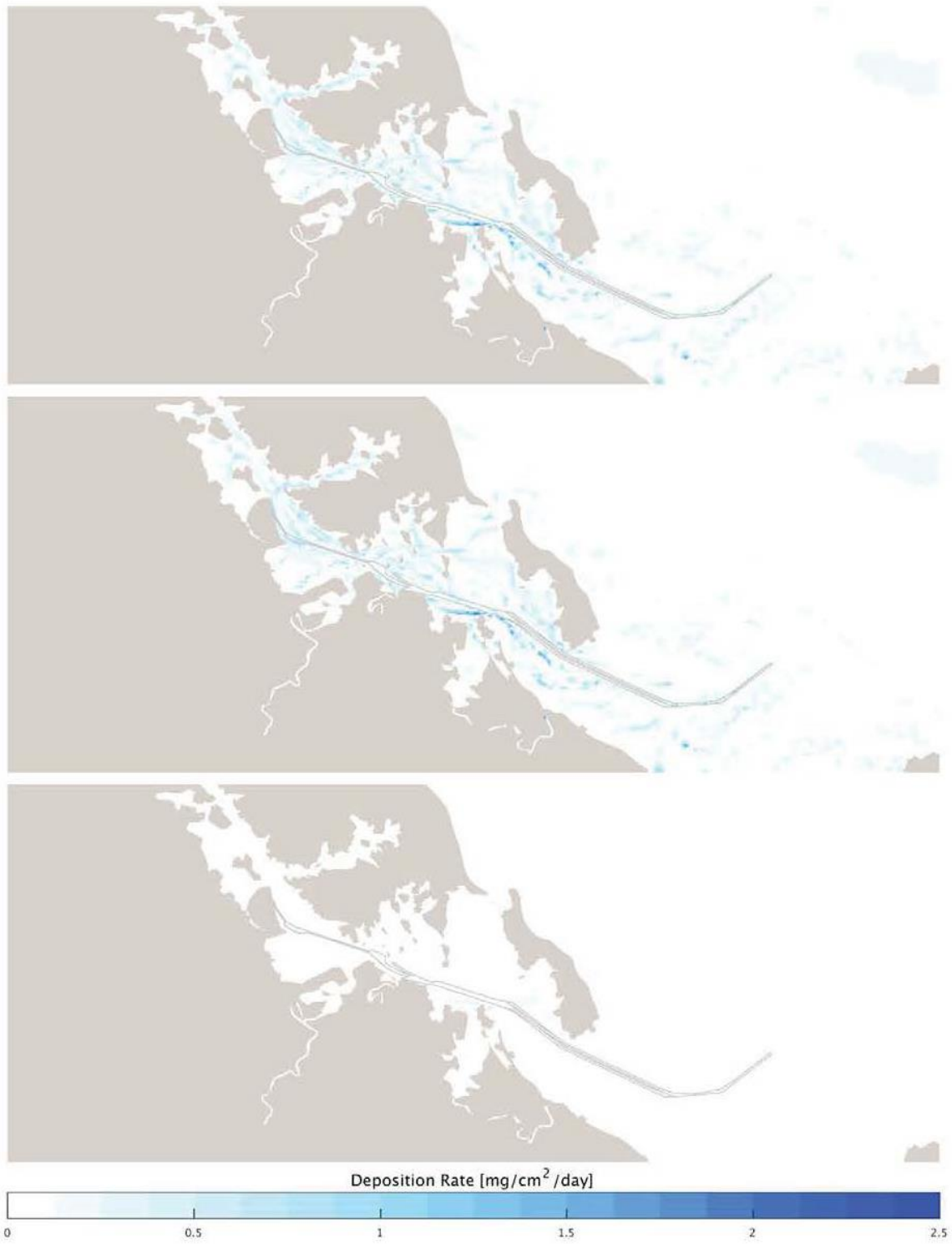
South Trees Island; and along the shoreline of Curtis Island adjacent to the proposed barge access channel.

I note the proponent has committed to monitor sedimentation at sensitive locations including the Facing Island Harbour and important public and environmental areas (mangrove and saltmarsh communities along the shoreline of Facing Island) before, during and after dredging.

The proponent has also committed to undertake mitigation measures where any significant increases in sedimentation are identified. It is noted that Facing Island Harbour already experiences sediment build-up due to the calm conditions in this area and that the proponent already periodically maintains this sediment build-up using a drag bar. As a result, a similar measure would be undertaken where any increases in sedimentation are identified by monitoring.

The EIS concludes that the capital dredging works within the main channel are unlikely to have an indirect impact on any mangroves, samphire and saltmarsh communities as a result of changes to hydrodynamics surrounding the channel as there is no intertidal vegetation within 500 m of the proposed works.

The EIS also concludes that dredging works in the barge access channel is unlikely to have any indirect impact on these types of communities as a result of changes to hydrodynamics, as these works are offshore. The closest mangroves, samphire and saltmarsh communities are located between 100 and 300 m from the existing and proposed WB and WBE reclamation areas which are adjacent to the barge access channel.



50th percentile of the deposition rate ambient (top), total (middle) and impact of dredging (bottom) overall dredging campaign

Figure 5.10 Predicted deposition rate for total dredging campaign (under the 50th percentile)

Significant residual impacts and offsets

Significant residual impacts

Direct removal of/loss of marine plants

Based on the figures provided in the EIS, dredging works within the main channel are expected to result in the permanent loss of 85.33 ha of marine plants associated with the direct removal of seabed material. As per the State *Significant Residual Impact Guidelines*[9] (SRI guidelines) a permanent loss of an area of marine plants greater than 50 m^2 is a significant residual impact (SRI). The permanent loss of 85.33 ha of seagrass from the dredging footprint is therefore considered to be an SRI requiring an offset to compensate for the loss.

Due to the transient nature of seagrass meadows in the Port I have taken a precautionary approach and have stated a condition to be attached to the preliminary approval which includes the entire marine footprint of dredging works as the SRI for marine plants. I note that this number may be revised following additional survey work prior to lodging a development application for the removal, destruction or damage of marine plants. This would inform the project's final SRI and offset obligations.

Indirect impacts on marine plants

As discussed in the previous section about potential water quality impacts on marine plants, turbidity plumes generated by dredging works have the potential to indirectly impact on 1664.03 ha of marine plants including 876.98 ha of seagrass and 787.05 ha of macroalgae. The EIS concluded that the water quality management measures that would be employed during dredging works would ensure sediment plumes generated by these works do not result in long-term adverse impacts on marine plants. It is also considered that seagrass meadows in the predicted impact area would be expected to return to the pre-disturbance condition after dredging operations have ceased.

In accordance with the State SRI guidelines, an action is unlikely to have an SRI on marine plants if the area impacted is expected to return to its pre-disturbance condition within five years. Given that any seagrass impacted within the predicted zone of high impact is likely to recover after 24 months (but less than five years), these impacts are not considered to be an SRI for the purposes of the State. To determine whether any losses of seagrass from changes to water quality have occurred, the proponent has proposed to monitor the health and extent of seagrass meadows within the predicted impact area during and following dredging works. The baseline health and extent of these seagrass meadows would be confirmed prior to dredging works and used as a benchmark to determine the project's SRI and offset obligation for marine plants.

While I consider the proposed measures in the project and dredging EMPs, and the Environmental Monitoring Procedure are appropriate for managing water quality impacts on marine plants, the predicted indirect impact area is based on modelling and will need to be confirmed once the activity has commenced. Therefore, I am unable to confirm at this point in time whether the project will have an SRI on marine plants due to changes in water quality associated with dredging activities. To address this uncertainty, I have undertaken a precautionary approach and stated conditions to be attached to the preliminary approval (for a development permit to disturb marine plants) which require that:

- either the entire marine footprint of works (including the predicted indirect impact area) is accepted as the project's SRI for marine plants in the final development approval; or a marine plant survey is undertaken at appropriate scale within 12 months prior to applying for any development application for

[9] Department of State Development, Infrastructure and Planning, December 2014. Significant Residual Impact Guidelines State of Queensland, Department of State Development, Infrastructure and Planning, December 2014, accessed 17 April 2020, http://www.dlgrma.qld.gov.au/resources/guideline/planning/dsdip-significant-residual-impact-guideline.pdf

marine plant disturbance and the survey results are considered in review of the project's final SRI for marine plants

- a monitoring and inspection program for the purposes of ongoing monitoring of the restoration of temporarily disturbed marine plants is undertaken. The monitoring and inspection program will involve monitoring the health and extent of marine plants prior to disturbance; and monitoring after dredging to confirm whether marine plants have returned to the pre-disturbance condition within five years after dredging has ceased. Where the monitoring and inspection program indicates the marine plants in the impacted area have not returned to pre-disturbance condition within five years after dredging has ceased, the area which has not recovered will inform the project's final SRI on marine plants.

I require the proponent to work with the relevant approving authority to determine the authorised extent of impact on marine plants, the project's SRI and offset obligations.

Offsets

As part of the draft offsets strategy that was provided in the EIS documentation, the proponent has identified the following potential offset options for marine plants to compensate for the project's SRI on marine plants:

- review and investigate the recommendations of the Port of Gladstone studies on resilience of seagrass and determine if there are any actions that can be implemented as direct offsets
- compensatory measures including investigating the need for research into:
  - seagrass meadow creation/expansion (such as intertidal and coastal seagrass), and if natural dispersal can propagate
  - seagrass habitat creation through using maintenance dredging material to create viable seagrass meadows
  - the possibilities of keeping viable seedbanks and using these seedbanks if/when flood events occur and determine if the seed would take and grow
  - confirm the type, frequency and nature of fauna species utilising the seagrass meadows in and adjoining the proposed WBE reclamation area.
- provide a financial contribution to the appropriate parties for research of programs to improve seagrass resilience and to result in knowledge which can be applied to seagrass management and contribute to achieving a conservation gain for the impacted matter
- provide a financial contribution to the Queensland Government Offset Fund Management and Delivery Unit.

I note that at this stage these options are only under consideration and that the proponent would undertake further investigations to assist in finalising the offset strategy to determine the most suitable options to address the project's SRI on marine plants.

As marine plants are also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

Coordinator-General's conclusions: marine plants

I am satisfied that the EIS has adequately assessed potential impacts that the capital dredging works and transfer of dredge material would have on marine plants.

While the project is expected is to result in the permanent loss of seagrass within the direct project footprints, I consider the proposed measures in the EIS and the proponent's commitments relevant to managing impacts on marine plants are appropriate for mitigating long term impacts on marine plants.

I have also stated conditions to be attached to the EA requiring the proponent to implement a DMP which includes measures to manage potential impact on seagrass.

I have also stated conditions which:

- set water quality limits for turbidity and BPAR which are key parameters for seagrass
- require monitoring to be undertaken at defined sites to ensure potential dredge related water quality exceedances are identified and rectified early before an adverse impact on any sensitive receptors (i.e. seagrass and coral) occurs.

Direct removal of/loss of marine plants

Based on the information presented in the EIS, dredging works in the main channel are expected to have a direct impact on 85.33 ha of marine plants (comprising of 35.65 ha of deep-water seagrass and 49.68 ha of macroalgae) associated with the removal of seabed material.

To ensure these permanent impacts are minimised, I have stated conditions to be attached to the EA and the preliminary approval for any development permit for removal, destruction or damage of a marine plan which require that dredging is only permitted within the area proposed in the EIS. These conditions ensure the direct removal of marine plants only occurs within the authorised area.

As per the State SRI guidelines a permanent loss of an area of marine plants greater than 50 m^2 is an SRI. The permanent loss of 85.33 ha of seagrass from the dredging footprint is therefore considered to be an SRI requiring an offset to compensate for the loss.

Due to the transient nature of seagrass meadows in the Port I have taken a precautionary approach have stated a condition to be attached to the preliminary approval which includes the entire marine footprint of works as final SRI for marine plants. I note that this number may be revised following additional survey work prior to lodging a development application for the removal, destruction or damage of marine plants. This would inform the project's final SRI and offset obligations.

Indirect impacts on marine plants

Based on the modelled zone of high impact the EIS concluded that dredging works in the main channel could have an indirect impact on 1664.03 ha of marine plants (comprising of 876.98 ha of seagrass and 787.05 ha of macroalgae) as a result of increased turbidity levels.

The EIS concluded that indirect impacts on marine plants associated with water quality could be adequately managed through adaptive management measures (such as halting dredging works or moving the dredger to another location) to ensure no long-term adverse impacts on marine plants.

It is also considered that seagrass meadows in the predicted impact area would be expected to return to the pre-disturbance condition after dredging operations have ceased.

While I consider the proposed measures in the project and dredging EMPs, and the Environmental Monitoring Procedure, are appropriate for managing water quality impacts on marine plants, the predicted indirect impact area is based on modelling and will need to be confirmed once the activity has commenced.

Therefore, I am unable to confirm at this point in time whether the project will have an SRI on marine plants due to changes in water quality associated with dredging activities. To address this uncertainty, I

have undertaken a precautionary approach and stated conditions to be attached to the preliminary approval for a development permit to disturb marine plants which require that:

- either the entire marine footprint of works (including the predicted indirect impact area) is accepted as the project's SRI for marine plants in the final development approval, or a marine plant survey is undertaken at appropriate scale within 12 months prior to applying for any development application for marine plant disturbance and the survey results are considered in review of the project's final SRI for marine plants
- a monitoring and inspection program for the purposes of ongoing monitoring of the restoration of temporarily disturbed marine plants is undertaken. The monitoring and inspection program will involve monitoring the health and extent of marine plants prior to disturbance, and monitoring after dredging to confirm whether marine plants have returned to the pre-disturbance condition within five years after dredging has ceased. Where the monitoring and inspection program indicates the marine plants in the impacted area have not returned to pre-disturbance condition within five years after dredging has ceased, the area which has not recovered will inform the project's final SRI on marine plants.

Additionally, I have stated conditions for the EA for capital dredging to ensure water quality impacts on marine plants and other sensitive ecological receptors are adequately managed. These conditions set water quality limits for turbidity and BPAR which are key parameters for seagrass. The conditions also require monitoring to be undertaken at defined sites to ensure potential dredge-related exceedances are identified and rectified early before an adverse impact occurs.

While the stated conditions in my report include water quality limits for turbidity, I note that the limits are likely to be revised as more data is collected. I have stated a condition for the EA requiring the proponent to submit a report validating the hydrodynamic modelling of the dredge plumes to the DTRP and DES within three months of the commencement of dredging. I am satisfied that this would validate the modelling of potential dredge plume impacts at the time of dredging. I require that the validation modelling is undertaken in consultation with the DTRP.

As marine plants are also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

5.4.3 Wetlands

A wetland is an MSES if it is:

- shown as a HES wetland on a map of referable wetlands under schedule 12, part 2 of the Environmental Protection Regulation 2008
- located in a WPA as shown on the map of referable wetlands under schedule 12, part 2 of the Environmental Protection Regulation 2008

A wetland is also an MSES if it is located in HEV waters as identified under the Environmental Protection (Water and Wetland Biodiversity) Policy 2019.

Presence and distribution in the project area

The Port, including all tidal areas, is recognised as a nationally important wetland and listed on the Directory on Nationally Important Wetlands (DIWA) (Port Curtis DIWA). Notable ecological features of this area include extensive mangrove forests and shrublands, salt flats, seagrass meadows and benthic habitat. These features provide habitat for range of conservation significant fauna species including marine turtles, dugongs and migratory shorebirds as well as habitat for commercially important prawn and fish species. While wetlands listed on the DIWA are not specifically MSES, the Port Curtis DIWA contains mapped areas of HES wetlands which are MSES.

In proximity to the main dredge channel, State mapping indicates that there are estuarine wetlands (mangroves and intertidal communities) that are mapped as HES wetlands around South Trees Island; and on the inside of Facing Island. There are also mapped HES wetlands in the vicinity of the barge access channel near Curtis Island and south of Fisherman's Landing.

Impacts and mitigation

Direct impacts

The EIS indicates that no HES wetland values are expected to be directly impacted by capital dredging works within the main channel as there are no intertidal vegetation communities within 500 m of the direct impact area and that these works are fully located in the marine zone. The EIS also indicates that there are no HES wetlands mapped within the barge access channel footprint.

Indirect impacts

While no direct impacts are expected, there are HES wetlands mapped along the intertidal areas on the inside of Facing, and South Trees Islands that have the potential to be indirectly impacted dredging works due to changes to hydrodynamics and water quality.

Likewise, the HES wetlands mapped along the shoreline of Curtis Island also have the potential to be indirectly impacted changes to hydrodynamics and water quality associated with dredging works for the barge access channel.

An evaluation of these potential impacts are discussed in this section.

Changes to hydrodynamics and water quality - main channel

Based on wetland mapping there are HES wetlands dominated by mangroves and mud flats that are mapped in the areas adjacent to the main channel and in the intertidal areas on the inside of Facing Island.

In my evaluation of the project's impact on coastal processes in chapter 5.3 of this report I concluded that the dredging in the main channel:

- is not expected to have an effect on water levels in the Port. The project is therefore unlikely to result in any changes to the inundation of coastal habitats including wetlands
- depending on the change to the local bed level the newly deepened channel is likely to result in a slight reduction (approximately 0.025 to 0.15 m/s) in current speeds outside the existing channels in some areas and increases (approximately 0.025 to 0.2 m/s) in current speeds within and surrounding the existing shipping channels. These changes are not considered to be significant in terms of variation from the existing conditions. Given the distance to the nearest HES wetlands (more than 500 m), these changes are unlikely to have any effect on hydrological processes in the vicinity of these wetlands
- is likely to result in additional wave reflection and alter wave heights with a very slight reduction in wave height to the southwest of the duplicated channel, and a corresponding slight increase in wave height within the new channel. These changes are not expected to change the wave characteristics (including wave-driven sediment transport) at adjacent shorelines (i.e. Facing and Boyne Islands).
- would result in increased rates of siltation within the channels due to a reduction in velocity caused by the increased water depth. The overall net annualised siltation rate within the shipping channels is likely to increase by seven per cent (18,200 m^3) following the duplication of the Gatcombe and Golding Cutting Channels (increasing from 260,000 m^3 to 278,200 m^3) which would increase the length of maintenance dredging campaign by two days. Rates of siltation are expected to be

negligible (less than 0.5 mg/cm^2/day above ambient rates) elsewhere in the Port including the Facing Island shoreline.

Based on modelled rates of sediment deposition, the modelled area indicates that the HES wetlands along Facing Island and South Trees Island are not located in an area that is expected to experience high rates of sedimentation. As discussed in the previous section for marine plants, the predicted change in deposition rate above the ambient levels (background) associated with the dredge plumes is less than 0.5 mg/cm^2/day and the combined rate of sediment deposition (i.e. rates associated with dredging combined with ambient rates) is predicted to be up to up to 2.5 mg/cm3/day). As this sediment deposition rate is well below the sediment threshold for mangroves and saltmarsh, dredging activities are not expected to have an impact on the HES wetlands on the shoreline of Facing Island and South Trees Island.

I note the proponent has committed to monitor sedimentation at sensitive locations including the Facing Island harbour and important public and environmental areas (mangrove and saltmarsh communities along the shoreline of Facing Island) before, during and after dredging. It is noted that Facing Island Harbour already experiences sediment build-up due to the calm conditions in this area and that the proponent already periodically maintains this sediment build-up using a drag bar. As a result, a similar measure would be undertaken where any increases in sedimentation are identified by monitoring.

I consider the project EMP and Dredging EMP include appropriate mitigation measures (including water quality limits for seagrass) which are relevant to managing water quality impacts on HES wetlands in the project area. I also consider the stated conditions in the EA for managing impacts on seagrass, including the inclusion of water quality limits, would also be applicable for managing impacts on HES wetlands.

Changes to hydrodynamics and water quality – barge access channel

Likewise, the HES mangrove and saltmarsh communities along the shoreline of Curtis Island adjacent to the proposed barge access channel and south of Fisherman's Landing are unlikely to be impacted by increased rates of sediment deposition as a result of the dredging works, as these would be also below 0.5 mg/cm^2/day.

I consider the project EMP and Dredging EMP includes appropriate mitigation measures (including water quality limits for seagrass, sediment plume monitoring and adaptive measures in response to monitoring) which are relevant to managing water quality impacts on HES wetlands in the project area. I also consider the stated conditions in the EA for managing impacts on seagrass including the inclusion of water quality limits, would also be applicable for managing impacts on HES wetlands.

Given the above conclusions, dredging works in the main and barge access channels are unlikely to have an adverse impact on any HES wetlands.

Significant residual impacts and offsets

As capital dredging works in the main and barge access channels are unlikely to have an adverse impact on any HES wetlands the project would not result in an SRI or require an offset for this matter.

Coordinator-General's conclusions: wetlands

I am satisfied that EIS has adequately assessed potential impacts that the capital dredging works and transfer of dredge material would have on HES wetlands that are MSES.

Based on the information provided in the EIS, I consider capital dredging works are unlikely to impact on any HES wetlands. The EIS concluded that the project is not expected to have a direct impact on any HES wetlands as there are no HES wetlands present in the proposed impact areas.

Dredging works are also not expected to significantly alter hydrodynamics near any mapped HES wetlands and therefore result in any adverse impacts. The proponent has committed to monitor sedimentation rates at Facing Island Harbour and important public and environmental areas (including the mangroves and saltmarsh communities in this area) before, during and after dredging. Mitigation measures, such as the use of a drag bar, would be undertaken should monitoring identify increased sedimentation.

I consider the project and dredging EMP include appropriate mitigation measures which are relevant to managing water quality impacts on HES wetlands in the project area. I also consider the stated conditions in the EA for managing impacts on seagrass, including the inclusion of water quality limits, would also be applicable for managing impacts on HES wetlands.

Based on the information provided in the EIS and my stated conditions to be attached to the EA, I consider that the proposed dredging activities are unlikely to have a long-term adverse impact on any HES wetlands.

5.4.4 Protected wildlife habitat

Under the Environmental Offsets Regulation 2014 the definition of protected wildlife habitat as an MSES includes habitat for an animal that is listed as endangered, or a vulnerable wildlife animal under the NC Act. Examples of such habitat include land used by an animal for foraging, roosting, nesting or breeding.

The EIS identifies that the project area provides habitat for a range of marine and coastal fauna which are listed as protected wildlife under the NC Act including marine turtles, sharks and fish, dugongs, dolphins, whales and shorebirds.

Issues raised in submissions

Key issues raised in submissions on the EIS regarding impacts to protected wildlife habitat include:

- insufficient information in the draft offset strategy to demonstrate that the proposed offsets are appropriate or able to be delivered for those MSES for which the project is having an SRI.
- need for more detail regarding the project's potential impacts on loggerhead, hawksbill, olive ridley and flatback turtles and potential SRI associated with loss of foraging habitat, and increased interaction with marine vessels and dredge equipment.

I have considered each submission and the responses provided by the proponent in my evaluation of the project. My assessment is provided in the relevant sections below.

Shorebirds

Presence and distribution in the project area

The Port of Gladstone area supports a diverse range of marine ecosystems which provide foraging and roosting habitat for a number of threatened shorebirds. Many of these species are also migratory and visit the area seasonally. The EIS identifies 21 species of shorebirds that are known or considered likely to occur within the areas proposed to be dredged, including seven that are MSES (i.e. listed as endangered or vulnerable under the NC Act). These MSES shorebirds are identified in Table 5.3.

I note that the MSES species in listed in Table 5.3 are also MNES as they are listed as migratory and/or threatened under the EPBC Act and also recognised as an attribute which contributes to the OUV of the GBRWHA.

Table 5.3 MSES shorebirds known or likely to occur within the project impact areas

Common name *Species name*	NC Act listing	EPBC Act listing
Lesser sand plover *Charadrius mongolus*	Endangered	Endangered Migratory
Greater sand plover *Charadrius leschenaultia*	Vulnerable	Vulnerable Migratory
Red knot *Calidris canutus*	Endangered	Endangered Migratory
Curlew sandpiper *Calidris ferruginea*	Endangered	Critically endangered Migratory
Great knot *Calidris tenuirostris*	Endangered	Critically endangered Migratory
Northern Siberian bar-tailed Godwit *Limosa lapponica menzbieri*	Endangered	Critically endangered Migratory
Eastern curlew *Numenius Madagascariensis*	Endangered	Critically endangered Migratory

The Port and the wider Curtis Coast region supports internationally significant numbers of migratory shorebirds and also includes a large number of individual sites which support nationally significant numbers of birds. The shorebird habitats in this region are of great conservation value and provide an important refuge site to multiple critically endangered, endangered and vulnerable shorebird species.

The total number of migratory shorebirds that use the region annually is estimated to be 20,000. Most of these birds will spend the whole summer foraging, to lay down fat stores which will provide them with the significant amount of energy required for their eventual return to their breeding grounds in the Northern Hemisphere. The birds appear to have high site fidelity, returning to the same roosts and foraging grounds each year, and remaining mostly at those sites during the summer.

The EIS indicates that there are locally important roost sites for two of the MSES shorebirds listed in Table 5.3 within 5 km of the areas proposed to be dredged within the main channel including:

- one on Facing Island approximately 5.3 km north-west of the area to be dredged which is a locally important roost site for the lesser plover and eastern curlew
- one on Boyne Island beach approximately 2.6 km south of the area to be dredged which is a locally important roost site for the lesser sand plover.

Impacts and mitigation

Dredging activities have the potential to impact on migratory shorebirds including:

- impacts on foraging habitat associated with disturbances from dredging vessels and changes to water quality
- disturbances to roosting habitat due to noise, vibration and lighting associated with dredging activities.

These potential impacts are discussed in detail in the following section.

Impacts on foraging habitat

The EIS indicates that the proposed dredging works within the main and barge access channels are unlikely to have direct impact on foraging habitat for any of the shorebird species listed in Table 5.3 .

This conclusion is made on the bases that these species are unlikely to forage in the deeper waters where these activities would occur.

In terms of indirect impacts, changes to water quality including increased rates of sediment deposition associated with dredging have the potential to impact on shorebird foraging habitat by increasing rates of sedimentation and burying/smothering mudflats and intertidal flora.

In evaluating the dredging impacts on marine plants and HES wetlands, I concluded that the mangrove and saltmarsh communities on the shoreline of Facing Island are unlikely to be impacted by increased rates of sedimentation deposition associated with dredging activities. The predicted rates of sediment deposition are expected to be well below the sediment deposition threshold for mangroves and saltmarsh. The proponent has also committed to monitor sedimentation rates at Facing Island Harbour and important public and environmental areas before, during and after dredging. Mitigation measures such as the use of a drag bar would be undertaken where monitoring identifies increased sedimentation.

Likewise, the mangrove and saltmarsh communities along the shoreline of Curtis Island adjacent to the proposed barge access channel and south of Fisherman's Landing are also unlikely to be impacted by increased sedimentation as a result of dredging works.

I consider the project EMP and Dredging EMP include appropriate mitigation measures which are relevant to managing water quality impacts in the project area (including water quality limits for seagrass, sediment plume monitoring and adaptive measures in response to monitoring). I also consider the stated conditions in the EA for managing impacts on seagrass, including the inclusion of water quality limits, would also be applicable for managing impacts on potential areas of habitat for migratory shorebirds.

I therefore consider the project is not expected to result in permanent loss or alteration of migratory shorebird habitat along the shoreline of Facing, Boyne and Curtis Islands as a result of dredging activities.

Based on the information provided in the EIS, I consider that the project is unlikely to have a long-term adverse impact on foraging habitat for migratory shorebirds.

Impacts on roosting habitat and other disturbances

Noise, vibration and lighting impacts associated with dredging activities have the potential to impact on roosting shorebirds. The EIS indicates there are no known roosting sites for any MSES shorebird species within the dredge footprint of the main channel. The closest known important roost sites are located more than 2 km away, with the closest sites to the area to be dredge being approximately 2.8 km north on Facing Island and 2.6 km south on Boyne Island.

Given the distance to the dredging works in the main channel from the nearest roost sites, these activities are unlikely to have any direct impact on important roosts sites for shorebird species. It is unlikely that noise and vibration levels and lighting generated by activities would be measurable in these areas.

Based on mapping provided in the EIS, there are two important roost sites in proximity to the proposed barge access channel including a site approximately 2 km to the north at Friend Point and a site approximately 800 m adjacent to the bottom of the channel on the Curtis Island side.

The proponent has committed to implement project and dredging EMPs during construction which would include measures which would mitigate potential impacts from these activities on shorebirds that are MSES. This would include measures to minimise impacts from artificial lighting on dredge and other marine vessels, noting that some types lighting are essential for maritime safety.

I expect the project and dredge EMP to include measures to manage dredging activities to ensure there are no adverse impacts on migratory shorebirds during the proposed dredging campaigns. To ensure

these measures are appropriate I have stated a condition to be attached to the EA requiring a proponent to submit a dredge management plan to the approving authority for approval prior to dredging.

Significant residual impacts and offsets

Based on the information in the EIS, I consider that dredging works within the main and barge access channels are unlikely to have an SRI on any MSES shorebirds.

Coordinator-General's conclusions: shorebirds

I am satisfied that the EIS adequately assessed the potential impacts that the capital dredging works and transfer of dredge material may have on shorebird species that are MSES. Based on the information in the EIS, I consider that dredging works within the main and barge access channels are unlikely to have an SRI on any MSES shorebirds.

I consider the project and dredge EMPs include suitable measures to manage dredging activities to ensure there are no adverse impacts on shorebirds during the proposed dredging campaigns. To ensure the measures in these plans are appropriate, I have stated a condition to be attached to the EA requiring the proponent to submit a dredge management plan to the approving authority for approval prior to dredging.

I also consider the mitigation measures proposed to manage water quality impacts on seagrass would also be applicable in managing potential impacts on foraging habitat for MSES shorebirds. Additionally, I have stated conditions to be attached to the EA which ensure water quality impacts are adequately managed during the proposed dredging campaigns. I consider that these conditions would also be relevant for managing potential water quality impact on MSES shorebirds.

Based on the information provided in the EIS and my stated conditions to be attached to the EA, I consider that the proposed dredging activities are unlikely to have a long-term adverse impact on any MSES shorebird species.

As the identified MSES shorebirds are also an MNES, the project's impacts will also be considered and addressed in the Commonwealth's assessment.

Marine mammals

Presence and distribution in the project area

The EIS indicates that there are four marine mammal species which are known or likely to occur within the Port. These species of identified in Table 5.4. All of these marine mammal species are listed under the NC Act and are listed threatened and/or migratory species under the EPBC Act, and are also an attribute which contribute to the OUV of the GBRWHA.

Table 5.4 Marine mammals that are known or likely to occur in the project area

Common name ***Species name***	**NC Act listing**	**EPBC Act listing**
Humpback whale *Megaptera novaeangliae*	Vulnerable	Vulnerable Migratory
Australian humpback dolphin *Sousa sahulensis* - formerly *S. chinensis*	Vulnerable	Migratory
Australian snubfin dolphin	Vulnerable	Migratory

Common name *Species name*	NC Act listing	EPBC Act listing
Orcaella heinsohni - formerly *O. brevirostris*		
Dugong *dugong dugon*	Vulnerable	Migratory

Whales

The EIS states that the humpback whale is known to occur in the coastal waters east of Curtis Island and has been occasionally recorded in the Port. Humpback whales migrate along the east coast of Australia from May to October with low numbers also reported between April and November.

Dolphins

Australian snubfin dolphin

The EIS indicates that the Australian snubfin dolphin (*Orcaella heinsohni*) has been recorded largely in the Port Alma region to the north of Curtis Island and has a low likelihood of occurring within the proposed capital dredging areas in the main channel as this species is known to mostly occur in protected shallow waters close to the coast, and close to river and creek mouths.

There is only one record of this species within the Port and the northern section of the Narrows. While the area where the barge access channel is proposed provides potentially suitable habitat, it is considered this species has a low likelihood of using this area on a regular basis given its known distribution.

Australian humpback dolphin

The EIS indicates that Australian humpback dolphin (*Sousa sahulensis*) has been frequently recorded within the Port. This species typically occurs in relatively shallow and protected coastal habitats such as inlets, estuaries, major tidal rivers, shallow bays and inshore reefs. The species tends to have preference for water depths between 2 and 10 m; however, is sometimes known to use deeper waters (15 - 20 m).

Studies undertaken by Dr. Cagnazzi in 2013[10] indicate that the Port, including the areas to be dredged in the main channel and barge access channel, form part of this species' known core habitat. The Australian humpback dolphin is considered to be an opportunistic-generalist feeder, preying on a wide variety of fishes including both bottom-dwelling and pelagic (deeper water) species. The species is thought to also occasionally feed on invertebrates such as squids and crustaceans.

Following the 2011 flooding events, the number of dolphins in Port Curtis significantly declined (almost 40 per cent reduction from 2007 numbers). This decline was attributed to poor water quality conditions and a reduction in foraging resources.

The population has since returned to its original level before 2011 (around 71- 99 individuals), owing to dry weather conditions. The effects of these flooding events highlight the importance of maintaining good water quality in the Port to support this population of Australian humpback dolphins.

[10] Cagnazzi, D 2013, Review of Coastal Dolphins in central Queensland, particularly Port Curtis and Port Alma regions, report produced for the Ecosystem Research and Monitoring Program Advisory Panel as part of Gladstone Ports Corporation's Ecosystem Research and Monitoring Program, 53pp

Dugong

Within the Gladstone region, a relatively small resident population of dugong utilises Port Curtis and Rodds Bay. All intertidal seagrass meadows in this area is of regional significance and important for dugongs, being the only known major area of seagrass between Shoalwater Bay and Hervey Bay.

The area of Port Curtis from Rodds Bay to The Narrows was declared a Dugong Protection Area in 1997 to recognise the importance of this seagrass habitat to dugong populations and to place extra control measures on gill net fisheries.

While dugongs typically forage on seagrass in shallower water, they are known to forage in deeper water areas, particularly when shallow meadows are scarce or absent. The areas where dugong foraging has been regularly recorded in the Port include the seagrass meadows at:

- Wiggins Island to the south of the proposed barge access channel
- Pelican Banks and South Trees which are north and south of the area proposed to be dredged in the main channel.

Dugongs have also been regularly recorded at the seagrass meadows at Rodds Bay to the far south-east of the main channel. These areas are shown in Figure 5.11.

As discussed in the marine plant section of this chapter, the extent, distribution and density of seagrass is highly variable in the Port and is susceptible to extreme weather events.

Dugongs are susceptible to declines in seagrass associated with poor water quality, and the population in the Port has experienced high rates of mortality following large scale flooding events which have resulted in large scale losses of seagrass.

Due to dry weather in recent years, seagrass meadows in the Port have increased in extent from earlier years with 3,558 ± 466 ha of coastal meadows mapped in 2018 which has increased the availability of food for the recovering dugong population.

Figure 5.11 Primary seagrass meadows that provide foraging habitat for dugongs

Impacts and mitigation

Dredging activities have the potential to impact on marine mammals including:

- vessel strike and disturbances by operating vessels
- loss or alteration of foraging habitat associated with direct removal of seabed and water quality impacts associated with dredging
- disturbance from underwater noise associated with dredging vessels and pile driving activities during the removal and relocation of navigational aids

These potential impacts are discussed in detail in the following section.

Potential impacts – vessel strike/interactions

Dredging works

Given the known distribution of whales, dolphins and dugongs in the Port, there is potential for these fauna species to interact with the dredger and barges during dredging and material transfer operations.

The increase in the number of vessels in the project area associated with the dredging works would increase the risk of vessel strike with marine megafauna including marine mammals.

The Queensland Strandnet database for marine wildlife indicates that boat strike is a contributing factor to marine megafauna mortalities in Queensland, including records from the Port of Gladstone. Based on the database, recreational vessels are considered to account for 96.9 per cent of vessel strikes.

As discussed in chapter 2.3 of this evaluation report, it is expected that dredging works would be undertaken by a TSHD 24 hours a day, seven days a week for the duration of the dredging campaign/s. The TSHD would be supported by a dredger shuttle and survey vessels, and four barges to transport dredged material to the BUF.

The EIS indicates that seven existing navigational aids would be required to be either removed or relocated (two removed and five relocated) and additionally, five new navigational aids would be installed.

These works would require a pile driving barge, an ancillary work boat to deliver piling and construction equipment and a small vessel for transport of personnel. These works are expected to be undertaken over 8 to 12 weeks, 12 hours a day, 6 days a week.

It is estimated that there would be approximately 1310 project vessel movements associated with the Stage 1 dredging activities over a nine-month period; and 775 project vessel movements will be associated with the Stage 2 dredging activities over a six-month period.

The EIS considers the risk of vessel strike during dredging operations to be low, as dredgers and work boats are slow-moving and provide time for marine mammals to evade the approaching vessel. It is also considered that there would be a lower risk of vessel strike in the main channel due to dredging works being undertaken in deeper waters.

The EIS indicates that a range of measures would be undertaken to reduce the risk of potential injury or mortality of marine megafauna during dredging works. The draft Dredging EMP provided as part of the EIS includes a fauna management plan which outlines these measures. Measures include but are not limited to:

- ensuring that suitably qualified and experienced marine fauna spotters are present on all moving vessels larger than 7 m in length at all times. Marine spotters would conduct a search for marine megafauna (e.g. dolphins, dugongs, whales or marine turtles) prior to the commencement of dredging and continual observations for marine fauna would be undertaken throughout dredging activities
- stopping dredging works where marine megafauna are observed within 50 m of operations and not recommencing works until the animal(s) have moved beyond 50 m or have not been observed within 50 m for more than 15 minutes
- enforcing vessel speed limits to prevent injuries to marine fauna, including the use of go-slow zones for project vessels in shallow areas less than 5 m in depth
- using tugs to tow self-powered barges that are operating in shallow waters into deep water prior to engaging propellers, and fitting vessels with propeller guards to prevent propeller strike
- ceasing works immediately where an animal has been injured and not recommencing activities until rescue actions have been taken and a review of appropriate management actions to prevent re-occurrence
- stopping dredging operations and not recommencing until consulting and receiving direction from DES where two or more of any endangered or vulnerable species of marine megafauna are fatally injured on any two out of three consecutive days.

I consider that the proposed mitigation measures in the dredging and project EMP are appropriate for mitigating the risk of vessel strike with marine mammals during dredging works.

Harbour operations post channel dredging works

While the project would not be expected to increase marine traffic directly, the deeper and wider channel would be expected to facilitate improvement in efficiency and safety of vessel movements.

The Port currently experiences a high volume of commercial and recreational vessel traffic with ship movements and other port-related activities operating 24 hours per day all year round. The EIS indicates that the number of commercial vessels accessing the port has been steadily increasing since 2010/2011. For example, the number of annual vessel movements in the 2010/2011 was 1316, and in 2018/2019 the number of annual vessel movements increased to 1842. Based on GPC's records, future throughput and vessels numbers are expected to continue to grow with as much as 2335 vessels movements anticipated by 2025/2026 under a moderate growth scenario. As the number of vessel movements in the Port are expected to increase regardless of the project, I consider that the proposed dredging works in the channel will not have a direct impact on vessel numbers and/or vessel strikes on marine mammals.

Potential impacts – direct loss of foraging habitat

Australian humpback dolphin

Australian humpback dolphins have been recorded in the Port including in the areas proposed to dredged in the main channel and barge access channel. It is considered that these areas potentially provide foraging habitat as the areas of seagrass and macroalgae are likely to support habitat for fish which this dolphin species preys on. Given the potential suitability of habitat, the permanent loss of 85.33 ha marine plants including 35.65 ha of seagrass and 49.68 ha of macroalgae from the main channel would be expected to impact on this species by reducing the availability of prey resources (i.e. fish) and increasing competition with other dolphins and marine predators of which could have a negative impact on the health of these dolphins. I therefore consider the loss of this habitat to be significant.

Additionally, the permanent loss of 421.4 ha of benthic habitat from the main channel and 19.03 ha of benthic habitat from the barge access channel could also result in the loss of foraging resources for the Australian humpback dolphin by removing food for fish that these dolphins' prey on.

Dugong

As discussed in the marine plant section of this chapter, dredging in the main channel is likely to result in the permanent direct loss of 35.65 ha seagrass associated with the removal of seabed material. While this area is not a key feeding site, all seagrass in the Port is considered to be important foraging habitat for dugongs. I therefore consider the permanent loss of seagrass in this area to be significant.

Potential impacts–changes to water quality

As discussed, in the marine plants section, dredging works have the potential to impact on marine plants as a result of a reduction in available light for photosynthesis associated with increased suspended sediment in the water column (turbidity) and burial by the sediments settling out of suspension. These potential impacts with regard to impacts on potential foraging habitat for dugongs and Australian humpback dolphins are discussed in this section.

As discussed, for marine plants based on the zone of high impact dredging works could have an indirect impact on 1664.03 ha of marine plants including 876.98 ha of seagrass and 787.05 ha of macroalgae associated with increased turbidity levels.

The EIS concluded that indirect impacts on marine plants associated with water quality could be adequately managed through adaptive management measures to ensure no long-term adverse impacts.

The proponent has proposed a range of mitigation measures which would be employed during the dredging campaign to minimise impacts on sensitive ecological values including seagrass.

It is also considered that seagrass meadows in the predicted impact area would be expected to return to the pre-disturbance condition after dredging operations have ceased.

Australian humpback dolphin

Likewise, for the Australian Humpback dolphin, the temporary loss of marine plants over this time period could impact on this species by reducing habitat for its prey resources (i.e. fish). Increased turbidity resulting from dredging works is also likely to result in fish moving away from the area temporarily until turbidity levels are reduced which could further impact on the availability of foraging resource for dolphins. Dolphins may also move to other foraging areas, which could result in increased competition with other dolphins and marine predators which could have a negative impact on the health of these dolphins. I therefore consider the loss of this habitat to be significant. As discussed in relation to marine plants, increases in the rate of sedimentation from dredge plumes is very low and not expected have an adverse impact on any marine plants. This would mean the effects of sedimentation are also unlikely to impact on foraging habitat for dugongs or Australian humpback dolphins.

Dugong

While the EIS concludes that long-term impacts can be managed, any temporary losses in the seagrass are likely to result in a reduction of the potential foraging habitat for dugongs.

Given the length of the dredging campaign (up to 58 weeks) the period of time between loss and recovery could be as long as two years, which would mean the availability of this foraging resource to dugongs could be lost for at least two years. As all areas of seagrass in the port are an important food source to dugongs, I consider any losses of seagrass over this time period to be significant.

Potential impacts – underwater noise

Coastal dolphins have a medium-high hearing frequency range between 5 kiloHertz (kHz) to 120 kHz which overlaps with the medium-high frequency range of underwater noise. Dugongs have a medium frequency range between 1 to 18 kHz and humpback whales have a lower frequency range between 2 to 6 kHz.

It is considered that dredging activities and the movement of barges and other vessels are unlikely to generate underwater noise that would have an adverse impact on marine mammals. Given the existing high level of activity in the Port, marine mammals in this area are already exposed to a noisy acoustic environment. Noise generated by moving vessels and dredgers is also characterized as low frequency, typically less than 1000 Hz, with peak frequencies between 10 and 50 Hz and non-impulsive. In addition, the EIS indicates that dredging vessels and equipment would include noise attenuation devices for all pumps, motors and noise generating sources on deck.

The EIS indicates that impact pile driving using a Junttan hydraulic piling hammer would be used for installation of navigational aids. The specific size of the Junttan hydraulic hammer is yet to be determined but noise levels are expected to be in the range of 124 dB. This type of piling produces high intensity sounds pulses at levels which are capable of producing injury to marine mammals that are in close proximity (within 35 m). It is anticipated that this activity will generate the highest levels of underwater noise for the project, being approximately 204 dB for the impact piling and 168 dB for the piling barge. These works are expected to be undertaken over 8 to 12 weeks, 12 hours a day, 6 days a week.

The EIS states that five existing navigational aids will be removed and reinstalled using a barge pile extractor. The installation of the new navigational aids via piling is expected to two to three days per pile. Hammering associated with the installation of these aids would be undertaken intermittently over two to three months and during daylight hours. The EIS indicates that standard operational procedures would be implemented during piling activities to manage noise impacts on marine fauna. This includes employing exclusion/safety and shut-down zones around the perimeter of piling activities, monitoring for the presence of marine fauna before and during piling, soft-starts (i.e. gradually increasing the intensity of the piling). Piling would also be scheduled to be conducted outside sensitive environmental windows

(i.e. when marine mammals are breeding, calving, feeding or resting in biologically important habitats nearby). The EIS indicates that impact pile driving would be undertaken outside of the humpback whale migration season from June to August.

These noise management measures are outlined in the noise and vibration management and fauna management plans that have been prepared as part of the draft project EMP. I require the proponent to implement the mitigation measures outlined within these management plans.

Significant residual impacts and offsets

Inshore dolphins

While the EIS has not considered the project to result in an SRI on inshore dolphins, given that they are generalist feeders, relying on a variety of food sources, I am of the view that the project could have an SRI on the Australian humpback dolphin. Given the Australian humpback dolphins in the Port are a genetically isolated population, the Port is a regionally significant area to this species and therefore the habitats which support the prey species of these dolphins are important. In accordance with the State SRI guidelines an action is likely to have a significant impact on vulnerable wildlife if it likely to cause disruption to ecologically significant locations including feeding areas.

I have stated a condition to be attached to the EA which specifies the maximum disturbance limit of 2482.07 ha for the humpback dolphin. This includes the areas proposed to be dredged in the main and barge access channels, as well as the area impacted by reclamation works, which are discussed in chapter 6.5.

I note that the proponent has committed to survey the proposed dredged area to confirm the area of marine plants that would be removed prior to commencement of dredging. The proponent would also conduct monitoring after dredging to confirm whether marine plants have returned to the pre-disturbance condition within five years after dredging has ceased. The results of these surveys may result in the final SRI being slightly different to the estimated number in the EIS.

I require the proponent to work with the relevant approving authority to confirm the project's final SRI and offset obligations, and to include a range of measures in the final offset strategy to address the project's SRI on the Australian humpback dolphin, where it is confirmed that the project is having an SRI on this species.

As the Australian Humpback dolphin is also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

Dugongs

The EIS concluded that dredging works are expected to have an SRI on dugongs associated with the direct removal of seagrass from the main channel but are not expected to result in an SRI as a result of temporary indirect impacts associated with changes in water quality.

The EIS concluded that the implementation of measures during dredging works which are contained in the Environmental Monitoring Procedure including water quality limits that must be met and adaptive management measures would ensure no permanent indirect impacts on seagrass.

As I am unable to confirm at this point in time whether the project will have an SRI on marine plants due to changes in water quality associated with dredging activities, I have undertaken a precautionary approach and considered both the direct and indirect impacts on seagrass to be SRI. This conclusion is based on the SRI criteria in the State SRI guidelines where an action is likely to have a significant impact on vulnerable wildlife if it is likely to cause disruption to ecologically significant locations including feeding sites.

Given that seagrass is the primary food source, and the seagrass meadows in Gladstone are of regional significance, I consider all seagrass within the Port to be ecologically significant for dugongs. I also consider that given the proposed duration of the dredging campaign (up to 58 weeks) the temporary loss of any seagrass during this period would be a disruption to dugongs feeding.

As I am unable to confirm the project's final SRI at this stage, I have stated a condition to be attached to the EA which specifies a total maximum disturbance limit of 1,287.27 ha for dugongs. This includes the 35.65 ha associated with the direct removal of seagrass from the main channel and 876.98 ha of seagrass potentially impacted as result of changes to water quality, as well as the area impacted by reclamation works, which are discussed later in chapter 6.5.

I note that the proponent has committed to survey the proposed dredging area to confirm the area of seagrass that would be removed prior to commencement of dredging. The proponent would also conduct monitoring after dredging to confirm whether marine plants have returned to the pre-disturbance condition within five years after dredging has ceased. The results of these surveys may result in the final SRI being slightly different to the estimated number in the EIS.

I require the proponent to work with the relevant approving authority to confirm the project's final SRI and offset obligations. I have stated a condition to be attached to the EA requiring that the proponent provide an offset for any MSES on which the project is confirmed to have an SRI. I require the final offset strategy to include measures that appropriately compensate for any loss of habitat which constitutes an SRI.

Offsets

As part of the draft offsets strategy that was provided in the EIS documentation, the proponent has proposed a range of measures to further investigate prior to commencing dredging activities to address the project's SRI on dugongs. Direct offsets may include using dredged material from port-wide maintenance dredging programs to create viable seagrass meadows and foraging habitat for dugongs. Other compensatory measures may include research on dugong foraging behaviour in the Port, financial contribution towards dugong conservation research programs or contribution to the State Government to undertake offsets on behalf of the proponent.

I require the proponent to undertake further investigations to determine suitable and feasible offsets option/s which addresses the project's SRI on dugongs and to provide the adequate level of detail on the selected option/s in the final offset strategy.

As dugong are also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

Coordinator-General's conclusions: marine mammals

I am satisfied that the EIS has adequately assessed the potential impacts that the capital dredging works and transfer of dredge material would have on marine mammals that are MSES.

I note the proponent's commitment to implement dredging and project EMP which would include measures that would mitigate impacts on marine mammals associated with vessel and dredger movements during dredging operations. I am satisfied the measures listed in the project EMP to manage noise impacts on marine fauna, would address the potential underwater noise impacts from pile driving on marine mammals.

I have also included a stated condition to be attached to the EA requiring the proponent to implement a dredging management plan which includes measures to address potential impacts on marine mammals. I require the dredging management plan to be implemented.

I am also satisfied that the potential marine water quality impacts during capital dredging work and dredge material transfer can be managed through the conditions in the project's EA, the implementation of the Dredging EMP including mitigation measures included in the EIS, implementation of the Environmental Monitoring Procedure and the establishment of the DTRP. Based on the information in the EIS I consider that direct removal of marine plants and benthic habitat within the main channel and potential loss of seagrass and macroalgae associated with changes to water quality associated with dredge plumes could have an SRI on the Australian humpback dolphin.

I also consider the direct removal of 35.65 ha of seagrass from the main channel is an SRI for dugong as I consider all seagrass within the Port to be ecologically significant for dugong. I have also taken a precautionary approach and have also considered the potential loss of 876.98 ha seagrass associated which changes to water quality could be an SRI. While the proponent has proposed measures to manage water quality to ensure no permanent impacts on marine plants, the proposed duration of the dredging campaign could be up to 58 weeks and the temporary loss of any seagrass during time period is likely to be a disruption to dugong feeding. As per the State SRI guidelines any activity that is likely to cause disruption to an ecologically significant location (i.e. feeding habitat for a vulnerable species) can be considered to be an SRI.

As I am unable to confirm the project's final SRI at this stage, I have stated a condition to be attached to the EA which specifies a total maximum disturbance limit for humpback dolphins and dugongs. The total maximum limits I have required for the project include:

- 2482.07 ha for the humpback dolphin including:
  - direct removal of 421.4 ha marine plants and benthic habitat from the main channel and 19.03 ha of benthic habitat from the barge access channel
  - 1,664.03 ha of marine plants potentially indirectly impacted as result of changes to water quality
  - the area impacted by reclamation works, which are discussed in chapter 6.5
- 1,287.27 ha for the dugong including:
  - direct removal of 35.65 ha seagrass from the main channel
  - 876.98 ha of seagrass potentially impacted as result of changes to water quality
  - the area impacted by reclamation works, which are discussed in chapter 6.5.

I require the proponent to work with the relevant approving authority to confirm the project's final SRI and offset obligations. I have stated a condition to be attached to the EA requiring that the proponent provide an offset for any MSES which the project is confirmed to have an SRI. I require the final offset strategy to include measures that appropriately compensate for any loss of habitat which constitutes an SRI.

As the inshore dolphins and dugongs are also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

Marine turtles

Presence and distribution in the project area

The EIS indicates that five marine turtle species are likely to occur in the project area which are listed under the NC Act and are listed threatened and migratory species under the EPBC Act. All five of these species are also an attribute which contribute to the OUV of the GBRWHA. These species and their listings are identified in Table 5.5.

Table 5.5 Marine turtle species are known or likely to occur in the project area

Common name *Species name*	NC Act listing	EPBC Act listing
Green turtle *Chelonia mydas*	Vulnerable	Vulnerable Migratory
Flatback turtle *Natator depressus*	Vulnerable	Vulnerable Migratory
Loggerhead turtle *Caretta caretta*	Endangered	Endangered Migratory
Hawksbill turtle *Eretmochelys imbricata*	Endangered	Vulnerable Migratory
Olive ridley turtle *Lepidochelys olivacea*	Endangered	Endangered Migratory

Green turtles

Green turtles are the most commonly found marine turtle species in the Gladstone region. The EIS states that the entire GBR including the Gladstone region is considered an important feeding ground for green turtles as it supports a rich diversity of coastal marine habitats, including rocky and coral reefs, tidal and subtidal seagrass meadows, mangroves and soft-bottom habitats which provide foraging habitat for this species. Immature and adult green turtles primarily forage on seagrass (*Zostera muelleri* and *Halophila ovalis*), algae, mangrove leaves and fruit, and occasionally on jellyfish, egg masses, sponges, dead fish and small crustaceans[11]. While adults are primarily herbivorous, green turtles are considered to be more carnivorous during their pelagic juvenile stage, feeding on algae, pelagic crustaceans and molluscs.

Movement and habitat use studies in the Port indicate that green turtles have very distinct home ranges and strong site fidelity within Port Curtis region. These studies also indicate the northern Pelican Banks area between Facing and Curtis Island to the north-east of the dredge footprint are considered to support higher densities of green turtles than any other part of the Port, as this area contains the largest and densest areas of seagrass in the Port. This area typically experiences lower levels of turbidity than sites closer to the central harbour, due to reduced tidal velocities and lower levels of sediment re-suspension, as well as benefiting from regular flushing from offshore waters entering through the passage between Curtis and Facing Islands. Other areas of the Port where high densities of the green turtles have been recorded include the seagrass meadows near Wiggins Island to the south-east of the proposed barge access channel. Green turtles have also been recorded near Quoin Island, South Trees inlet and within the Boyne River estuary.

While green turtles are known to nest occasionally on Curtis and Facing Islands, this species is considered to prefer nesting on offshore islands in the GBR. The nesting period for the green turtle commences in October and peaks in late December to January and ends around March to April.

Flatback turtle

The flatback turtle is endemic to tropical waters of northern Australia, Papua New Guinea and Irian Jaya and all known breeding sites for this species occur only in Australia.

[11] Limpus, C.J. 2008. A biological review of Australian marine turtle species: green turtle, Chelonia mydas (Linnaeus). The State of Queensland. Environmental Protection Agency 2008.

Flatback turtles are known to nest on several beaches in the Gladstone region including Curtis, Facing and Hummock Hill Islands and Tannum Sands. While the other areas are not primary rookeries, Southend Beach on Curtis Island supports one of four major rookeries in the GBR. The peak nesting period for this species occurs between mid-November and mid-December, and peak hatching period occurs mid-February.

Flatback turtles have been known to enter the Port area during part of their inter-nesting period. Satellite tracking studies indicate that inter-nesting flatback turtles use habitat around the existing Gatcombe and Auckland shipping channels, waters off the coasts of Facing and Curtis Islands, and the outer harbour. It is considered that flatback turtles do not forage during the interesting period.

The flatback turtles is primarily carnivorous, feeding mostly in deeper waters on benthic, soft-bodied macroinvertebrates including soft corals and sea pens. Post-hatchling flatback turtles are known to forage on plankton in pelagic waters and the foraging ecology of juvenile turtles is unknown.

Loggerhead turtle

Loggerhead turtles have a worldwide tropical and subtropical distribution. In Australia, they occur in coral reefs, bays and estuaries in tropical and warm temperate waters off the coast of Queensland, Northern Territory, Western Australia and New South Wales.

There have been isolated records of loggerhead turtles nesting within the Port limits; however, this species is considered unlikely to nest in the Port on a regular basis. The peak nesting season for the loggerhead turtle occurs in December, with hatching occurring in the following months up until the end of April. The EIS states that inter-nesting habitat for the loggerhead turtles has not been identified in the Port but may occur.

Loggerhead turtles are known to forage in a wide range of tidal and subtidal habitats including rocky reefs, seagrass beds and areas with soft sand and mud between coral reefs and the mainland. Adult and large immature loggerheads are carnivorous, feeding mostly on shellfish, crabs, sea urchins and jellyfish. Post-hatchlings are thought to feed on macro-zooplankton. The Port provides a range of suitable foraging habitats for the loggerhead turtle including coral and rocky reefs, seagrass meadows, and soft-bottomed habitat. It is considered that the existing dredged channels and deeper subtidal areas within the Port provide foraging habitat for loggerhead turtle.

The EIS states that the existing shipping channels are unlikely to support an abundance of foraging resources due to ongoing annual disturbance associated with maintenance dredging.

Hawksbill turtle

The Hawksbill turtles are known to occasionally migrate through the Port; however, no resident populations have been recorded. Adult and immature hawksbill turtles are typically found in tidal and subtidal coral and rocky reef habitats and sometimes within seagrass habitats of coastal waters and in deeper waters. Hawksbill turtles are omnivorous, feeding on algae, sponges, soft corals and other soft-bodied invertebrates. Given its known diet, hawksbill turtles would be expected to forage in coral and rocky reef habitat, and soft bottom habitats within shallow and deeper subtidal areas of the Port, including the areas proposed to be dredged in the main channel and the barge access channel.

No hawksbill turtle nesting has been recorded within 500 km of Port Alma and Port Curtis.

Olive ridley turtle

Olive ridley turtles are known to forage in both shallow benthic habitats and deeper pelagic waters. This species is primarily carnivorous, feeding on soft-bodied invertebrates such as sea pens, soft corals, sea cucumbers and jellyfish. The EIS acknowledges that the existing channel may provide suitable foraging habitat (based on the presence of seagrass and soft bottom habitats which support prey resources);

however, concludes that the existing shipping channels are unlikely to support a great abundance of foraging resources. This conclusion is based on the low likelihood of this species occurring in the Port and ongoing annual disturbances to benthic habitat associated with maintenance dredging.

Impacts and mitigation

Dredging activities have the potential to impact on marine turtles including:

- loss or alteration of foraging habitat associated with direct removal of seabed and water quality impacts associated with dredging
- impacts on nesting and internesting habitat
- vessel strike and disturbances
- disturbance from underwater noise associated with dredging vessels and pile driving activities during the removal and relocation of navigational aids

These potential impacts are discussed in detail in the following section.

Potential impacts – direct loss of foraging habitat

The EIS indicates that the proposed dredging area contains seagrass, macroalgae and benthic habitats which support benthic macroinvertebrates (e.g. molluscs and crustaceans) which are a foraging resource for marine turtles. Dredging activities would result in the removal of potential foraging habitat for marine turtles from this area and subsequent maintenance dredging within the proposed dredging footprint would also be expected to prevent or impede the recovery of available food resources in the channel.

The EIS indicates that dredging works in the main and barge access channels could result in the direct permanent loss of 440.43 ha of foraging habitat (e.g. seagrass, algae and benthic habitat) for marine turtles including 421.40 ha from the main channel and 19.03 ha from the barge access channel. Subsequent maintenance dredging within the proposed dredging footprint would also be expected to prevent or impede the recovery of available food resources in these areas.

Green turtle

While the green turtles are herbivorous as adults, I have also considered the loss of benthic habitat as potential impact on foraging habitat, as this species is known to forage on invertebrates during different stages of development. As such I have included this area of habitat in the maximum disturbance limit for the green turtle, which I have set in my stated conditions to be attached to the EA.

Loggerhead, flatback and Hawksbill turtles

Based on the known records of these species in the Port Curtis area and foraging preferences, I consider that these species have the potential to use the area proposed to be dredged and that any reduction in the area of available habitat within Port Curtis could be significant. As such I have included this area of habitat in the maximum disturbance limit for these species, which I have set in my stated conditions to be attached to the EA.

Olive ridley turtle

While the EIS has concluded that olive ridley turtles are unlikely to use the areas proposed to be dredged in main and barge access channels for foraging, I have undertaken a precautionary approach for this species. Based on the known records of this species in the Port Curtis area and foraging preferences, I consider that this species has the potential to use the area proposed to be dredged and that any reduction in the area of available habitat within Port Curtis could be significant. As such I have

included this area of habitat in the maximum disturbance limit for this species, which I have set in my stated conditions to be attached to the EA.

Potential impacts – changes to water quality

As discussed in the marine plants section, dredging works have the potential to impact on marine plants as result of a reduction in available light for photosynthesis associated with increased suspended sediment in the water column (turbidity) and burial by the sediments settling out of suspension. These potential impacts with regard to impacts on potential foraging habitat for marine turtles are discussed in this section.

Turbidity and sedimentation impacts

As discussed in my evaluation on marine plants, based on the modelled zone of high impact dredging, works could have an indirect impact on 1664.03 ha of marine plants including 876.98 ha of seagrass and 787.05 ha of macroalgae associated with increased turbidity levels.

The EIS concluded that indirect impacts on marine plants associated with water quality could be adequately managed through adaptive management measures to ensure no long-term adverse impacts. The proponent has proposed a range of mitigation measures which would be employed during the dredging campaign to minimise impacts on sensitive ecological values including seagrass. It is also considered that seagrass meadows in the predicted impact area would be expected to return to the pre-disturbance condition after dredging operations have ceased.

While the EIS concludes that long-term impacts can be managed, any temporary losses in the seagrass are likely to be result in a reduction of the potential foraging habitat for marine turtles. Given the length of the dredging campaign (up to 58 weeks), the time between the loss and recovery of marine plants in this area could be as long as two years. This could mean the availability of this foraging resource to marine turtles could be lost for at least two years.

Potential impacts – disturbances on nesting and inter-nesting habitat

Impacts on nesting

The closest areas to the dredging area where nesting has been recorded include Lilley's Beach on Boyne Island, Hummock Hill, Tannum Sands and along the coast to Colosseum Inlet which are approximately 4.5 km to 5.5 km south of the area to be dredged.

The proposed dredging area is also located near Facing, Curtis and Peak Islands, which are known to provide important nesting habitat for the flatback turtle. While the dredging activities are not expected to have a direct impact on any turtle nesting habitat, dredging activities have the potential to have an indirect impact on nesting turtles as result of light, noise and vibration disturbances and direct interactions with turtles during inter-nesting periods when turtles return to the marine environment between laying eggs. Lighting on vessels also has the potential to impact on hatchlings which have been reported to swim around lights on boats.

Facing Island is designated an environmental management precinct in the Priority Port of Gladstone master planned area. There is a sea turtle protection code which applies to development within this precinct. The purpose of the code is to be achieved by ensuring development avoids or minimises adverse lighting impacts on the habitat values and functions of turtle nesting areas. This includes avoiding or minimising artificial lighting that is directly visible from turtle nesting areas or the ocean. Another relevant performance outcome of this code is for operational work to avoid or minimise noise or vibration impacts on turtle nesting areas. The EIS states that the outcomes of this code would be a consideration for the project.

The proponent will also need to consider requirements of the *National Light Pollution Guidelines for Wildlife including Marine Turtles, Seabirds and Migratory Shorebirds*[12] for managing potential impacts of artificial light on marine turtles.

The EIS states that dredging activities will be undertaken 24 hours per day, seven days a week over the dredging and dredged material placement campaign.

With the exception of lighting, which is essential for maritime safety, the draft dredge EMP outlines mitigation measures to minimise impacts from artificial lighting including:

- only using amber LED aero-screen lighting on the outside of project vessel cabins
- blacking out cabin portholes at night on all project vessels to prevent light spill
- using shading to ensure no light source within the area is directly visible from outside the vessel perimeter.

I note that measures used will need to be consistent with the sea turtle protection code which applies to development within the Facing Island environmental management precinct that has been designated in the Priority Port of Gladstone master planned area; and the *National Light Pollution Guidelines for Wildlife including Marine Turtles, Seabirds and Migratory Shorebirds*.

Impacts on inter-nesting habitat

The Gladstone region supports important nesting populations of flatback turtles. The species is known to nest on Curtis Island (South End beach), Facing Island, Hummock Hill Island and Tannum Sands with peak nesting activity occurring between mid-November to mid-December. The peak hatching period for this species occurs during February. The area where dredging is proposed in the main channel is known to support internesting habitat for flatback turtles.

The EIS indicates that a number of measures would be implemented in accordance with a DMP during dredging activities to minimise disturbances and potential injury and mortality of marine turtles. The draft Dredging EMP provided in the EIS includes a range of measures that are relevant to managing impacts on flatback turtles including but not limited to:

- ensuring that suitably qualified and experienced marine fauna spotters are present on all moving vessels larger than 7 m in length at all times. Marine spotters would conduct a search for marine turtles and other marine megafauna prior to the commencement of dredging and continual observations for marine megafauna would be undertaken throughout dredging activities
- stopping dredging works where marine turtles and other marine megafauna are observed within 50 m of operations and not recommencing works until the animal(s) have moved beyond 50 m or have not been observed within 50 m for more than 15 minutes
- ensuring the dredger head is fitted with fauna exclusion devices, including but not limited to turtle deflector/exclusion devices
- reducing pump speeds and activating drag head water jets when the drag head is not in contact with the seabed.

The EIS concludes that the dredging activities are unlikely to have a long-term adverse impact on the reproduction of flatback turtles using this area as works would be temporary and a range of measures would be undertaken to minimise impacts. While the EIS concludes that dredging works are unlikely to have an adverse impact on reproduction for flatback turtles nesting at beaches in the region, I have taken a precautionary approach and have included a maximum disturbance limit for interesting habitat in

[12] https://www.environment.gov.au/biodiversity/publications/national-light-pollution-guidelines-wildlife

my stated conditions to be attached to the EA. I note that the maximum disturbance limit for inter-nesting habitat also overlaps with the maximum disturbance limit for impacts on foraging habitat for the flatback turtle.

In addition, I have also required in my conditions that a DMP be developed and then implemented during dredging works to ensure potential impacts on marine turtles including interesting flatback turtles are adequately managed.

I am satisfied that these conditions would ensure that impacts are restricted to proposed impact footprints and minimise the project's impact on internesting flatback turtles.

Potential impacts–vessel strike/interactions

Dredging activities and vessel movements would increase the risk of turtle injuries and mortalities. Marine turtles have the potential to be entrained by dredgers as they are known to spend time at the bottom of coastal inlets and shipping channels. It is considered that the risk of vessel strike would be increased during the inter-nesting period for the flatback turtle.

As discussed in my evaluation of the project's impact on marine mammals I require the proponent to implement a Dredging EMP during dredging operations that includes measures to reduce the potential for dredger and vessel interactions with marine megafauna including marine turtles. I note that the draft Dredging EMP provided in the EIS includes a range of measures that are relevant for managing vessel interactions with marine turtles. The measures which I have discussed for marine mammals would also be applicable to marine turtles. Other additional measures in the draft Dredging EMP which are particularly relevant to marine turtles include:

- ensuring the dredger head is fitted with fauna exclusion devices, including but not limited to turtle deflector/exclusion devices
- reducing pump speeds and activating drag head water jets when the drag head is not in contact with the seabed.

These measures are intended to mitigate the potential entrainment (capture) of the turtles during dredging activities. As exclusion devices have limitations, they would need to be serviced and inspected throughout dredging activities. While these measures can reduce the potential for entrainment and injury, these measures are unlikely to completely remove this risk.

While there is potential for boat strike to occur, I consider the proposed measures in the EIS and dredging EMPs are standard measures for dredging projects and would minimise potential vessel strike impacts during dredging activities.

I have also stated conditions to attach to the EA requiring a DMP to be developed and implemented prior to commencing dredging works to ensure potential impacts on marine turtles are adequately managed.

Potential impacts – underwater noise

Underwater noise resulting from dredging and piling activities required for the installation of navigational aids have the potential to impact on turtles directly by causing disruptions to behaviour and impacting on hearing, and by disturbing prey.

Turtles are most sensitive to low noise frequencies between 100 and 400 Hz and impulsive sounds (i.e. impact piling driving and rock blasting). Studies indicate that the sound exposure level threshold level for mortality and potential mortal injury is 210 dB.

It is considered that dredging activities and the movement of barges and other vessels are unlikely to generate underwater noise that would have an adverse impact on marine turtles. Given the existing high level of activity in the Port, turtles in this area are already exposed to a noisy acoustic environment.

Noise generated by moving vessels and dredgers is also characterized as low frequency, typically less than 1,000 Hz with peak frequencies between 10 and 50 Hz and non-impulsive. In addition, the EIS indicates that dredging vessels and equipment would include noise attenuation devices for pumps, motors and noise generating sources on deck.

Large shipping vessels and tankers produce lower frequency noise with a primary energy near 40 Hz and underwater source levels for these commercial vessels generally range from 177 to 188 dB.

The EIS indicates that impact pile driving using a Junttan hydraulic piling hammer would be used for installation of navigational aids. The specific size of the Junttan hydraulic hammer is yet to be determined but noise levels are expected to be in the range of 124 dB. This type of piling produces high-intensity sounds pulses at levels which are capable of producing injury to marine turtles that are in close proximity (within 35 m). It is anticipated that this activity will generate the highest levels of underwater noise during the project, being approximately 204 dB for the impact piling and 168 dB for the piling barge. While this is below the sound exposure level threshold level for mortality (210 dB), studies indicate that marine turtles become stressed by noise levels above 166 dB. The noise generated by this activity is therefore likely to result in turtles moving away from the area temporarily), however is unlikely to result in mortality or injury to turtles, provided that the proposed mitigation measures are implemented.

The EIS indicates that standard operational procedures would be implemented during piling activities to manage noise impacts on marine fauna. This includes employing exclusion/safety and shut-down zones around the perimeter of piling activities, monitoring for the presence of marine fauna before and during piling, ensuring soft-starts (i.e. gradually increasing noise intensity) are always undertaken before piling. Piling would also be scheduled to be conducted outside sensitive environmental windows including peak nesting periods for flatback and loggerhead turtles (November to December, and February).

I am satisfied that these mitigation measures will minimise potential impacts to marine turtles during pile driving activities.

Significant residual impacts and offsets

Direct impacts

Green turtle

It is expected that dredging works will directly remove 440.43 ha (421.40 ha from the main channel and 19.03 ha from the barge access channel) of potential foraging habitat associated with the loss of seagrass, algae and habitat for benthic invertebrates. While the EIS has concluded that only the direct removal of seagrass and macroalgae would be considered to be an SRI for the green turtle, I have taken a precautionary approach and have also considered the loss of benthic habitat as potential impact on foraging habitat, as this species is known to forage on invertebrates during different stages of development. As such I have included this area of habitat in the maximum disturbance limit for the green turtle, which I have set in my stated conditions to be attached to the EA. In accordance with the State SRI guidelines, an action is likely to have a significant impact on endangered or vulnerable wildlife if it is likely to cause disruption to ecologically significant locations including feeding sites. Given that dredging works could permanently disrupt feeding in this area, I have considered that this impact could be an SRI.

Loggerhead, hawksbill, olive ridley and flatback turtles

Given the habitat preferences for the other marine turtle species, I have undertaken the same approach for the loggerhead, hawksbill, olive ridley and flatback turtles and have provided a maximum disturbance limit for the combined area of seagrass, algae and habitat for benthic invertebrates that would be lost from the dredge footprints. Likewise, for the green turtle I have considered this impact could be an SRI,

as the removal of material from this area could permanently disrupt feeding for marine turtles in this area.

Indirect impacts

The EIS concluded that dredging works are not expected to result in an SRI on marine turtles as a result of temporary indirect impacts on foraging habitat (i.e. seagrass and macroalgae) associated with changes in water quality. It is considered that the implementation of measures contained in the Environmental Monitoring Procedure during dredging works would ensure no permanent indirect impacts on marine plants associated with changes to water quality.

As discussed in the marine plant section, I am unable to confirm at this point in time whether the project will have an SRI on marine plants due to changes in water quality associated with dredging activities. As such I have undertaken a precautionary approach and have also considered the indirect impact on marine plants to be an SRI for the purpose of this assessment. In accordance with the State SRI guidelines, an action is likely to have a significant impact on endangered or vulnerable wildlife if it is likely to cause disruption to ecologically significant locations including feeding sites. I consider that given the proposed duration of the dredging campaign (up to 58 weeks), the temporary loss of marine plants could be a disruption to feeding for marine turtles and potentially be an SRI.

Total impact

As I am unable to confirm the project's final SRI at this stage, I have stated a condition to be attached to the EA which specifies a total maximum disturbance limit of 2482.07 ha for the green, loggerhead and hawksbill turtles. This includes 440.43 ha of potential foraging habitat associated with the loss of seagrass, algae and habitat for benthic invertebrates from the main channel and barge access channels, and 1664.03 ha of marine plants potentially impacted as result of changes to water quality, as well as the area impacted by reclamation works, which are discussed in chapter 6.5.

I have also specified in my stated condition a maximum disturbance limit of 2104.46 ha of potential foraging habitat for the olive ridley turtle and 2104.46 ha of foraging and inter-nesting habitat for the flatback turtle which includes direct and indirect impact footprints in the main channel and barge access channel.

I note that the proponent has committed to survey the proposed dredged area to confirm the area of seagrass that would be removed prior to commencement of dredging. The proponent would also conduct monitoring after dredging to confirm whether marine plants have returned to the pre-disturbance condition within five years after dredging has ceased. The results of these surveys may result in the final SRI being slightly different to the estimated number in the EIS.

I require the proponent to work with the relevant approving authority to confirm the project's final SRI and offset obligations. I have stated a condition to be attached to the EA requiring that the proponent provide an offset for any MSES for which the project is confirmed to have an SRI. I require the final offset strategy to include measures that appropriately compensate for any loss of habitat which constitutes an SRI.

Offsets

As part of the draft offsets strategy that was provided in the EIS documentation, the proponent has proposed a range of measures to further investigate as part of developing the final offset strategy to address the project's SRI on the green turtle. Direct offsets may include using dredged material from port-wide maintenance dredging programs to create viable seagrass meadows and foraging habitat for green turtles. Other compensatory measures may include research on green turtle foraging behaviour in the Port, financial contribution towards marine turtle conservation research programs or contribution to the State Government to undertake offsets on behalf of the proponent.

Should it be identified that the project is having an SRI on the other marine turtle species discussed in the chapter I would expect the proponent to undertake further investigations to determine suitable and feasible offsets option/s; and to provide the adequate level of detail on the selected option/s in the final offset strategy.

As marine turtles are also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

Coordinator-General's conclusions: marine turtles

I am satisfied that the EIS has adequately assessed potential impacts of the capital dredging works, and transfer of dredge material would have on marine turtles that are MSES.

I note the proponent's commitment to implement project and dredging EMP which would include measures that would mitigate impacts on marine turtles associated with vessels and dredger movements during dredging operations. I am satisfied that these plans would address the projects impacts on marine turtles including impacts from noise, lighting and vessel strike. I require the proponent to adhere to the commitments in the EIS and expect the project and dredging EMP to be implemented.

I am satisfied that the potential marine water quality impacts during capital dredging work and dredge material transfer can be managed through the conditions in the project's EA, the implementation of the project and dredging EMP and Environmental Monitoring Procedure including the establishment of a DTRP.

The EIS indicates that dredging works in the main and barge access channels could result in the direct permanent loss of 440.43 ha of foraging habitat (e.g. seagrass, algae, mollusc and crustaceans) for marine turtles including 421.40 ha from the main channel and 19.03 ha from the barge access channel. Subsequent maintenance dredging within the proposed dredging footprint would also be expected to prevent or impede the recovery of available food resources in these areas.

Based on the modelled zone of high impact dredging, works could have an indirect impact on 1664.03 ha of marine plants including 876.98 ha of seagrass and 787.05 ha of macroalgae associated with increased turbidity levels. While the EIS concluded that dredging works are not expected to result in an SRI on marine turtles as a result of temporary indirect impacts on foraging habitat (i.e. seagrass and macroalgae) associated with changes in water quality, I have undertaken a precautionary approach and have also considered the indirect impact on marine plants to be an SRI for the purpose of this assessment. In accordance with the State SRI guidelines an action is likely to have a significant impact on endangered or vulnerable wildlife if it is likely to cause disruption to ecologically significant locations including feeding sites. I consider that given the proposed duration of the dredging campaign (up to 58 weeks) the temporary loss of marine plants could be a disruption to feeding for marine turtles and potentially be an SRI.

I note that the proponent has committed to survey the proposed dredged area to confirm the area of seagrass that would be removed prior to commencement of dredging. The proponent would also conduct monitoring after dredging to confirm whether marine plants have returned to the pre-disturbance condition within five years after dredging has ceased. The results of these surveys may result in the final SRI being slightly different to the estimated number in the EIS.

As part of the draft offsets strategy that was provided in the EIS documentation, the proponent has proposed a range of measures to be further investigated as part of developing the final offset strategy to address the project's SRI on the green turtle. Direct offsets may include using dredged material from port-wide maintenance dredging programs to create viable seagrass meadows and foraging habitat for green turtles. Other compensatory measures may include research on green turtle foraging behaviour in the Port, financial contribution towards marine turtle conservation research programs or contribution to the State Government to undertake offsets on behalf of the proponent.

As I am unable to confirm the project's final SRI at this stage, I have stated a condition to be attached to the EA which specifies a total maximum disturbance limit of 2482.07 ha for the green, loggerhead and hawksbill turtle a. This includes 440.43 ha of potential foraging habitat associated with the loss of seagrass, algae and habitat for benthic invertebrates from the main channel and barge access channels; and 1664.03 ha of marine plants potentially impacted as result of changes to water quality, as well as the area impacted by reclamation works, which are discussed in chapter 6.5.

I have also specified in my stated condition a maximum disturbance limit of 2104.46 ha of potential foraging habitat for the olive ridley turtle and 2104.46 ha of foraging and inter-nesting habitat for the flatback turtle which includes direct and indirect impact footprints in the main channel and barge access channel.

I require the proponent to work with the relevant approving authority to confirm the project's final SRI and offset obligations for marine turtles. I have stated a condition to be attached to the EA requiring that the proponent provide an offset for any MSES for which the project is confirmed to have an SRI. I require the final offset strategy to include measures that appropriately compensate for any loss of habitat which constitutes an SRI.

As marine turtles are also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

Coordinator-General's conclusions: protected wildlife habitat

I am satisfied that EIS has adequately assessed potential impacts of the capital dredging works, and transfer of dredge material would have on protected wildlife habitat as an MSES.

I consider that the potential impacts on protected wildlife habitat can be managed, provided the proponent carries out the activity in accordance with the measures outlined in the EIS, including commitments and measures described in the project and dredge EMP, and the Environmental Management Procedure which were provided as part of the EIS. This includes measures to manage, underwater noise, water quality, vessel strike, the introduction and spread of marine pests and disturbances from noise, dust and light pollution.

I expect the proponent to adhere to the commitments and measures outlined in the EIS to ensure impacts on protected wildlife habitat are adequately addressed and not having an adverse impact on these matters. Furthermore, I expect that the conditions I have stated for inclusion in the EA and operational works approvals would ensure potential impacts on protected wildlife habitat are adequately managed.

While most impacts can be managed, I have concluded that the proposed capital dredging works and the transfer of material to the reclamation area could have SRIs on protected wildlife habitat for the Australian humpback dolphin, the dugong and marine turtles.

I note that the proponent has committed to survey the proposed dredged area to confirm the area of seagrass that would be removed prior to commencement of dredging. The proponent would also conduct monitoring after dredging to confirm whether marine plants have returned to the pre-disturbance condition within five years after dredging has ceased. The results of these surveys may result in the final SRI being slightly different to the estimated number in the EIS.

As I am unable to confirm the project's final SRI at this stage, I have set the following maximum disturbance limits in my stated conditions to be attached to the EA:

- 2482.07 ha for the Australian humpback dolphin including:
  - 421.4 ha direct removal of marine plants and benthic habitat from the main channel and 19.03 ha of benthic habitat from the barge access channel

  - 1,664.03 ha of marine plants potentially indirectly impacted as result of changes to water quality
  - the areas impacted by reclamation works, which are discussed in chapter 6.5.
- 1,287.27 ha for the dugong including:
  - 35.65 ha direct removal of seagrass from the main channel
  - 876.98 ha of seagrass potentially impacted as result of changes to water quality
  - the areas impacted by reclamation works, which are discussed in chapter 6.5.
- 2482.07 ha of foraging habitat for green, loggerhead and hawksbill turtles which includes:
  - the direct removal of 440.43 ha of potential foraging habitat for the green, loggerhead, and hawksbill, flatback and olive ridley turtles from the main and barge access channels (which includes seagrass, algae and habitat for benthic invertebrates
  - the temporary loss of 1664.03 ha potential foraging habitat (seagrass and macroalgae) impacted as result of changes to water quality
  - the areas impacted by reclamation works, which are discussed in chapter 6.5.
- 2104.46 ha of foraging habitat for olive ridley turtle which includes:
  - the direct removal of 440.43 ha of potential foraging habitat for the olive ridley turtles from the main and barge access channels (which includes seagrass, algae and habitat for benthic invertebrates
  - the temporary loss of 1664.03 ha potential foraging habitat (seagrass and macroalgae) for the olive ridlely turtle
- 2104.46 ha of foraging and inter-nesting habitat for the flatback turtles which includes:
  - the direct removal of 440.43 ha of foraging and internesting habitat for the flatback turtle from the main and barge access channels
  - the temporary loss of 1664.03 ha of foraging and internesting habitat for the flatback turtle impacted as result of changes to water quality.

I note that the draft offset strategy provided as part of the EIS outlines a range of options for addressing the project's SRI on green turtles and dugongs and that these options would be further investigated, and the selected option appropriately detailed in the final offset strategy.

I require the proponent to work with the relevant approving authority to confirm the project's final SRI and offset obligations for all MSES discussed in this section. I have stated a condition to be attached to the EA requiring that the proponent provide an offset for any MSES which the project is confirmed to have an SRI. I require the final offset strategy to include measures that appropriately compensate for any loss of habitat which constitutes an SRI.

As the dugong, Australian Humpback dolphin and marine turtles are also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

5.4.5 Fish habitat areas

An area declared under the Fisheries Act to be a fish habitat area is an MSES.

The EIS indicates that there are no declared FHA present within the project direct impact areas. There are two declared FHAs to the south of the areas to be dredged in the main channel including:

- Rodds Harbour (i.e. Rodds Bay)
- Colosseum Inlet.

The Rodds Harbour declared FHA is located 40 km south-east of Gladstone and south-east of the Project areas to be dredged. The area contains extensive habitat values, including mangroves and estuaries, samphire and claypan areas, seagrass meadows, island banks, bar zones, channels and deltaic areas. These areas provide a conservation, protection, management and research area for essential fish habitat, support juvenile fish and prawn habitat and also provide an important recruitment area for mud crabs. These areas are known to support commercial, recreational and Indigenous fisheries values.

The Colosseum Inlet declared FHA is located 24 km south-east of Gladstone and south of the project areas to be dredged. The area contains extensive habitat values, including mangroves, bar zones, island banks, silty sand, channels, deltaic islands, samphire and clay pan areas, small coral community and seagrass meadows towards Tannum Sands. These habitats are known to support commercial, recreational and Indigenous fisheries values.

Water quality modelling for the EIS indicates that the environmental values in this area are unlikely to be impacted by the dredging works. These areas fall outside the predicted zone of impact and unlikely to experience measurable increases in turbidity as a result of these works.

Coordinator-General's conclusions: fish habitat areas

I am satisfied that EIS has adequately assessed potential impacts that the capital dredging works and transfer of dredge material would have on FHAs as an MSES.

Given the distance from the proposed dredging works these activities are unlikely to have an adverse impact on the Colosseum Inlet and Rodds Harbour FHAs.

5.5 Maritime transport

This section of the report evaluates the EIS's assessment of the potential impacts on maritime (shipping) transport associated with dredging, transfer of material to the BUF, and the removal and installation of navigational aids. This section does not include the unloading or placement of dredged material into the WBE reclamation areas and non-maritime transport, which are discussed in section 6.6.

The Port operates 24-hours, seven days a week, all year round. The Port's wharf centres, and associated facilities cater for the import and export of raw materials, such as bauxite and coal, and the export of finished products associated with major industries within the Gladstone and Central Queensland regions, including liquefied natural gas and aluminium. In 2018, the total annual commercial vessel movements within the Port was 1785 (excluding commercial fishing and tourist vessels).

The existing and potential future Port wharf centres are identified in Figure 5.12.

The Port of Gladstone Pilotage Area (see Figure 2.3) is controlled by MSQ. MSQ, through the authority of the Regional Harbour Master (RHM), has jurisdiction over the safe movement of all shipping within the pilotage area. The RHM is authorised to give direction under the relevant provisions of the *Transport Operations (Marine Safety) Act 1994*.

MSQ operates a Vessel Traffic Service (VTS) for the Port. The role of the VTS is to facilitate the safe and efficient movement of shipping within the VTS area. Vessels waiting to enter the Port generally do so in offshore vessel mooring locations or in a designated external anchorage area determined by the Gladstone VTS. Internal anchorages are available for safe anchorage inside the harbour limits, including a designated emergency anchorage. Ships are only to anchor in the position and area designated by the Gladstone VTS. Anchorage limits and locations are designated on the Port navigational charts. MSQ directs each ship's master to the appropriate anchorage.

Operation of the duplicated Gatcombe and Golding Cutting channels will not negatively impact on maritime transport within the Port. The EIS indicated that the project will facilitate improved shipping activity and movement efficiency and reduce the likelihood of collisions, delays and congestion within the Port as throughput increases. The project is not predicted to have a direct influence on any future increase in the number of vessel movements within the Port; changes in vessel movements are associated with existing and future industries within Gladstone.

5.5.1 Issues raised in submissions

Impacts to maritime transport from capital dredging works and the transfer of dredge material was not a key issue raised in submissions received on the EIS, although one submitter raised the potential for impacts to maritime safety during dredging. I acknowledge the potential for maritime transport impacts and have considered them in my assessment below.

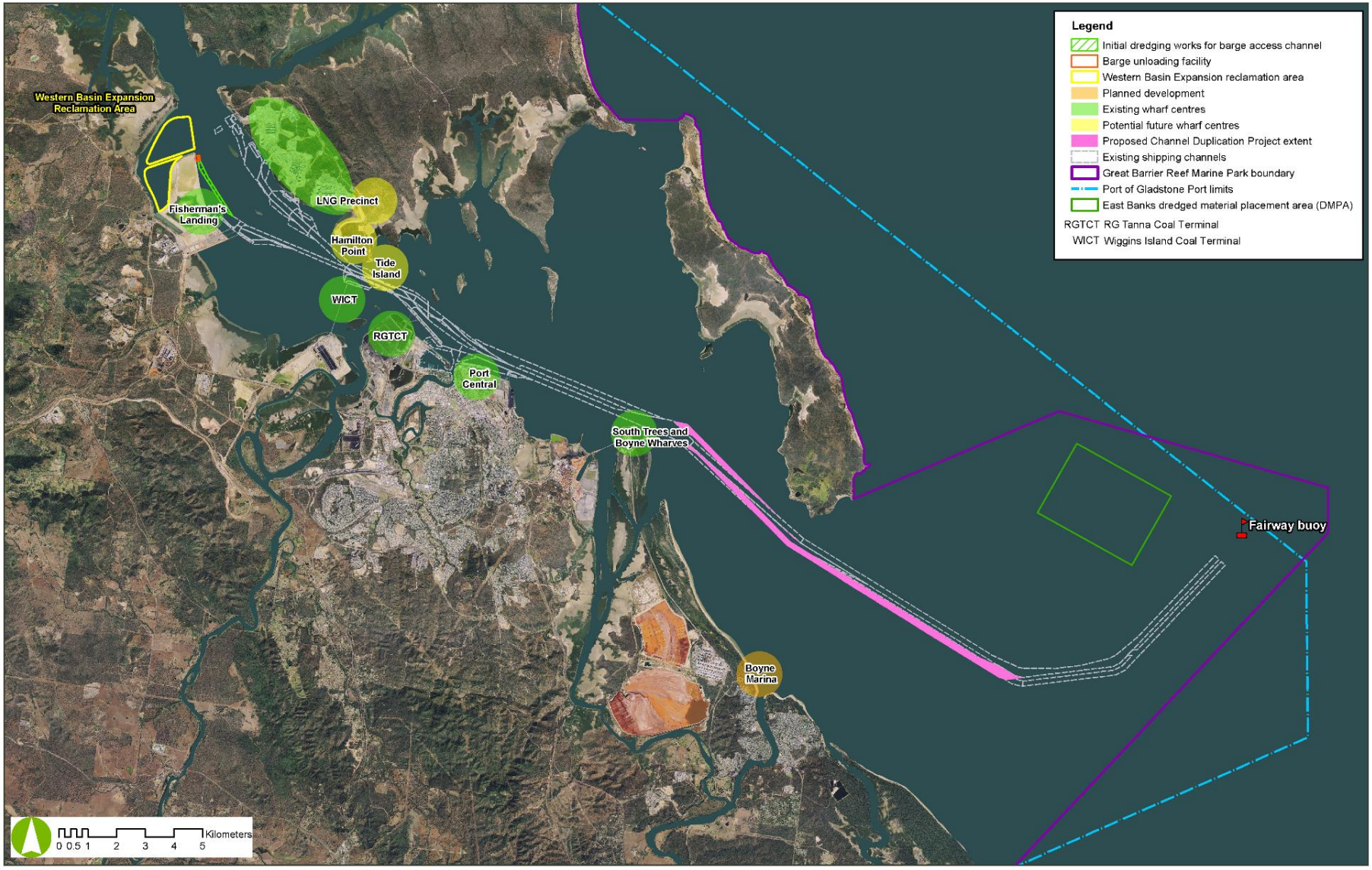


Figure 5.12 Existing and potential future Port wharf centres

5.5.2 Impacts and mitigation

Capital dredging works and dredge material transfer impacts on maritime transport

Impacts

The dredging program, including initial dredging works, would involve the removal of an estimated 12.85 Mm^3 of seabed material for placement in the existing WB and proposed WBE reclamation areas.

Initial dredging works would involve the removal of an estimated 0.25 Mm^3 of seabed material over a six and a half-week period to establish a 2.3 km-long access channel between the duplicated channels and BUF, including:

- 150,000 m^3 of material from the southern portion of the channel via TSHD dredge
- 100,000 m^3 of material from the northern portion of the channel via CSD dredge.

The dredged material from the barge access channel would be pumped directly into the existing WB reclamation area via the TSHD and CSD.

The EIS states that capital dredging works for the permanent duplication of the existing Gatcombe and Golding Cutting shipping bypass channels would involve the removal of 12.6 Mm^3 of seabed material over 58 weeks during either two dredging stages or a combined campaign. If dredging was undertaken in two stages, Stage 1 would occur over a 33-week period and Stage 2 would occur over a later 25-week period.

Dredging would be undertaken via TSHD dredge supported by two to four dredger shuttle (to transport dredging staff) and survey vessel (for mapping purposes) movements per day, and up to forty movements per week for the fleet of four barges used to transport dredged material to the BUF. Pushbusters will be used to manoeuvre barges (one per barge).

Dredgers are proposed to operate 110 hours per week, seven days a week with 24-hour operations.

Dredging equipment crews will be transported on small work boats from one or more existing Port wharf facilities, including the existing Gladstone Marina and/or existing pontoon facilities either at Fisherman's Landing or Port Central area depending on the location of the dredger.

Dredging activities (requiring dredgers, barges, pushbusters and other associated vessels such as dredger shuttles) would generate additional vessel traffic in the Port during the dredging campaigns:

- Stage 1 would generate an average of 5.6 additional vessel movements per day within the Port (approximately 1310 vessel movements in total)
- Stage 2 would generate an average of 4.4 additional vessel movements per day within the Port (approximately 775 vessel movements in total).

The EIS reports that this additional vessel traffic is not predicted to have a significant impact on the area of navigable waterway within the Port for existing and future vessel movements, for either commercial or recreational vessel movements. On average, in 2018 the total annual commercial vessel movements within the Port were 5 vessel movements per day.

Mitigation

The EIS reported that the proponent will consult with the RHM in relation to additional vessel movements and activities in the Port. Prior to the commencement of the dredging program, all dredgers, barges and associated vessels would be approved to work within the Port of Gladstone Pilotage Area by the RHM.

Under the *Transport Operations (Marine Safety) Act 1994*, the *Port Procedures and Information for Shipping – Port of Gladstone* (Port Procedures) must be complied with by all vessels operating within the pilotage area. The Port Procedures provides details of the services and regulations, and procedures to be observed by all vessels utilising the Port, under the guidance of MSQ. The proponent must undertake all capital dredging activities in accordance with the Port Procedures.

Where all vessels are operated in accordance with Port Procedures and under the direction of the Gladstone VTS, the EIS reported that dredging activities are not anticipated to compromise maritime safety or the safe navigation of vessels within the Port.

The EIS indicates no changes to the Port Procedures are required to accommodate the dredging activities, although changes to the Port Procedures may occur as determined by MSQ.

The EIS includes commitments that confirm all works must comply with the requirements of:

- Port Procedures
- Standards of Marine Construction Activity with Gladstone Harbour
- Standard for Commercial Marine Activities – Gladstone Region (DTMR 2017a)
- *Transport Operations (Marine Safety) Act 1994* and Transport Operations (Marine Safety) Regulation 2016
- Dredging EMP.

A key mitigation measure within the Dredging EMP for the project includes the preparation and implementation of a dredging contractors' Marine Execution Plan in accordance with MSQ's 'Standard for Commercial Marine Activities – Gladstone Region' to manage potential marine traffic and safety issues from vessel operations. The Marine Execution Plan will also include the final dredging methodology adopted for the project. The proponent has also committed to consult with and obtain acceptance by the RHM of the final dredging methodology detailed in the Marine Execution Plan. This will be required before any maritime works can occur.

To ensure the safe movement of vessels within the Port, I have stated a condition in this report requiring the proponent to prepare and implement a vessel traffic management plan (VTMP) as a component of the Marine Execution Plan. The VTMP would include vessel management measures to be addressed during the construction phase of the project and is to be provided to the RHM within two weeks prior to the commencement of capital dredging.

I am satisfied that the mitigation measures, including the Marine Execution Plan, proposed by the proponent and the condition in this report to prepare and implement a VTMP will ensure that all marine vessel traffic can be effectively managed through the Port Procedures and Dredging EMP during the construction phase.

Construction: Navigational aids

Impacts

Seven existing navigational aids would be required to be either removed or relocated (two removed and five relocated) as part of the project and a further five new navigational aids would be installed. For this work, the following marine vessels would be required:

- pile driving barge
- a work boat to deliver piling and construction equipment

- a small vessel for transport of personnel from Port Central and/or the Gladstone Marina to the pile driving barge.

Navigational aid works would be undertaken over eight to twelve weeks during the construction phase, within the standard construction hours of 6.30 am to 6.30 pm, Monday to Saturday. The estimated timing for the navigational aid works is summarised in Table 5.6.

Table 5.6 Estimated timeframe for navigational aid works

Navigational aid tasks	Estimated average timeframe
Removal of two navigational aids (piles)	1 to 2 days per pile
Installation of piles at new location	2 to 3 days per pile
Fit equipment on piles	2 to 3 days per pile
Pile protection	3 to 4 days per pile
Install electronics	1 to 2 days per pile

The EIS identifies the total maximum time taken to install each navigational aid would be twelve days per pile.

The EIS notes the vessel movements associated with the navigational aid works are typical activities associated with an active port. The additional vessel movements will be subject to Port Procedures and operated under the direction of the RHM, and therefore will not have a significant impact on existing and future vessel movements in the Port.

The International Association of Marine Aids to Navigation and Lighthouse Authorities provided advice which informed the proposed locations of the navigational aids and how they will be sited (see Figure 5.13). Consultation with RHM also informed these decisions.

Mitigation

The EIS includes the commitment to obtain MSQ approval of the navigational aid relocation and installation methodology prior to the commencement of any works.

The EIS also included the commitment to ensure all marine plant and equipment must comply with the requirements of the Standards of Marine Construction Activity within the Gladstone Harbour (SMCA). The SMCA provides general direction to all vessels, and the ship masters in charge of each vessel, engaged in or associated with projects within the Port of Gladstone Pilotage Area to ensure marine safety in the Port. I am satisfied that the standards and associated guidelines detailed in the SMCA, such as any barge fitted with any equipment that may affect stability (i.e. crane, pile driver and excavator) must be manned by a barge master, would ensure marine safety in the Port is maintained throughout navigational aid works.

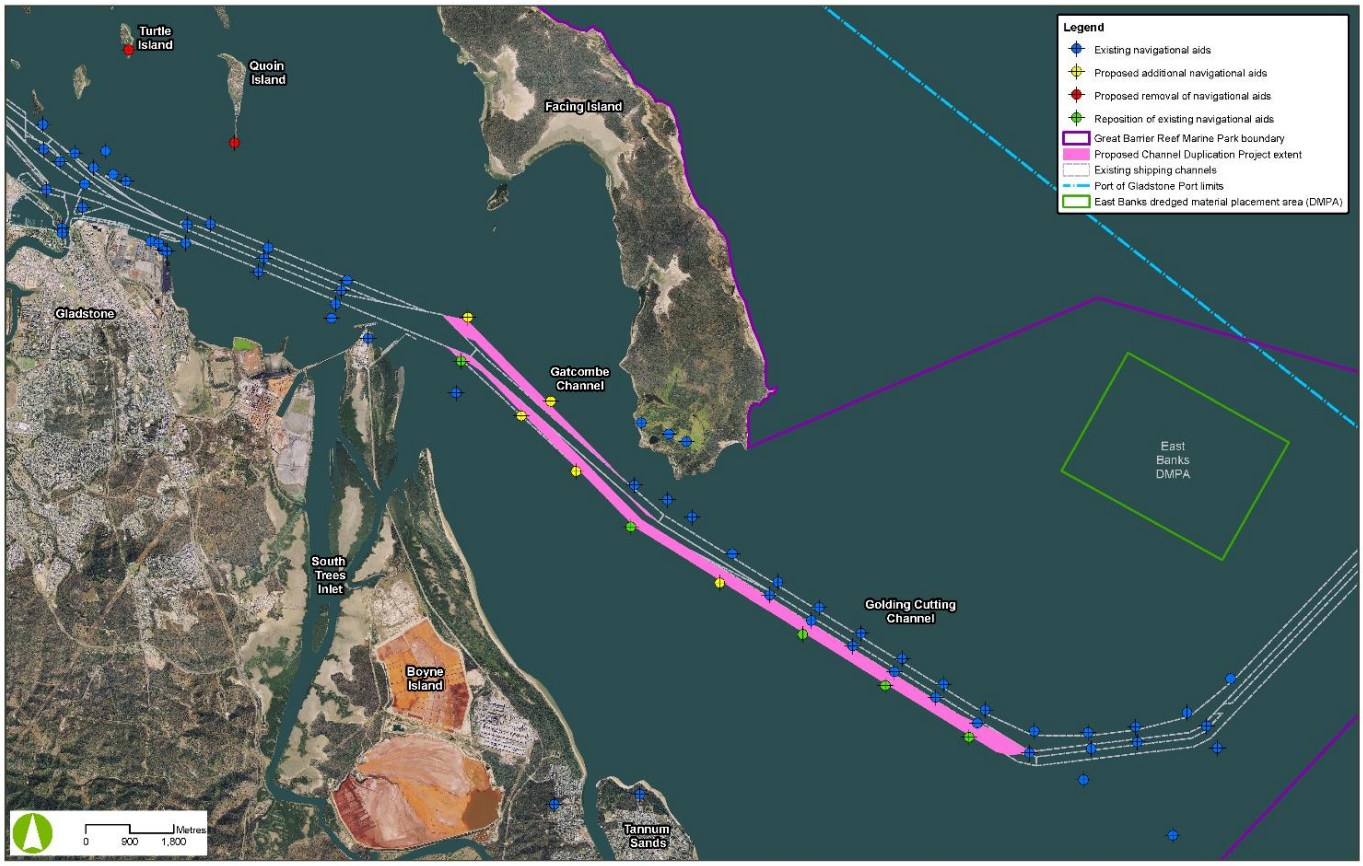


Figure 5.13 Proposed changes to navigational aids in the Port

Operation: Maritime transport within the Port

The operation of the duplicated Gatcombe and Golding Cutting channels will not have a negative impact on existing maritime transport within the Port. The EIS indicates the project will facilitate improved shipping activity and movement efficiency, potentially reducing average delays by between 60 to 80 per cent, and will reduce the likelihood of collisions, delays and congestion within the Port as throughput increases. The EIS reports the project is not predicted to have a direct influence on any future increase in the number of vessel movements within the Port due to the changes in vessel movements being associated with existing and future industries within Gladstone. The EIS notes existing procedures, including safe passage and handling of vessel traffic management controls, will be implemented for vessel movements within the duplicated channels.

Maintenance dredging is undertaken annually in the Port's channels, berths and swing basins to remove sedimentation to maintain declared depths for safe navigation of vessels. Annual maintenance dredging volume for the Port between 2007 and 2010 was approximately 153,000 m^3, which was dredged over an average period of 22 days per year.

The project would increase the volume of annual maintenance dredge material by seven per cent.

The EIS reported that all maintenance dredging operations will occur in compliance with:

- applicable Commonwealth and State legislative requirements
- Port of Gladstone Maintenance Dredging EMP (#879363)
- Long Term Monitoring and Management Plan for Sea Disposal (#1071543).

The proponent currently places maintenance dredge material within the existing East Banks DMPA. The proponent holds a current Sea Dumping Permit (SD2018-3762) under the *Environmental Protection (Sea*

Dumping) Act 1981 (Cwlth). The disposal of an increased volume of maintenance dredge material at the existing East Banks DMPA is not part of the project assessed in this section of the report.

5.5.3 Coordinator-General's conclusions: maritime transport

Construction

I am satisfied that the EIS appropriately considered the potential maritime transport impacts associated with capital dredging activities and navigational aid works and all maritime safety matters for the project. The assessment predicted that dredging activities and navigational aid works would generate minimal vessel traffic in the Port and have an insignificant impact on the area of navigable waterway within the Port for existing and future vessel movements, including for both commercial and recreational vessel movements.

To manage any potential marine traffic and safety issues from dredging activities and navigational aid works, the proponent has committed to:

- implement a dredging EMP and subsequent Marine Execution Plan that details the final dredging methodology in consultation with the RHM
- comply with the relevant requirements within the Port Procedures, SMCA, Standard for Commercial Marine Activities – Gladstone Region and Transport Operations (Marine Safety) Regulation 2016.

I am satisfied that these commitments would address the need for managing vessel safety and ensure that the requirements of the *Transport Operation (Marine Safety) Act 1994* are met.

In order to ensure dredging activities are managed to avoid impacts to vessel traffic and safety, I have stated a condition requiring the proponent to prepare and implement a VTMP. The VTMP is to be provided to MSQ no later than two weeks prior to the commencement of capital dredging.

Operation: Maritime transport within the Port

The project will facilitate improved shipping activity and movement efficiency in the Port, potentially reducing average delays by between 60 to 80 per cent, and will reduce the likelihood of collisions, delays and congestion within the Port as throughput increases.

I note that the proponent has committed to undertake maintenance dredging in compliance with applicable Commonwealth and State legislative requirements and existing management plans for long-term dredging within the Port limits. I am satisfied these management plans would address ongoing maintenance dredging activities at the Port, and accordingly, no additional mitigation measures are required to address potential impacts on maritime transport.

5.6 Noise and vibration

This section of the report evaluates noise and vibration impacts associated with capital dredging, the transport of dredge material and navigational aid works. The unloading of dredged material into the WBE reclamation areas is considered (along with other activities associated with the WBE reclamation areas) within section 6.7 of this report.

The EIS identified that noise and vibration would be generated during the project's construction and operation from activities including the operation of the TSHD and CSD during dredging, pushbusters (used to manoeuvre non-motorised barges) and the impact piling rig that will be used for the installation of the navigational aids.

Potential underwater noise and vibration impacts on marina fauna are further discussed in section 5.4 and 6.5 of this report.

5.6.1 Sensitive receptors

The Port is a major industrial port on Australia's east coast. The existing noise environment is characterised by noise associated with existing shipping operations, handling of commodities, large and small vessel traffic noise and other industry construction and operational activities along the Gladstone foreshore.

Sensitive receptors considered for the assessment were identified by the proponent in accordance with the Environmental Protection Policy (Noise) 2019 (EPP (Noise)) guidelines and based on factors including distance from project noise sources, and potential exposure to noise.

The communities of Gladstone City, Boyne Island, Tannum Sands and Facing Island are all located within 6 km of the project, as shown in Table 5.7, and are therefore considered to be sensitive receptors for the purpose of assessing the potential noise and vibration impacts of the project. The sensitive receptors considered in the EIS are also shown in Figure 5.14.

The EIS did not consider offices associated with industrial land uses on the mainland and on Curtis Island as terrestrial noise sensitive receptors for the purpose of this assessment, due to the noise levels currently experienced within these sites, which I accept as appropriate.

Table 5.7 Sensitive residential receptors

Receptor name	Approximate distance to project areas			
	Barge access channel	Barge unloading facility	Channel duplication	WBE reclamation area
Gladstone City	12.4 km	14.5 km	5.3 km	12.5 km
Barney Point	10.2 km	14.6 km	5.2 km	14.6 km
Quoin island	11.7 km	14 km	5.7 km	13.5 km
Facing Island (northwest and south)	16.6 km	17.6 km	0.9 km	18.4 km
Boyne Island	24.6 km	27.0 km	5.1 km	26.8 km
Tannum Sands	26.7 km	28.6 km	4.7 km	28.5 km
Turtle Island	9.5 km	11.7 km	8.5 km	10.9 km
Witt Island	7.1 km	9.2 km	10.1 km	9.0 km
Tide Island	5.6 km	7.5 km	11.3 km	7.9 km
Targinnie	6.4 km	6.1 km	24.1 km	4.3 km

Table note: see section 6.7 for assessment of noise and vibration impacts associated with the reclamation works and transfer of dredged material.

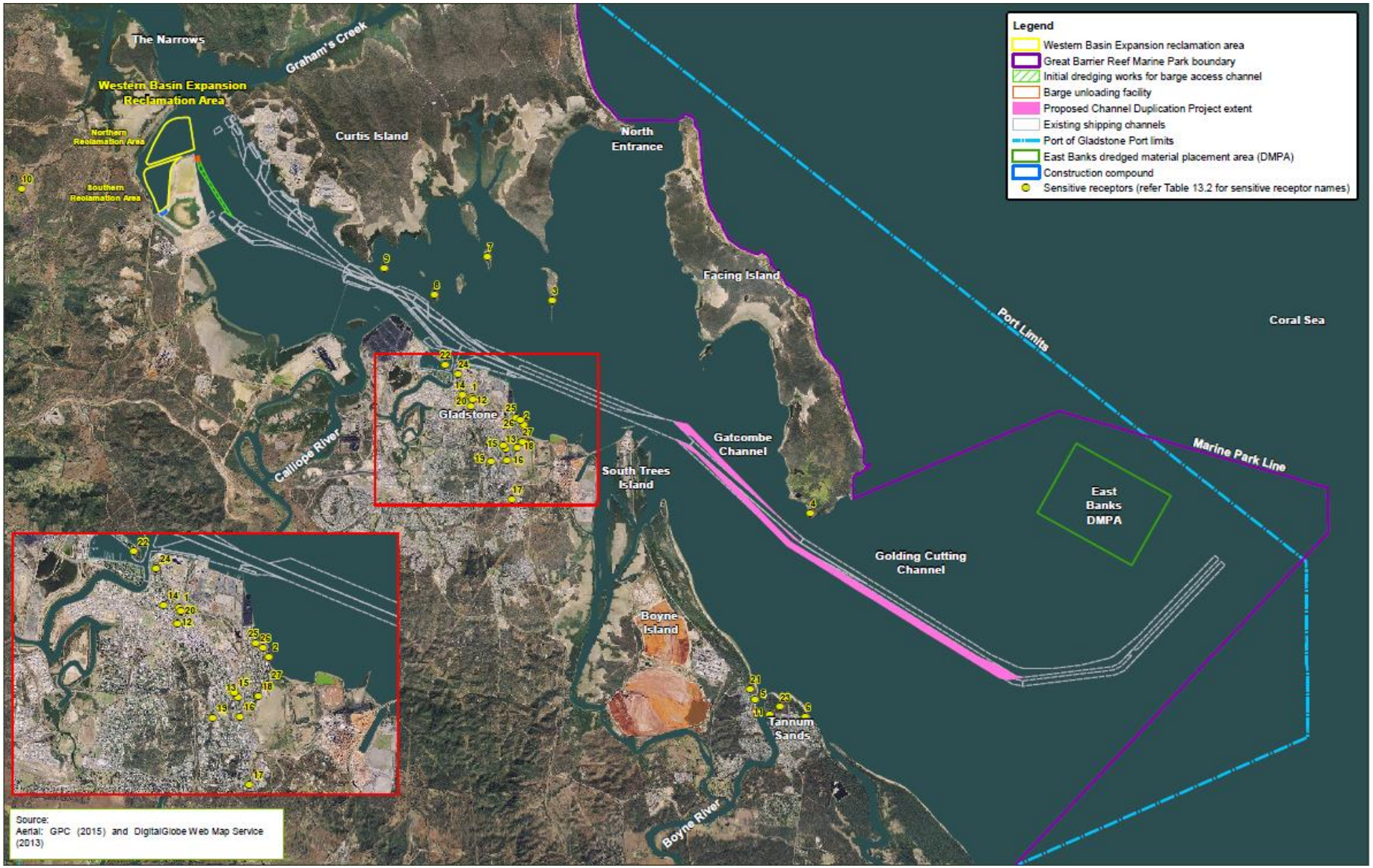


Figure 5.14 Sensitive receptors

5.6.2 Assessment methodology

Noise

The proponent conducted background noise monitoring in 2014 at three sites located within 3 km of the proposed project extent and within the Port limits, which is representative of the nearest residential communities (see Figure 5.15). Data was gathered in accordance with the DES Noise Measurement Manual (2013) and relevant Australian Standards for environmental noise monitoring. The noise levels monitored at each location are summarised in Table 5.8 and are considered indicative of the local ambient noise environment.

Table 5.8 Noise Assessment Criteria

Noise survey area	Rating background level (dBA)			Intrusive noise criteria, $L_{Aeq,adj,(1hour)}$ dBA		
	Daytime	Evening	Night-time	Daytime	Evening	Night-time
Location 1 Barney Point	41	41	43	46	46	46
Location 2 Boyne Island	37	37	35	42	42	40
Location 3 Facing Island	36	38	38	41	41	41

Table note: daytime is 7.00 am to 6.00 pm, evening is 6.00 pm to 10.00 pm and night-time is 10.00 pm to 7.00 am.

The acoustic quality objectives as defined in Schedule 1 of the EPP (Noise) were used in conjunction with the existing background noise environment (measured rating background levels (RBL) as shown in Table 5.8), to provide a target criterion for the assessment of noise during construction activities and to inform if mitigation measures were required. The noise assessment criterion was applied outdoors at the noise sensitive receptors.

'Background creep', defined as the gradual increase in the total amount of background noise in the area, was adopted as an additional target criterion to assess maintenance dredging noise emissions.

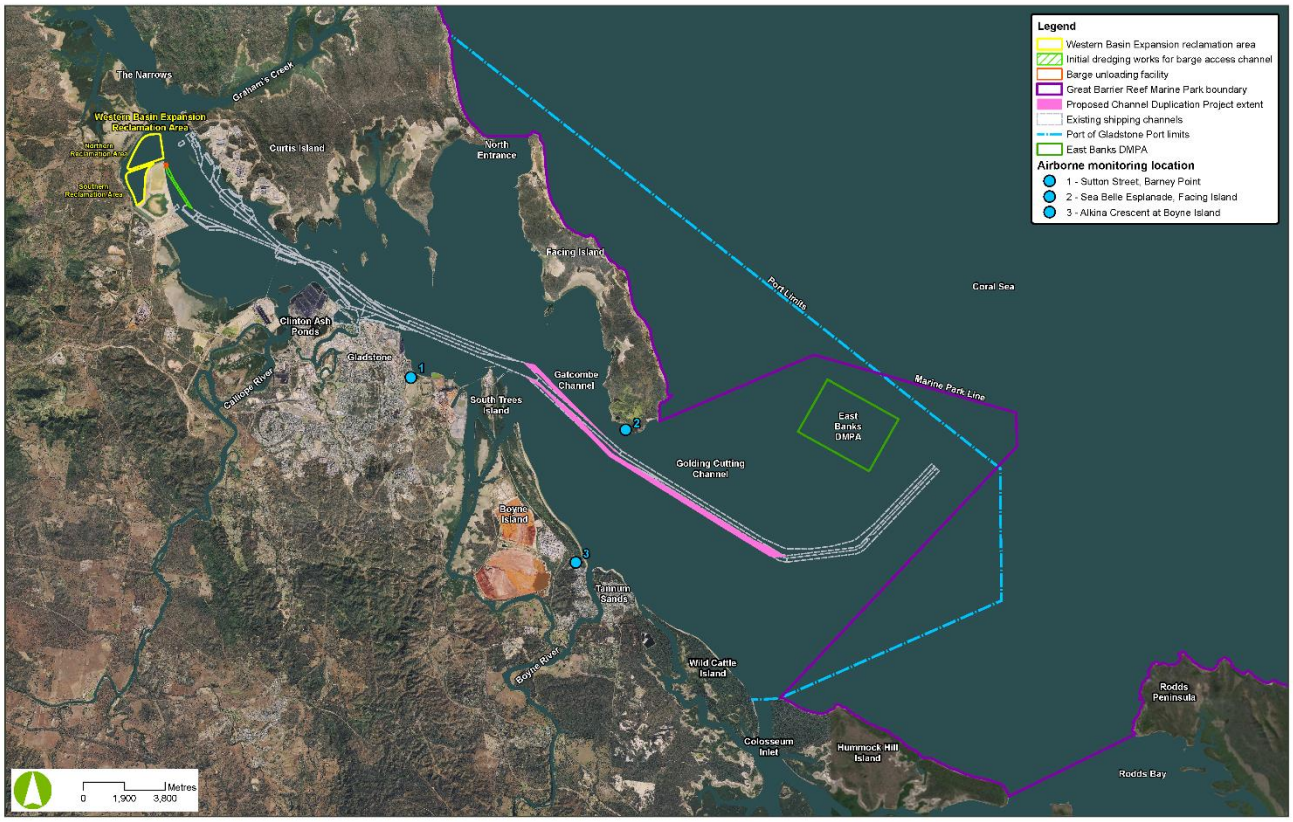


Figure 5.15 Background noise monitoring locations

The assessment modelled eight scenarios, focussing on the worst-case impacts on sensitive receptors from each construction and operation activity. The scenarios assumed wind speeds of three m/s and were representative of steady-state operations for fixed plant and normal operation of mobile plant. The scenarios are represented in Figure 5.16 and are described as:

- Construction phase –
  - Scenario 1: bund wall construction at the WBE reclamation area (southern area)
  - Scenario 2: bund wall construction at the WBE reclamation area (northern area)
  - Scenario 3: construction of the BUF, including two short bund walls
  - Scenario 4: CSD and TSHD dredging of the barge access channel and direct placement of dredge material into the existing WB reclamation area
  - Scenario 5: TSHD dredging of the channel duplication area, barge movements via a pushbuster and placement of dredged material at the existing WB and WBE reclamation (southern area)
  - Scenario 6: TSHD dredging of the channel duplication area, barge movements via a pushbuster and placement of dredged material at the existing WB and WBE reclamation (northern area)
  - Scenario 7: installation of navigational aids near Facing Island.
- Operational phase –
  - Scenario 8: maintenance dredging of the duplicated channels and the barge access channel.

The assessment of noise impacts on noise sensitive receptors was based on scenario modelling completed using SoundPLAN 7.4, an environmental noise propagation model which predicts the noise impacts of the project for assessment against the relevant acoustic quality objective.

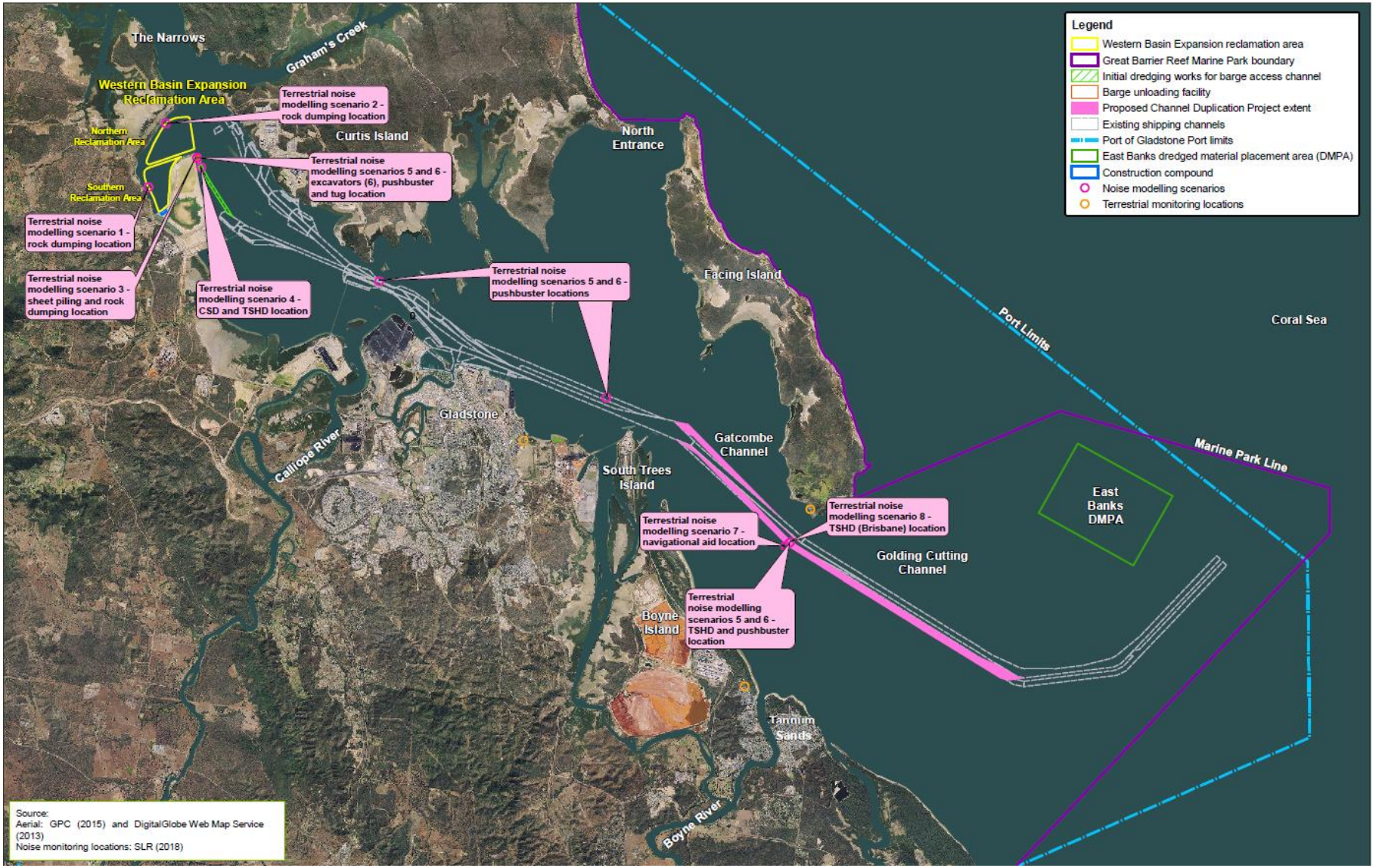


Figure 5.16 Modelling scenario locations

Vibration

The impact of vibration during construction on human comfort was assessed by applying the vibration impact criteria recommended by the NSW Department of Environment and Conservation's 'Assessing Vibration: A technical guideline 2006', British Standard (BS) 5228-2:2009 Code of Practice for Noise and Vibration Control on Construction and Open Site – Part 2: Vibration (2009) and BS 6472-2008 Evaluation of Human Exposure to Vibration in Buildings (1kHz to 80Hz). In accordance with BS 5228-2:2009, a vibration level of 0.14 mm/s was adopted as the trigger for the management of vibration levels as presented in Table 5.9.

The impact of vibration on buildings was assessed using BS 7385-1993: Evaluation and Measurement for Vibrations in Buildings – Part 2 Guide to Damage Levels from Ground-Borne Vibration (EMVB). The EMVB recommends vibration limits to minimise risk of cosmetic damage to residential and commercial buildings, as are summarised in Table 5.10.

Table 5.9 Vibration impact criteria – human comfort

Vibration level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situation for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than very brief exposure to this level.

Table 5.10 Guide values for intermittent vibration – minimal risk to cosmetic damage

Type of building	Peak Particle Velocity (PPV) in frequency range of the predominant pulse	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mms at 4Hz and above	
Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4Hz increasing to 20 mm/s at 15Hz	20 mm/s at 15Hz increasing to 50 mm/s at 40 Hz and above

I am satisfied that the EIS has adequately assessed the project's potential noise and vibration impacts as a result of capital dredging, transport of dredge material and navigational aid works.

5.6.3 Submission received

A submitter queried how contractors and sub-contractors would be required to implement the commitments and mitigation measures described in the EIS relating to noise and vibration generated by the project. I have considered the submission and the response provided by the proponent in my evaluation of the project.

5.6.4 Impacts and mitigation

Construction impacts – TSHD and CSD dredging

This section deals with the noise and vibration that would be generated during dredging activities, comprising scenarios 4, 5 and 6 identified above.

Noise

TSHD and CSD dredging is proposed to occur 24 hours per day, seven days per week throughout the six and a half-week initial dredging works and 58-week capital dredging program to duplicate the existing channels.

Noise would be generated through the operation of the TSHD including the mechanical plant on the main deck and from the pushbusters manoeuvring up to four non-motorised barges to transport dredge material to the BUF. The EIS notes that dredge material from the barge access channel will be placed directly into the existing WB reclamation area by the CSD and TSHD and will not involve the use of barges or pushbusters.

Predicted noise levels for the CSD and TSHD dredging are based on the anticipated worst-case activity during the night-time period, which is when receptors are most sensitive to noise impacts. The greatest predicted noise impact would be generated by the operation of the TSHD and a pushbuster simultaneously, where the pushbuster is moving against the tide and at a slow speed. However, the assessment noted that the pushbusters would be highly mobile within the channel and unlikely to result in noise exposure at any single receptor for an extended period.

In the absence of mitigation measures, the assessment predicted that the noise levels produced by the TSHD and pushbusters at all non-residential receptor locations would be well within the EPP (Noise) acoustic quality objectives identified for each sensitive receptor type.

Where both the TSHD and a pushbuster are operating nearest to residential receptors during the night-time, the noise assessment predicted worst-case outdoor noise levels of up to L_{Aeq} 44 dBA at Facing Island, and up to L_{Aeq} 41 dBA at Tide Island. The EIS considered the predicted noise levels of up to L_{Aeq} 44 dBA as above the existing night-time background noise environment of 38 dBA at sensitive receptors at Facing Island. As such, should dredging be undertaken during the night-time in the vicinity of the nearest receptors at Facing Island, it is predicted that noise may be audible at night with the potential to result in noise disturbance or amenity nuisance.

The EIS considered the predicted noise levels of up to L_{Aeq} 38 dBA where only a TSHD is operating would not be audible at night at Facing Island with an existing night-time background noise environment of 38 dBA.

The assessment indicated that the residential communities on Facing Island and Tide Island are familiar with noise characteristics from current and previous dredging works and commercial shipping activities within the Port. The EIS indicates familiarity with these activities may desensitise communities to noise generated by project activities and therefore reduce the potential for noise impacts. Nonetheless, the proponent has proposed noise mitigation measures.

For all other residential receptors, even in the absence of mitigation measures, the EIS predicted noise levels are within the EPP (Noise) acoustic quality objectives and are equivalent to the existing daytime, evening and night-time background noise environments summarised in Table 5.8.

The proponent has committed to implementing the following mitigation measures to address the potential TSHD and pushbuster noise impacts during the night-time:

- design the TSHD to include noise attenuation measures for the pumps, power generation plant and motors that would be on-deck sources of noise. Measures may include:
  - installing plant with the lowest available noise emissions
  - utilise on-deck structures to screen noise emissions
  - installing plant with acoustic enclosures, acoustic exhaust mufflers and acoustic louvres to limit noise emission levels.
- plan and manage the dredging program to utilise the less sensitive daytime and evening periods when dredging adjacent to residences on Facing Island.

The proponent has also committed to ensure pushbusters are not operated at full speed, where practicable, when passing by, and within 2.4 km of, noise-sensitive receptors on Facing Island.

Vibration

The assessment predicts that vibration from dredging activities would be below the vibration trigger level (0.14 mm/s) for all sensitive receptors, as at the closest point, dredging would be undertaken 900 m from the nearest sensitive receptor located at Facing Island. As such, there will be no perceptible (disturbance) impacts on human comfort or cosmetic damage to buildings from ground vibration as a result of dredging activities.

No blasting activities will be necessary to extract material from the seabed.

Construction impacts – Navigational aid installation

This section deals with the noise and vibration that would be generated during scenario 7 identified above, being the installation of navigational aids near Facing Island.

Noise

Construction works associated with the removal of two existing navigational aids, the relocation of five navigational aids and the installation of five new navigational aids are proposed to be undertaken over a two to three month period and would be limited to occurring only within the standard construction hours of 6.30 am to 6.30 pm, Monday to Saturday.

The greatest noise impact would be generated through impact piling during the installation of navigational aids (scenario 7). The potentially most affected sensitive receptors would be residences located on Boyne Island and Facing Island.

The assessment predicted that without mitigation measures, piling noise would generate noise above the existing rating background level at Facing Island by 7 dBA, as represented in Table 5.11, and would therefore have the potential to cause noise impacts. The EIS indicated that the noise generated through impact piling may be audible to residences located on Boyne Island at 2 dBA below the existing rating background level and would have the potential to result in minor noise impacts to sensitive receptors. The assessment concluded that piling would result in noise impacts to sensitive receptors within 1 km of the impact piling rig when undertaken during standard construction hours.

Table 5.11 Predicted noise levels from piling activities

Location	Time-period	Rating background level (dBA)	Predicted L_{Aeq} dBA noise level
Boyne Island	Daytime	37	35
Facing Island	Daytime	36	43

Table note: daytime is 7:00 am to 6:00 pm

In the instance an impact piling rig is used within 1 km of sensitive receptors on Facing Island and Boyne Island, the proponent has committed to implement the following mitigation measures:

- undertake impact piling trials to determine the minimum required drop height to install the piles to reduce/control noise
- install piling cushions at the point of impact to reduce the energy (sound emission) during each impact event.

Mitigation measures

In addition to the measures stated above and in section 6.7 for specific project activities, the proponent has committed to adopt and adhere to general noise management controls, as proposed in the project EMP, for all general activities for the duration of the construction phase, including:

- use mobile plant with efficient acoustic mufflers on the exhausts
- selection of the quietest plant and equipment that can economically undertake the work
- regular maintenance of equipment to ensure that it remains in good working order
- where practical, avoid the coincidence of plant and equipment working simultaneously close together near sensitive receptors
- where work is proposed within at least 1 km of residences, the community will be notified at least two weeks prior to the commencement of start-up. Notifications will describe the potential noise and vibration levels and the proposed management measures to control environmental impacts
- the site manager (as appropriate) will provide a community liaison phone number and permanent site contract so that noise and/or vibration related complaints can be received and addressed in a timely manner. Consultation and cooperation between the site(s) and neighbours to the site(s) will assist in limiting uncertainty, misconceptions and adverse reactions to noise and vibration.

A Noise and Vibration Management Plan (NVMP) has been prepared as part of the project EMP and includes the abovementioned noise management controls.

The proponent has also committed to monitor, document and manage noise generated during construction and operational phases in accordance with the NVMP. The NVMP requires the following actions:

- monitor construction noise levels at the commencement of the construction phase to verify the outcomes of the noise assessment and confirm the noise from project activities will not cause unacceptable impacts at sensitive receptors
- implement a rolling spot check regime of noise intensive plants and equipment
- undertake all monitoring in accordance with the relevant Australian Standards and regulatory guidelines for the measurement of environmental noise
- conduct supplementary noise and/or vibration monitoring, as warranted, to identify issues of concern in response to any noise complaints.

5.6.5 Coordinator-General's conclusions: noise and vibration

I am satisfied that the EIS documentation appropriately considered the potential noise and vibration impacts associated with capital dredging works including navigational aids works and the transfer of dredge material to the BUF. The assessment predicted that construction noise levels during the night-

time may cause noise disturbance or amenity nuisance at sensitive receptors on Facing Island around 1 km away when both the TSHD and pushbuster are in simultaneous operation. However, I note that the predicted construction noise levels of up to 6 dBA above the existing night-time background noise environment are based on worst-case scenarios with no mitigation applied, and that as such, are likely to be lower than predicted.

The proponent has committed to monitor, document and manage all noise generated from project activities in accordance with the NVMP, which includes the mitigation measures outlined in the EIS documentation. I expect the proponent to implement the mitigation measures outlined within the NVMP.

To further manage potential noise impacts during the night-time, the proponent has committed to:

- design the TSHD to include noise attenuation measures for all on-deck sources of noise
- undertake dredging works during less sensitive daytime and evening periods when dredging adjacent to the residences on Facing Island
- ensure pushbusters are not operated at full speed, where practicable, when passing by and within 2.4 km, of noise-sensitive receptors on Facing Island.

Noise generated through impact piling may be audible at sensitive receptors on Facing Island and Boyne Island where piling noise is above the existing background noise environment. To reduce and/or control piling noise, the proponent has committed to determine the minimum drop height requirements for pile installation via impact piling trials and install piling cushions at the point of impact during each impact event.

I note that vibrations levels are predicted below the 0.14 mm/s vibration trigger level for the duration of dredging works, and that as such human comfort impacts will not be experienced.

I have stated conditions in Appendix 2 for the EA for dredging activities that set requirements for noise monitoring and recording to ensure that noise associated with capital dredging is managed to avoid nuisance at sensitive receptors.

I have also imposed a condition in Appendix 1 requiring the proponent to ensure that impact mitigation strategies are implemented in response to any complaints or feedback received from sensitive receptors. As discussed in chapter 7.2, all complaints and measures taken to rectify issues must be published on the proponent's website.

I am satisfied that through the proponent commitments and mitigation measures and the conditions identified, the potential for impacts to sensitive receptors from capital dredging and piling noise and vibration can be sufficiently managed.

5.7 Air quality and greenhouse gas

This section of the report evaluates potential air quality and greenhouse gas (GHG) impacts associated with capital dredging and the transport of dredge material and navigational aid works. The unloading of dredged material into the WBE reclamation area is considered (along with other activities associated with the WBE) within section 6.8 of this report.

5.7.1 Air quality

The Port is a commodity and coal port situated next to the Gladstone SDA which is industrial area comprising some 27,000 ha. The area is heavily industrialised.

DES operates a network of ambient air quality monitoring stations in the Gladstone region and Queensland Health monitors air toxins harmful to human health. These monitoring programs operate

within international and national standards. GPC conducts continuous monitoring of dust and meteorological conditions at four sites near the project area.

Ambient background concentrations selected for use in the assessment of the impacts of the project are based on the available monitoring data for the region provided by DES and Queensland Health. The barge access channel project timeframe is six and a half weeks, and barge operating hours will be 24 hours per day, seven days a week. Air emissions for this period have been modelled in this assessment.

Residential sensitive receptors are located in the Targinnie Valley, on an area of land set aside for industrial development within the Gladstone SDA which lies 4 km to the southwest of the project area.

Potential impacts on air quality may result from activities associated with:

- dredging of a barge access channel by a CSD and a TSHD to enable access for barges to transport dredged material to WBE (north and south) reclamation areas
- dredging seabed material by a TSHD to permanently duplicate the existing Gatcombe and Golding Cutting channels
- operation of tugs and pushbusters to mobilise barges transporting dredged material to the BUF
- removal and relocation of existing navigational aids and the placement of new navigational aids.

The impact of predicted changes to air quality on migratory bird habitat is addressed in chapter 5.4 of this Report.

Dredging of seabed material to duplicate the existing Gatcombe and Golding Cutting channels is to be conducted by a TSHD operating 24 hours per day, seven days a week for either a 33-week first stage and 25-week second stage, or a combined 58-week campaign.

Potential air quality impacts during post-dredging operations will be managed through the implementation of the 'Maintenance Dredging Strategy for the Great Barrier Reef World Heritage Area Ports' by the DTMR. This strategy includes management measures based upon Reef 2050 decision-making principles.

Methodology

An assessment of emissions caused by dredging was undertaken having regard to the Environment Protection (Air) Policy 2008 (EPP (Air)) and Schedule 1 to this Policy, the US Environmental Protection Agency 'Compilation of Air Pollutant Emissions Factors' (AP42), and the DES Guideline 'Application requirements for activities with impacts to air'. Emissions caused by various types of engines were calculated utilising the data in the National Pollution Inventory.

The emissions to air will occur as a result of marine diesel oil required to operate the dredging vessels, tugs and pushbusters that transport the barges. The exact types of vessel to be used in the dredging program has not been decided; accordingly, for the purpose of an assessment of impacts, a small CSD and large TSHD with a hopper capacity of approximately 20,000 m^3 were used to estimate impacts.

I am satisfied that the EIS has adequately assessed the project's potential air quality and GHG impacts as a result of capital dredging, transport of dredge material and navigational aid works.

Submissions

A submission on the draft EIS requested more details regarding the methodology to estimate air quality factors. These matters were addressed in the revised draft EIS. I have considered the submission and the responses provided by the proponent in my evaluation of the project.

Impacts and mitigation

The EIS identified that dredging activities and the transport of dredge material are unlikely to impact air quality in the area, and that ground level concentrations at all receptor locations are below EPP (Air) quality objectives during construction.

The proponent has made a number of commitments to manage air quality, including the reduction of fuel consumption, fuel efficiency during dredge operations, and the use of bio-fuel.

Mitigation measures proposed by the proponent include an Air Quality Management Plan, dust deposition monitoring at locations of sensitive receptors, requirements in the project EMP and Dredging EMP to avoid and mitigate dust deposition impacts in accordance with the EPP (Air).

5.7.2 Greenhous Gas Emissions

Existing environment

Greenhouse gases that are reported under the Australian government National Greenhouse and Energy Reporting (NGER) scheme include carbon dioxide, methane, nitrous oxide, sulphur hexafluoride and specified kinds of hydro fluorocarbons and perfluorocarbons. Scope 1 emissions are those released into the atmosphere as a direct result of an activity at facility level; these must be reported to the government. Scope 2 emissions are those released into the atmosphere from the consumption of an energy commodity by the facility. This project generates Scope 1 emissions and does not generate Scope 2 emissions.

GPC submits NGER reports to the Australian Government and will have ongoing reporting obligations in respect of controlled facilities under the NGER scheme. This project will generate GHG emissions from fuel used to operate equipment during construction activities including bund wall construction, the barge unloading facility construction and the installation of navigational aids.

GPC emissions from GPC controlled facilities contribute to state and national GHG inventories. A summary of GPC reporting from 2011/12 to 2018/18 was provided in the EIS.

Methodology

In modelling GHG emissions, the TSHD vessel was assumed to operate for 24 hours per day for 12-13 days per fortnight. The CSD was assumed to operate for 24 hours per day for five days a week while in use.

Two construction scenarios were examined to estimate fuel consumption. A staged approach over a period of seven years, and a singular campaign over a period of five years.

The results were that project activities would contribute 8787 to 139,638 tonnes of carbon dioxide equivalent (CO2e) over a period of seven years, and 8787 to 175,421 CO2e over a period of five years. The GHG emissions for the whole project are associated mostly with dredging operations (67 per cent), bund wall construction (11 per cent), and dredged material earthworks (22 per cent).

The EIS confirms GHG emissions during post-dredging operations will be managed through the implementation of the ‘Maintenance Dredging Strategy for the Great Barrier Reef World Heritage Area Ports’ by the DTMR. This means that the impact of GHG emissions associated with maintenance dredging adjoining the GBRWHA is monitored at a strategic level by the State.

Submissions

Submissions on the draft EIS requested more information on GHG emissions sources. This information was provided by the proponent in the revised draft EIS. I have considered the matters raised and the responses provided by the proponent in my evaluation of the project.

Impacts and mitigation

The EIS found that the majority of project emissions are associated with vehicle and equipment use associated with the excavation and transport of dredge material to the WBE reclamation area, the bases for which are the quantity of dredge material, material depth, thickness, type and distance to the reclamation area.

The EIS states that emissions from these project activities will be minimised through equipment selection, maintenance and operational procedures. Mitigation measures include fuel efficiency by maximising payloads, matching vessel capacity to application, and minimising non-payload weight and idling times.

The EIS included the commitment to consider supplementing fuel volumes with bio-diesel and to connect vessels to mains power while docked instead of using fuel thus reducing scope 2 emissions. Additionally, a single dredging campaign over a five-year period instead of a staged approach over seven years, would reduce GHG emissions by 17,574 CO2e. The singular campaign would represent 0.03 per cent and 0.12 per cent of national and state emissions respectively.

The proponent has made a commitment to update the assessment of annual GHG emissions during the detailed design phase of the project (Appendix 4).

5.7.3 Coordinator-General's conclusions: air quality and greenhouse gas

I am satisfied that the EIS has assessed the project's air quality and GHG impacts as a result of capital dredging works, transport of dredge material and navigational aid works. The EIS concluded that air quality impacts resulting from capital dredging, transport of dredge material and navigational aid works can achieve the objectives of the EPP (Air).

The proposed Air Quality Management Plan, the Dredging EMP and the project EMP include monitoring requirements and corrective actions for emissions from equipment used during capital dredging and transfer of that material to the BUF.

The proponent has made a number of commitments to manage air quality, including the reduction of fuel consumption, fuel efficiency during dredge operations, and the use of bio-fuel.

The assessment followed the NGER scheme's methodology and predicted Scope 1 greenhouse gas emissions during the capital dredging works and the transfer of the dredge material to the BUF. The mitigation measures to control emissions from these project activities will be minimised through equipment selection, maintenance and operational procedures. GHG emissions reporting arrangements will be include as part of the GPC's duties under the NGER scheme.

I am satisfied that the Air Quality Management Plan, the Dredging EMP, and the project EMP as described in the EIS will manage and mitigate the potential air quality impacts and greenhouse gas emissions generated by the capital dredging works and dredge material placement.

6. Placement of dredge material and reclamation works

6.1 Introduction

This section evaluates key environmental impacts associated with placement of dredge material and reclamation works for the project. For a description of the pre-construction, construction and decommissioning activities refer to section 2 (About the project).

Activities associated with capital dredging, dredge material transfer and navigational aid works could affect land use and tenure, marine water quality, coastal processes, MSES, transport, noise and vibration, and air quality. My evaluation of these impacts is discussed in the following sections.

6.2 Land use and tenure

6.2.1 Existing environment

Land use

The Port, situated within the GBRWHA, is Queensland's largest multi-commodity port and the fourth-largest coal export terminal in the world (by throughput). The Port has eight existing wharf centres, including the Fisherman's Landing port facility which supports four wharves operated by multiple users including Rio Tinto Yarwun.

The project is wholly located within the master-planned area of the Port, which encompasses land and marine areas considered important for the efficient development and operation of the Port (discussed further in section 6.2.2).

The project includes the northern and southern sections of the WBE reclamation area for the placement of dredge material, with a total proposed area of 276 ha. After placement of dredge material is completed, the project will result in the permanent increase and expansion of the total area of land currently available for port-related industrial development within the Port.

The project area identified for the WBE reclamation areas is currently used for recreational and commercial fishing activities and supports seagrass communities.

Native title

The Port Curtis Coral Coast (PCCC) represents the Traditional Owners and relevant Native Title Claim Group for the Gladstone area, including the Port. An existing Indigenous Land Use Agreement (ILUA) is currently in place between GPC, the PCCC Land Trust and the Queensland Government.

Tenure

The area of seabed to be occupied by the WBE reclamation area (all the northern section and most of the southern section) and the BUF is presently unallocated state land (USL) situated below the high-water mark as shown in Figure 6.1.

The EIS indicates the proponent would apply for a perpetual lease for the WBE reclamation area and BUF once the USL is raised above the high-water mark, before converting the lease to freehold land

pursuant to the *Land Act 1994*. GPC has committed to follow the process required by the existing ILUA should they seek freehold title over the land.

Under the TI Act, GPC has vested planning powers for areas identified as Strategic Port Land (SPL). GPC will be required to have tenure granted over the WBE reclamation area to support the land being gazetted as SPL under the TI Act.

The portion of the BUF and southern section of the WBE reclamation area not situated on USL is proposed to be located on State leasehold land associated with Lot 511 on SP305597 (owned by the State and leased to GPC for the purpose of reclamation), as shown in Figure 6.1.

GPC will be required to comply with existing lease conditions associated with Lot 511 on SP305597 associated with the placement of dredged material within the WB reclamation area and the portion of the WBE reclamation area (southern area), together with any future lease conditions issued by the State for the WBE reclamation area.

The EIS reported that the temporary WBE construction compound would be located on port land at Fisherman's Landing or on State leasehold land at the WB reclamation area.

6.2.2 Queensland planning framework

This section discusses elements of the State planning and statutory framework considered for the project beyond the key project approvals required (refer section 4, Table 4.1)

Central Queensland Regional Plan 2013

The Central Queensland Regional Plan (CQRP), a statutory planning framework released in 2013, provides a long-term strategic direction to deliver outcomes for Central Queensland. Regional plans set the long-term strategic direction to guide how the region will grow and respond to change over time by ensuring good planning outcomes are delivered.

The Port, with its linkages to the Surat and Bowen basins, is identified in the CQRP as a significant contributor to the state and national economies. The CQRP recognises that Gladstone plays a key role as a transport and processing hub for the region. Improving the reliability and function of the Port to facilitate the export-reliant resource sector is recognised as a priority outcome within the CQRP.

The EIS provided an assessment of the project against the relevant Regional Outcomes of the CQRP and demonstrates that the project supports the growth and development of the Port by facilitating better safety and operational efficiency. I consider the works proposed for the project to be generally consistent with the CQRP.

Marine Parks Act 2004

The Marine Parks Act 2004 (MP Act) provides a framework for the management and protection of the marine environment under the jurisdiction of the State. The Great Barrier Reef Coast Marine Park (GBR Coast MP) is located between the boundaries of highest astronomical tide (HAT) and the Commonwealth marine park (i.e. Mean Low Water Mark).

The project does not include activities within the GBR Coast MP; therefore, a marine park permit is not required.

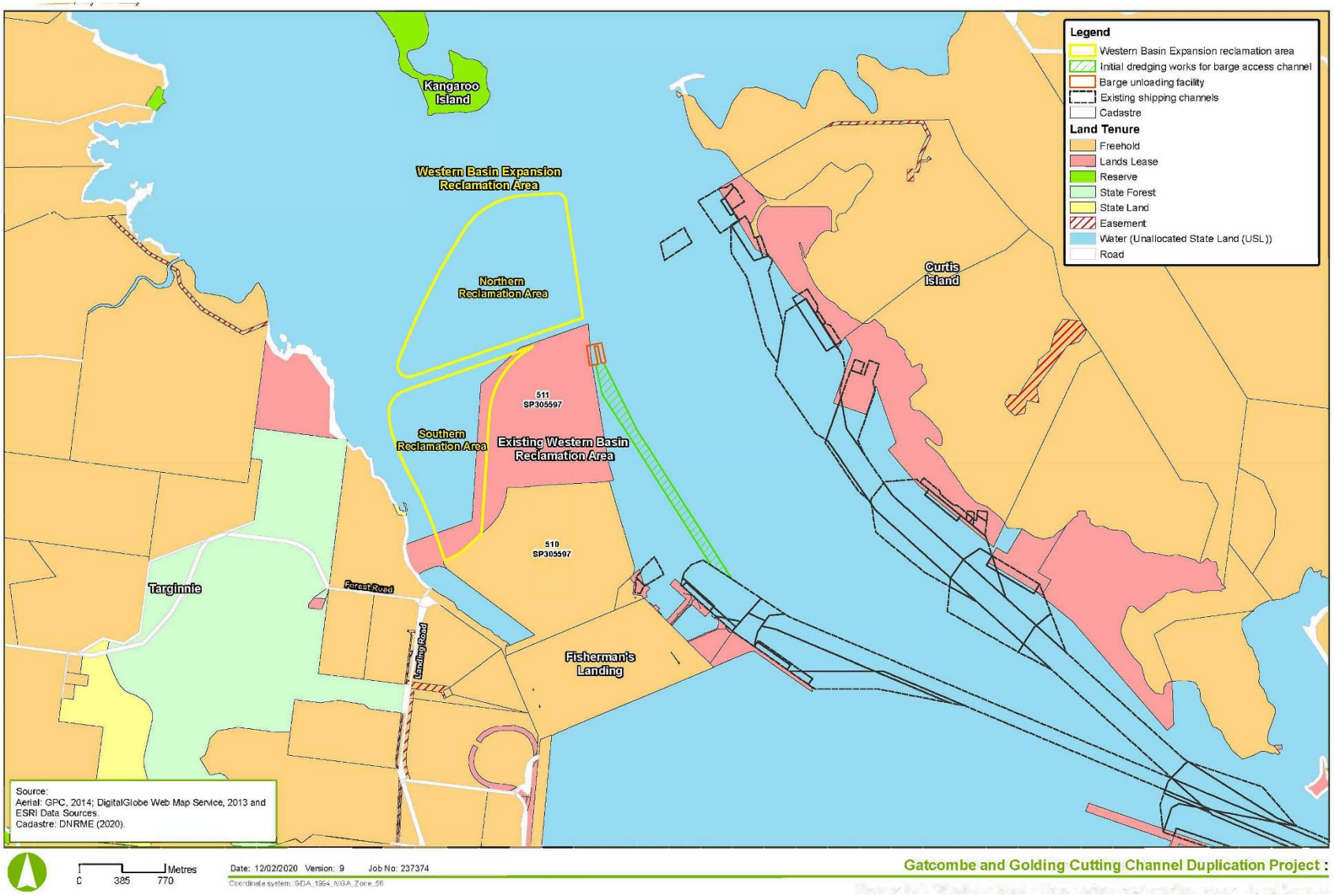


Figure 6.1 WBE reclamation area and BUF – land tenure

Gladstone Ports Corporation Land Use Plan 2012

Development on SPL is exempt from the provisions of the GRC Planning Scheme and identifies the port authority as the assessment manager. As such, the Gladstone Ports Corporation Land Use Plan (LUP) 2012 is the key planning document for the GPC SPL components of the project area.

The LUP s prepared in accordance with the TI Act and provides a framework for the assessment of development on SPL for each locality and the designated precincts therein.

Land immediately adjoining the proposed WBE reclamation area, including the existing WB reclamation area and a portion of the BUF and WBE reclamation area (southern section), is designated as 'Port Industry' and 'Ports Operations Support' for the Fisherman's Landing locality. The EIS states that the project is consistent with the intent of the locality, which has been recognised as a future growth area for the Port. The LUP does not identify the WBE reclamation area as future SPL, however, notes additional reclamation would be required to cater for future industry development.

It is anticipated that if freehold title is created for reclaimed land and if it is incorporated into SPL, that the land would be incorporated into the LUP and adopt a zoning that is commensurate with existing zones for similar port activity.

To ensure that local, regional and state interests are maintained and protected, the LUP is required to be reviewed at least every eight years, or as necessary, to respond as appropriate to changes. The first amendment to the Port of Gladstone Land Use Plan took effect in 2016.

I consider the works proposed to be undertaken on existing and proposed SPL to be generally consistent with the Gladstone Ports Corporation LUP given the project supports a coordinated approach to the beneficial reuse of dredged material to cater for future industry growth for the Port and its surrounds.

Master Plan for the priority Port of Gladstone

The Ports Act identifies the Port of Gladstone as a priority port and outlines a master planning process to protect environmental values and support the long-term sustainable development of the port, consistent with the principles of ecologically sustainable development.

Priority port master planning has a 2050 timeframe and aligns with the Reef 2050.

Under the Ports Act, the master plan document establishes the long-term strategic vision. The master plan is supported by a separate port overlay which provides regulatory effect for the master plan within an identified master planned area. In November 2018, the DTMR released a master plan for the priority Port of Gladstone, recognising capital dredging as an essential part of port development required to facilitate economic development of the port.

A separate port overlay is currently being finalised. Released for public comment in November 2019, the draft port overlay included a number of Priority Management Measures (PMMs) to support non-statutory measures that could assist with managing OUV across the master planned area. GPC is the responsible entity for the implementation of PMM 2 – Environmental values monitoring and reporting, and the establishment of a framework that supports access to available information on environmental values being monitored within the master planned area.

The master planned area, as shown in Figure 6.2 below and Figure 2.2 above, encompasses land-based and marine areas considered important for the efficient development and operation of the port and associated supply chain infrastructure to support economic activities.

The master planned area includes the Port's SPL, land within the Gladstone SDA and Gladstone LGA and marine areas, divided into precincts to guide port-related development.

The project area proposed for the placement of dredge material and reclamation works is mapped in the master plan as 'marine infrastructure precinct'. The intent of this precinct is to:

- ensure port and shipping access to navigational channels and waterside areas
- provide for marine-based port infrastructure and operational requirements, appropriate recreational and commercial activities while avoiding, mitigating and or offsetting potential impacts from development on environmental values.

As the port overlay is not yet finalised, the EIS evaluates the project against the strategic vision, objectives, relevant desired outcomes and the intent of the marine infrastructure precinct. I consider the works proposed for the project to be generally consistent with the master plan and the intent of the 'marine infrastructure precinct' given the project will facilitate the economic growth of the Gladstone region and the state through enabling the ongoing sustainable growth trade through the port.

It is expected that the information obtained through ongoing monitoring and reporting required for the project would contribute to the sustainable management of environmental values and understanding of OUV over time within the master planned area. This would align with the purpose of PMM 2 in the draft overlay.

Issues raised in submissions

Some EIS submitters raised concerns relating to the project's consistency with the port's strategic plan and the objectives of Reef 2050. However, the capital dredging and reclamation works for the project are located wholly within port limits, specifically the marine infrastructure precinct; this is consistent with the requirements of the Ports Act. The project is consistent with the objectives of Reef 2050 as no capital dredging will be undertaken outside the port's limits, capital dredge material will not be placed at sea within the GBRWHA and beneficial reuse of dredge material will be undertaken within port development areas for the purposes of reclamation.

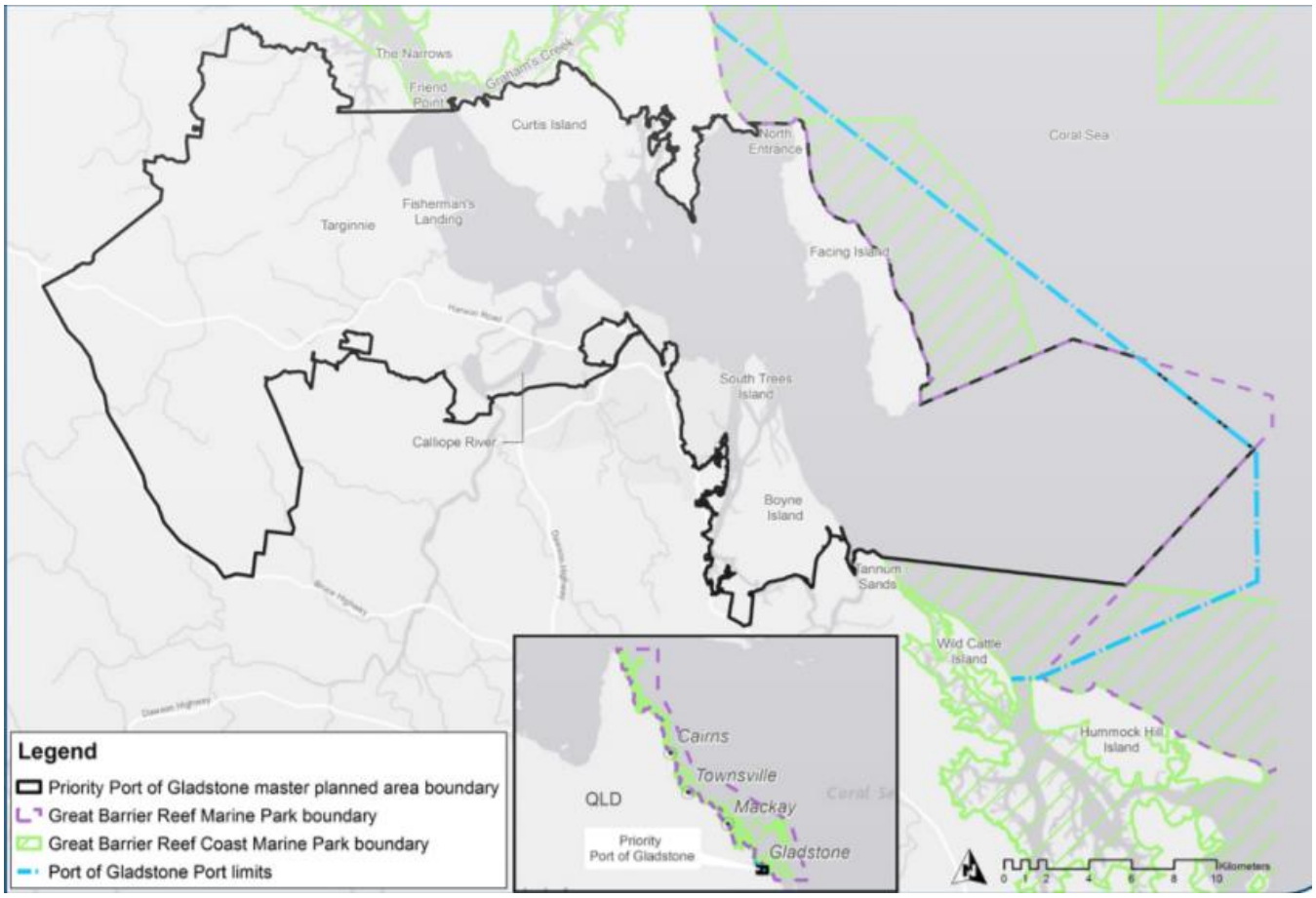


Figure 6.2 Priority Port of Gladstone locality plan

Maintenance Dredging Strategy for Great Barrier Reef World Heritage Area Ports 2016

The Queensland Government's 'Maintenance Dredging Strategy for Great Barrier Reef World Heritage Area Ports 2016' (Maintenance Dredging Strategy) provides the overarching framework for protecting and managing impacts on the Great Barrier Reef by improving the way maintenance dredging is planned, coordinated and regulated. The strategy sets out guiding principles and actions to be adopted in the Port of Gladstone Master Plan under the Ports Act.

Maintenance dredging at the Port is required annually and dredge material is placed at approved disposal sites. The proponent has a maintenance dredge material placement area north-east of East Banks within port limits, approved by Commonwealth and state legislation. Maintenance dredging will be undertaken in accordance with the Maintenance Dredging Strategy. There are no further approvals for maintenance dredging associated with this project.

State Planning Policy

The State Planning Policy (SPP) guides the assessment of projects through development assessment triggers and determines a project's impact on state interests.

The SPP has effect throughout Queensland and sits above and prevails over regional plans and local planning instruments in the hierarchy of planning instruments under the Planning Act.

The EIS identified that the project components associated with the placement of dredged material and reclamation works has six state interests, being:

(1) biodiversity

(2) coastal environment

(3) water quality

(4) natural hazards, risk and resilience

(5) strategic airports and aviation facilities

(6) strategic ports.

The state interest for Strategic Ports requires the protection of the operation of strategic ports to ensure their ongoing growth and development. The WBE reclamation areas is considered to generally meet the outcomes sought by the SPP, particularly as the beneficial reuse of dredged material to create land suitable for future port development is consistent with the master plan for the priority port specifically as it relates to promoting economic growth.

The proponent has considered the SPP through the EIS process and I am satisfied that the proposal is generally consistent with state interests. The state interests will be further managed through subsequent approvals, including environmental authorities, for which I have stated conditions. The proponent will be required to obtain these approvals subsequent to the completion of my evaluation.

Gladstone SDA and Our Place Our Plan

The Gladstone SDA supports economic development in a way that considers environmental, cultural and social issues as well as existing industry and surrounding infrastructure within the region. The development scheme identifies regulated development for the Gladstone SDA and provides the statutory controls for making, assessing and deciding an SDA application.

The development scheme is administered by the Coordinator-General pursuant to Part 6 of the SDPWO Act and includes provisions that are considered in the assessment of such applications. A small portion of existing SPL located south of the RG Tanna Coal Terminal overlaps with the Gladstone SDA. This area of SPL is not part of the project impact extent.

Whilst the project is not likely to trigger an assessment under the Gladstone SDA development scheme, it is acknowledged that the land area of the SDA surrounds the WBE reclamation areas and BUF and any future development within the SDA may require development assessment by the Coordinator-General.

Our Place Our Plan is the local planning scheme for the Gladstone LGA that currently applies to development of land around the Port that is not SPL or located within the Gladstone SDA. Any future development approval requiring assessment by GRC will need to comply with the requirements of Our Place Our Plan.

State Development Assessment Provisions

The State Development Assessment Provisions (SDAP) provide for specific matters of state interest and details the code assessment criteria for assessable development and referral requirements.

The SDAP assessment criteria are contained in stand-alone state codes which are broadly grouped into locational, use-based or advice only. The SDAP is a statutory document and is prescribed in the Planning Regulation 2017.

The States codes relevant to the placement of dredged material and reclamation works include:

- State code 7 – Maritime safety
- State code 8 – Coastal development and tidal works
- State code 11 – Removal, destruction or damage of marine plants

- State code 12 – Development in a declared fish habitat area
- State code 18 – Constructing or raising waterway barrier works in fish habitats
- State code 22 – Environmentally relevant activities.

A summary of how each of the applicable SDAP codes is addressed for this project is provided below. For a detailed assessment of matters relating to the SDAP codes, refer to section 5 (Capital dredging works and dredge material transfer) and section 6 (Placement of dredged material and reclamation works) of this report.

Maritime safety

State code 7 of the SDAP seeks to ensure development supports the safe operation of vessels in navigable waterways.

The EIS predicts that an increase in construction vessel traffic generated during the construction phase of the project would be minimal and are not anticipated to compromise maritime safety or the safe navigation of vessels within the Port. The proposed development would provide a permanent duplicated channel parallel to the main shipping channel with a sufficient depth to improve two-passage of ships in the Port, under all weather and tidal conditions therefore reducing the risk of vessels incidents.

MSQ have statutory responsibilities under the various maritime safety and transport operations Acts. It is a requirement that the proponent undertake all capital dredging activities in accordance with the Port Procedures under the guidance of MSQ.

For a more detailed assessment on maritime safety refer to Section 5.5 of this report.

I have stated a condition for the operational works approval for tidal works within a coastal management district to develop and implement a vessel traffic management plan as part of their Marine Execution Plan, with the relevant RHM to assist in the management of potential vessel interaction impacts. The project is generally consistent with the overarching objectives of State code 7.

Coastal development and tidal works

State code 8 of the SDAP seeks to maintain and conserve coastal processes and avoid impacts to matters of state environmental significance and, where avoidance is not reasonably possible, minimise and mitigate impacts, and provide an offset for significant residual impacts where appropriate.

Erosion prone area

The project is located within a coastal management district (CMD) and is located within the erosion prone area and high storm tide inundation area. State code 8 confirms development should not occur in the erosion prone area unless development:

(1) is one of the following types of development:

  (a) coastal-dependent development

  (b) temporary, readily relocatable or able to be abandoned

  (c) essential community infrastructure

  (d) redevelopment of an existing permanent building or structure that cannot be relocated or abandoned; and

(2) cannot be feasibly located elsewhere.

An increase in sediment deposition is predicted to occur to the east of the proposed WBE reclamation areas and in the channel adjacent to Fisherman's Landing, due to a reduction in current speeds caused

by the increased water depth as a result of the dredging for the project. Erosion and sediment build-up is also likely to occur in the channels that would be formed surrounding the WBE reclamation area.

The proponent has committed to develop and implement a monitoring program to observe any changes along the shoreline adjacent to the WBE reclamation areas. A suitably qualified and experienced person will also undertake monitoring of the WBE reclamation areas and existing WB outer bund walls to monitor the structural integrity/function of the bund walls. The project's Environmental Monitoring Procedure, which outlines the data requirements for monitoring to be undertaken during the construction of the WBE reclamation areas (including changes in sedimentation rates and water quality monitoring in vicinity of the WBE reclamation areas), will inform preparation of the project's REMP required by the stated conditions for the project's EA (Appendix 2). The design of the WBE reclamations will be also optimised to minimise erosion, and the WBE reclamation area bund wall will be designed to limit potential for erosion of the adjacent channel.

The EIS identified and assessed all potential dredge material placement options available at this point in time for the purposes of this assessment, and considered the limitations, costs and feasibility of each option. Of the four options, The WBE reclamation areas was determined the preferred site due to its ability to address the longer term dredge material placement needs of the Port (refer to section 2.4.1).

For a more detailed assessment on water quality, refer to section 6.3 of this report.

I am satisfied that these monitoring programs, committed to by the proponent, would ensure that any potential hydrodynamic and sedimentation impacts that may occur in the vicinity of the WBE reclamation areas are identified and appropriate management responses are implemented. I am also satisfied that the proponent's assessment of alternative locations for dredge material placement shows that the proposed WBE reclamation areas are the most feasible location when potential impacts on environmental values and the availability and feasibility of alternative locations are considered.

Water quality

The performance outcomes included in State Code 8 requires that development:

(1) Maintains or enhances environmental values of receiving waters

(2) Achieves the water quality objectives of Queensland waters

(3) Avoids the release of prescribed water contaminants to tidal waters.

As a result of the capital dredging and reclamation works water quality within and surrounding the Port's limits will be impacted by an increase to the natural turbidity and suspended sediments levels. To mitigate the impact to water quality, the proponent has committed that any project generated changes in water quality during capital dredging works will be managed through implementing a DMP and Environmental Monitoring Procedure The Environmental Monitoring Procedure will include a comprehensive procedure for ongoing monitoring of marine water quality and a program to investigate and respond to any exceedances of the project's water quality trigger levels. The monitoring will be undertaken at the locations of sensitive receptors, which will include seagrasses.

For a more detailed assessment on water quality, refer to section 5.2 and 6.3 of this report. The proposed mitigation measures as outlined in sections 5.2 and 6.3 including water quality monitoring in the vicinity of the WBE reclamation areas bund walls during construction, to detect any project related changes in water quality, will ensure the project achieves the performance outcomes of the code.

I am satisfied that the potential changes to marine water quality and associated impacts during capital dredging and reclamation works can be managed through the implementation of the DMP and Environmental Monitoring Procedure. The proponent's DMP will require approval by DES. I have stated conditions for an EA for capital dredging to ensure the protection of environmental values in the vicinity

of the dredging and reclamation works activities. I am satisfied that the project is generally consistent with the overarching objectives of State code 8 as potential changes to marine water quality will be managed by the DMP and Environmental Monitoring Procedure.

Matters of state environmental significance

The performance outcomes of State code 8 seek to avoid impacts to MSES and where possible provide an offset after demonstrating all reasonable avoidance, minimisation and mitigation measures undertaken.

In consideration of the need to demonstrate all reasonable avoidance measures, I acknowledge that the dredging, removal and placement of the dredged material is an unavoidable impact associated with this coastal-dependent development proposal and is required to ensure the Port can continue to operate efficiently and support Queensland's economy. Therefore, I am satisfied the impacts associated with the project cannot be avoided and that the proponent's efforts to minimise and mitigate the project's impacts are not inconsistent with the 'avoid, minimise and mitigate' impact hierarchy.

While some state agencies requested further assessment of options for onshore placement of dredge material to consider other avoidance measures, I am satisfied that the DMPOI in the EIS adequately identified and assessed the feasibility of the potential dredge material placement options available.

Capital dredging would result in a permanent loss and alteration of approximately 85.33 ha of marine plants, including 35.65 ha of deep-water seagrass and 49.68 ha of macroalgae. The loss of marine plants would have a direct impact on foraging habitat for dugongs and an indirect impact on dolphins by reducing the availability of prey resources. Dredging works would also be expected to directly removal 440.43 ha of potential foraging habitat for loggerhead and hawksbill turtles associated with the loss of seagrass, algae and habitat for benthic invertebrates.

The construction of the WBE reclamation area is expected to remove 275.23 ha of marine plants and have a significant residual impact on 364.64 ha of marine plants. This includes an indirect impact on 99.1 ha due to reduced water quality and changes to hydrodynamics (the movement of water, caused by tidal movement and interaction with the coast).

The permanent loss of seagrass and macroalgae would result in a significant residual impact as defined in the Queensland environmental offsets policy significant residual impact guideline.

For a more detailed assessment on MSES, refer to section 5.4 and 6.5 of this report.

In accordance with the significant residual impact guideline, where significant residual impact is considered an acceptable impact on MSES, an offset is considered appropriate in accordance with the *Environmental Offsets Act 2014*. I expect the proponent to undertake further investigations to determine suitable offsets that would address the project's significant residual impacts and provide the adequate level of detail in the final offset strategy. Refer to section 5.4 and 6.5 of this report for further details.

I note that the Commonwealth Minister for the Environment will consider residual impacts to MSES that are also MNES as part of the EPBC approval for the project. As many of the MSES being considered by the State are also listed as MNES, any conditions proposed by the Commonwealth will also be relevant to any overlapping MSES values. This consideration is expected to result in requirements for the proponent to undertake further surveys prior to commencing dredging to determine the offset obligation at the time of dredging. SARA would also include offset conditions on the required development permits for tidal works.

As the EIS identifies that an offset will be provided after demonstrating reasonable avoidance, minimisation and mitigation measures , I consider the performance outcome of the code for MSES to be complied with.

Dredging

The code's performance outcomes note all dredging and any disposal of dredged material in tidal water is required to be safe with regard to protection of the marine environment and by meeting the National Assessment Guidelines for Dredging 2009 (NAGD). It also requires that the project is supported by a monitoring and management plan that protects the marine environmental and complies with the NAGD.

The project would require the capital dredging of 12.85 Mm^3 of seabed material within the Port limits over approximately 58 weeks. The dredged material is proposed to be beneficially reused to reclaim land for future port growth.

The EIS compared geochemical analysis results of the sediment to be dredged against the National Environment Protection Measure (NEPM) objectives (for onshore re-use of dredged material) and the National Assessment Guidelines for Dredging (NAGD) (for offshore disposal of dredged material). The assessment found that the sediment is suitable for both on-shore re-use and off-shore disposal as per the requirements of the NEPM and NAGD.

The EIS includes the commitment to performing additional sediment sampling (prior to the commencement of dredging), where dredging is to be undertaken past the project sample validity period (5 years). Additionally, I have stated a condition for the EA requiring the results of updated sampling be provided to the administering authority. I am satisfied that through the implementation of this commitment and the EA condition, any changes in sediment quality up to the commencement of dredging activities will be identified and addressed by the proponent, where necessary. Acid sulfate soils encountered during dredging would be managed through the development and implementation of a detailed site-specific project ASSMP, prepared in accordance with the Queensland Acid Sulfate Soil Technical Manual.

I have stated conditions for the EA for capital dredging which require the proponent to ensure dredging does not exceed water quality limits at sensitive receptors.

I have also stated a condition for the EA requiring that a DMP for the activity must be developed and implemented prior to the commencement of the dredging activity. The DMP is subject to review and amendment as necessary due to changing regulation, monitoring results or administrating authority recommendations, as required by the stated conditions for the EA for capital dredging (Appendix 2). Refer to section 5.2 of this report for further details. I consider the performance outcome of dredging and disposal of dredged water in tidal water to meet the NAGD and be supported by a monitoring and management plan to be complied with.

Reclamation

The performance outcome notes that development does not involve reclamation of land below tidal water, other than for the purposes of:

(1) Coastal-dependent development, public marine development or community infrastructure; or

(2) Strategic ports, priority ports, boat harbours or strategic airports and aviation facilities, in accordance with statutory land use plan or master plan, where there is a demonstrated net benefit for the state or region and no feasible alternative exists; or

(3) Coastal protection works or work necessary to protect coastal resources or coastal processes.

The Port is identified as both a strategic port and a priority port and therefore meets the criteria of the code to allow for the reclamation of land below tidal water. I consider the performance outcome to be complied with for the proposed reclamation works.

Removal, destruction or damage of marine plants

State code 11 of the SDAP seeks to maintain both marine plant communities and the health and productivity of fisheries resources and fish habitat.

The EIS indicates that seagrass is present or has been historically present within and surrounding the proposed capital dredging footprint within the main channel, and the footprint of the WBE reclamation area. The proponent has committed to resurvey seagrass to confirm presence of seagrass and the exact area of direct impact.

For a more detailed assessment on marine plants, refer to section 5.4.2 and 6.5.3 and of this report.

The proponent is committed to minimising impacts to marine plants, as far as possible. If any significant residual impacts are identified the proponent would be required to provide offsets in accordance with the *Environmental Offsets Act 2014*. Offset requirements will be determined when the proponent applies for the marine plants clearing permit. I am satisfied that the project is generally consistent with the overarching objectives of State code 11.

Development in a declared fish habitat area

State code 12 of the SDAP seeks to ensure any development in a declared fish habitat area (FHA) is limited and that impacts on marine plants, waterways and declared FHAs of state environmental significance are avoided.

The EIS indicates that there are no declared FHAs within the project direct impact area. The project does not propose any development within the Rodds Harbour declared FHA and Colosseum Inlet declared FHA, located 40 km and 24 km south-east of the project areas to be dredged.

The WBE reclamation areas are located approximately 12 km from the Calliope River FHA. The construction of the WBE reclamation areas has the potential for short-term water quality declines associated with increases in turbidity, however the EIS predicts the FHA is located outside of the predicted zone of impact.

Assessment of fish habitat areas can also be found in section 5.4.5 and 6.5.7 of this report.

The proposed mitigation measures and stated conditions for managing water quality impacts on marine plants would also be applicable managing potential impacts on the Calliope River FHA. I am satisfied that the project is consistent with the performance outcomes of State code 12.

Constructing or raising waterway barrier works in fish habitats

State code 18 of the SDAP seeks to ensure that development involving the constructing or raising of waterway barriers works in a fish habitat maintains fish movement and connectivity throughout waterways as well as maintaining the health and productivity of fisheries resources and fish habitat.

The EIS indicates the WBE reclamation is located in an area mapped as a ‘tidal’ waterway for providing fish passage. A terrestrial waterway is mapped to the west of the WBE reclamation areas.

I have recommended that the proponent engage with DAF regarding the potential for waterway barrier works during detailed design for the northern and southern WBE reclamation areas, including the connecting structure between these (Appendix 3). Consistency with state code 18 would be determined following release of this report.

Environmentally relevant activities

State code 22 of the SDAP ensures that ERAs are located and designed to avoid or mitigate environmental harm. The code also aims to minimise and mitigate impacts to MSES and provide an offset for significant residual impacts, where appropriate.

The project involves an EA for ERA 16 – dredging of more than 1,000,000 m^3 in a year as well as a development permit for a material change of use (MCU) for the ERA. Potential impacts to MSES are likely to occur as a result of the project and have been considered in the EIS process. For more detailed information about the project's potential impacts to MSES, refer to section 5.4 and 6.5 and of this report. The EIS states that impacts can be mitigated through a DMP and Environmental Monitoring Procedure which will contain a range of mitigation measures which would seek to reduce impacts of the project. Therefore, I consider the performance outcome to be generally met.

6.2.3 Coordinator-General's conclusions: Land use and planning

The EIS identified the potential land use impacts associated with the project. I am satisfied that the project will support a coordinated approach to the beneficial reuse of dredged material to expand the total area of land currently available to cater for port-related industrial development within the Port. The expansion will also complement the surrounding land uses including the adjacent Gladstone SDA which links directly to the Port.

I have considered the relevant SDAP codes and have stated conditions for the relevant planning approvals to ensure that the state's interest in subsequent development assessment processes are maintained and protected. In accordance with section 39 of the SDPWO Act, I have stated conditions for an operational works approval (preliminary approval) to undertake tidal works within a coastal management district and for the removal of marine plants to facilitate the construction of the WBE reclamation areas and BUF.

I am satisfied that the project meets the requirements of the Ports Act in that capital dredged material is beneficially reused to create reclaimed land.

I have stated conditions for an EA for ERA16 – dredging of more than 1,000,000 m^3 in a year as well as a development permit for an MCU for the ERA.

I also expect that any potential land use impacts, such as the permanent loss of marine plants and erosion and sediment build up surrounding the WBE reclamation areas, would be further reduced through planning and project refinements during detailed design and implementation of proponent commitments and mitigation measures proposed in the EIS, such as the DMP and Environmental Monitoring Procedure.

I am satisfied that there will be no adverse impacts to adjoining land uses given these predominately consist of port-related industrial land, marine infrastructure and rural uses with no residences in the immediate area.

6.3 Marine water quality

The establishment of the WBE reclamation areas and placement of dredge material has the potential to change marine water quality within and the Port. This section evaluates the potential impacts associated with the potential changes to marine water quality and the mitigation and management measures proposed in the EIS.

6.3.1 Existing environment

Refer to section 5.2.1 for a detailed description of the existing coastal process and hydrodynamic environment.

6.3.2 Issues raised in submissions

Key issues raised in the submissions on the EIS regarding marine water quality include:

- potential water quality impacts to marine flora and fauna and surrounding environments (including the GBRWHA) from the construction of the reclamation area
- potential water quality impacts due to ASS following the placement of dredge material in the WBE reclamation areas
- the suitability of the proponent's WBE reclamation areas tailwater discharge water quality limits for the WBE reclamation areas
- potential cumulative impacts to marine water quality arising from simultaneous tailwater releases from the existing WB and proposed WBE reclamation areas
- I have considered each submission and the responses provided by the proponent in my evaluation of the project.

6.3.3 Methodology

The methodology for predicting the potential changes to marine water quality and the associated impacts to the marine environment associated with the placement of dredge material and the establishment of the WBE reclamation areas is as detailed previously in Section 5.2.3 of this report.

6.3.4 Impacts and mitigation

This section discusses the key potential changes to marine water quality that may arise during the placement of dredged material and reclamation works, and evaluates the potential impacts associated with those changes as well as the mitigation and management measures proposed in the EIS.

The project has the potential to change marine water quality within and surrounding the Port, through the disturbance of sediments (and potentially contaminants, if present, within those sediments) from the sea floor during the placement of dredge material and construction of the WBE reclamation areas. The project also has the potential to result in changes to existing marine water current speeds, wave activity and sediment build-up and erosion within the Port.

Potential impacts from the release of sediments into the receiving environment include the release of contaminants to the marine water column, increased algal blooms and toxicity to marine and or intertidal flora and fauna.

The final land use of the reclamation area would be port-related industrial activities. Such activities, without appropriate management, may spread contaminants to the surrounding environment through uncontrolled erosion and soil runoff and chemical spills and contamination from waste handling on the WBE reclamation areas. Potential water quality impacts associated with the operational WBE reclamation areas will be regulated through subsequent approvals not sought as part of this process; accordingly, no further discussion is provided here.

Similarly, the loading and unloading of imports and exports is controlled and managed by existing environmental licenses held by operators, however other shipping vessel-based sources have the potential to introduce contaminants that may impact water quality. Ballast water, antifouling and wastewater are regulated through international obligations and state and Commonwealth legislation and policy. I am satisfied that the potential impacts relating to shipping vessel related water quality impacts would be addressed through existing state and Federal regulatory mechanisms including the *Biosecurity Act 2015 (Cwlth)* and the *Transport Operations (Marine Pollution) Act 1995*.

Construction of the WBE reclamation areas and placement of dredged material

The construction of the BUF and WBE reclamation areas will be undertaken over a three-year period. It will involve the placement of core material (hard, durable rock) directly over existing sediments and seagrass areas to form the bund wall, followed by armour rock (larger, more durable rock to withstand harsh environmental conditions) being placed along the outer bund walls that face open water.

A geotextile material will be placed within the bund wall to prevent the dredge material from escaping through the bund wall into the surrounding environment. Once the outer and internal bund walls are complete, and the geotextile material is restrained and stabilised, dredge material will be placed in the WBE reclamation areas. Construction of the BUF will also require some sheet piling.

The placement of the core material and armour rock required for the WBE reclamation areas and BUF and sheet piling for the BUF has the potential to resuspend soft sediments, including contaminants (if present), into the water column during construction, which may result in changes to marine water quality and impacts to the surrounding environment.

The EIS considers that the sediment currently located within the undeveloped WBE reclamation areas (which would be disturbed during bund wall construction, resulting in a small but visible plume) complies with the NAGD contaminant screening levels, and if disturbed, would not result in the introduction of contaminants (other than sediments) into the environment.

The generation of plumes from the placement of core and armour rock material is expected to be a short-term impact and will reduce once the first layer of rocks has been placed onto the seabed. In addition, the EIS states that following the implementation of mitigation measures, any changes to water quality generated during the construction of the WBE bund wall would not likely be detectable above the naturally high turbid conditions in the Port.

I note that submitters raised concerns regarding the impact that changes to water quality as a result of the construction of the WBE reclamation areas may have to sensitive ecological receptors, including seagrass and other inshore flora and fauna. The changes to turbidity and sediment deposition rates in the vicinity of the WBE reclamation areas during construction will impact any ecological receptors that are located in these areas. Further evaluation of the potential impacts to ecological receptors is provided in section 6.5.

I also note that submitters raised concerns with the potential impacts associated with the disturbance of PASS and its management once placed in the WBE reclamation areas. In response to submissions and as part of the revised draft EIS, the proponent provided an updated DMPOI. The updated DMPOI states that to reduce the risk of PASS turning into AASS, areas of PASS within the material to be dredged will be placed within the reclamation area below the marine water level to ensure permanent submergence, thereby avoiding the generation of AASS.

Tailwater releases during construction

The placement and rehandling of dredge material within the WBE reclamation areas has the potential to impact the marine environment through the release of sediment-laden tailwaters from licensed discharge points into the Port. The dredge material placed within the WBE reclamation areas from the dredger will be in slurry form; that is, a mixture of sediments and water.

Once the dredge material is placed within the WBE reclamation areas it will settle over time, compacting down with the solid sediments on the bottom and water will pool on top. The water that collects on top of the settled sediments will be discharged back into the marine environment from licensed discharge points at the reclamation area, once it meets particular water quality requirements.

According to the EIS, the sediment from the area to be dredged (including for the barge access channel) is 'clean' as per the NAGD and therefore is chemically suitable for placement within the WB and WBE reclamation areas. Additionally, the EIS states that the contaminants within the sediments to be placed in the WBE reclamation areas would be below the NEPM human health risk assessment criteria for port-related industrial use, which further supports its suitability for placement and future development.

The EIS predicted that the potential changes to water quality due to a release of sediment laden water from licensed discharge points would be restricted to a contained area (i.e. in the area immediately surrounding the discharge point). During the placement of dredged material within the WBE reclamation areas, a series of decant ponds will be constructed internal to the outer bund wall to allow for the fine material to settle from the tailwaters, to achieve the levels authorised by the EA to enable discharge back into the marine environment.

The proponent has committed to ensuring that licensed discharges from the two existing WB reclamation area discharge points will not occur at the same time as the proposed new discharge points for the WBE reclamation areas. The proponent has also indicated that discharge from the two existing WB reclamation area discharge points will only occur if project dredged material is placed and managed in this area.

Mitigation measures

WBE reclamation construction

The bund walls for the WBE reclamation areas and BUF will be designed and constructed in accordance with:

- industry best practice:
  - to reduce the movement of fine sediment through the bund walls into the surrounding environment, geotextile materials (permeable material designed to control erosion and drainage) to filter sediment will be placed inside the inner bund wall and overlaid by secure core material, secured by the rock armour to prevent slippage and deformation and laid on the bund wall to conform with the requirements of Australian Standards 3706: Geotextiles – methods of test. Overlaps in the geotextile material will be directed vertically down the slope of the armour material
- the findings of the EIS and recommendations of the Independent Review of the Bund Wall at the Port of Gladstone (2014) (for further information refer to Section 2.3.1), specifically:
  - the proponent has consulted with Government stakeholders and community representatives during the preparation of the EIS
  - the geotextile material design and installation requirements for the bund walls of the WBE reclamation areas have been incorporated into the EIS project description and project EMP
  - an additional geotechnical investigation will be undertaken for the WBE reclamation areas and BUF during the detailed design phase of the project
  - hydrodynamic modelling will be undertaken during the detailed design phase to determine the least impact options for construction of the bund walls and sealing of the enclosure.

The proponent has committed to ensuring that all design measures for the WBE reclamation areas are consistent with the findings of the independent review of the WBDDP bund wall and the above measures are consistent with the review's recommendations. I expect that the proponent fulfils their commitment to implement these mitigation measures, and subject to the proponent doing so, I am satisfied that the BUF and WBE reclamation bund wall will be constructed and managed in accordance with the relevant findings of the independent review.

Sediment laden tailwater releases

The proponent has also indicated that an additional water quality monitoring site will be placed in close proximity to the existing WB reclamation area and the WBE reclamation areas. This site will be used to identify monitor changes in turbidity during the construction of the BUF and WBE reclamation areas, and will also be used to measure the potential water quality impacts of the tailwater discharges from the WB reclamation area during project dredging activities. The proponent has committed to implementing adaptive management measures in accordance with the project's Environmental Monitoring Procedure to ensure that marine water quality and ecological impacts are minimised. An adaptive management approach will ensure that any management measures applied for the project will be subject to review following their implementation, and modifications to those measures will be made if the review finds more beneficial outcomes can be achieved going forward.

The potential changes to water quality due to releases of sediment laden water from licensed discharge points on the WBE reclamation areas would be required to meet mandatory water quality requirements prior to release, as part of the project's EA conditions. To ensure that tailwater is tested prior to release, I have stated conditions for the project' EA which describe the surface water release limits to be achieved prior to any release of tailwater from the WBE reclamation areas. Water quality limits for tailwater releases will ensure that environmental values are protected.

Sediment laden tailwater releases from the WBE reclamation areas will also be monitored in accordance with the project's receiving environment monitoring program (REMP) during placement of dredge material. I have stated a condition for the project's EA outlining the requirements for the REMP; specifically, that it will monitor, identify, describe and respond to any adverse impacts to receiving waters. The REMP will assess the condition of the receiving waters within the Port, identify the potential impacts of the project to the receiving environment and identify the environmental values to be protected. It will also include a description of the monitoring locations, water quality indicators and provide for near real-time monitoring of the sediment plume related indicators. The conditions that I have stated for the EA require that the REMP must be implemented prior to the commencement of dredging and construction activities and not cease until after dredging activities are completed.

Acid sulfate soil

Any potential PASS impacts to marine water quality during the construction of the WBE reclamation areas will be managed through regularly monitoring pH. Any dredge material containing PASS or AASS that is placed within the WBE reclamation areas will be re-distributed as required so that it remains permanently under water where practicable, or if exposed to the atmosphere for a significant length of time, it is treated appropriately in compliance with an ASSMP.

The proponent has also committed to preparing and implementing a more detailed site-specific project ASSMP in accordance with the Queensland Acid Sulfate Soil Technical Manual, to provide additional detail on dredge material placement timings, monitoring and acid neutralisation methods. Additionally, pH in the WB and WBE reclamation areas will be monitored in accordance with the DMP, and adjustments to the pH will be made should the water within the reclamation areas be too acidic or alkaline prior to release.

6.3.5 Coordinator-General's conclusion: marine water quality

I am satisfied that the EIS has assessed the potential marine water quality impacts of the project resulting from the placement of dredge material and reclamation works.

The EIS identified that the construction of the bund walls of the WBE reclamation areas has the potential to result change marine water quality in the surrounding environment through increasing turbidity and sediment deposition rates, however the risk of such an impact is low. The EIS concluded that any

impacts would be unlikely to be detectable above the naturally high turbidity present within the Port, and impacts would reduce following the placement of the first layer of rock material on the seabed.

The potential changes to water quality due to a release of sediment-laden water from licensed discharge points would also be restricted to a contained area, and will be required to meet mandatory water quality requirements prior to release as part of the project's EA conditions.

The proponent has committed to implementing a number of measures to address the potential changes to marine water quality during the construction of the reclamation area and the placement of dredge material. This includes ensuring that water quality monitoring is undertaken in the vicinity of the WBE reclamation areas bund walls during construction, to detect any project related changes in water quality and initiate a management response. The proponent will also ensure that the WBE reclamation bund walls are constructed in accordance with industry best practice and incorporating and responding to the findings and recommendations of the independent review of the WBDDP bund.

I have stated a number of conditions (Appendix 2) for the project's EA that:

- set water quality trigger limits and release levels and require water quality monitoring
- require that the suitability of dredged material for land reclamation must be sampled and assessed no more than five years before dredging is undertaken
- require that any containment structures at the WBE reclamation areas are certified by an appropriately qualitied person and maintained to the certified design
- require that land that is reclaimed must be maintained in a manner such that:
  - erosion and sediment control measures are implemented in accordance with Best Practice Erosions and Sediment Control Guidelines of Australia
  - the release of sediment and erosion on and off site is prevented
  - the quality of water released from the site does not cause environmental harm
  - the final landform is stable and protects public safety
- require that an ASSMP must be prepared, in accordance with the Queensland Acid Sulfate Soil Technical Manual, for all PASS that may be directly or indirectly disturbed by the project.

I am satisfied that the potential changes to marine water quality and associated impacts during placement of dredge material and reclamation works can be managed through the conditions I have included in this report and the proponent's commitments at Appendix 4 and the implementation of the proponent's commitments including the mitigation measures outlined in the EIS.

6.4 Coastal processes

The establishment of the WBE reclamation areas and the placement of dredge material has the potential to impact on coastal processes and hydrodynamics within and surrounding the Port. This section evaluates these potential impacts and the mitigation and management measures proposed in the EIS.

6.4.1 Existing environment

Refer to section 5.3.1 for a detailed description of the existing coastal process and hydrodynamic environment.

6.4.2 Issues raised in submissions

Key coastal processes and hydrodynamics issues raised in submissions on the EIS included the following:

- potential changes in water velocities and sediment movement surrounding the WBE reclamation areas
- the need for a monitoring program to monitor and identify changes in landforms and the sea floor for areas directly and indirectly impacted by the construction of the WBE reclamation areas.

I have considered each submission and the responses provided by the proponent in my evaluation of the project.

6.4.3 Impacts and mitigation

The project has the potential to result in changes to existing marine water current speeds, wave activity and sediment build-up and erosion within the Port. Potential impacts that may arise due to changes in marine water currents, wave activity and sediment build-up and erosion include changes to the depths of the sea floor and alterations to the form of adjacent coastlines in the vicinity of the reclamation works.

Impacts due to the construction of the WBE reclamation areas

Water velocity impacts

The southern section of the WBE reclamation area will be constructed adjoining the existing WB reclamation area. The northern section of the WBE reclamation area will be constructed to leave a narrow channel between the two WBE reclamation areas (approximately 100 m wide) and along the existing shoreline (approximately 250 m wide) to allow water to continue to flow between these areas

The BUF would be constructed on the eastern side of the existing WB reclamation area to allow for unloading of dredge material from barges and placement of the material within the reclamation areas (refer Figure 2.4 in project description).

The EIS predicted that the construction of the WBE reclamation areas and BUF will cause changes in the immediate vicinity of the WBE reclamation areas to current patterns and speeds. There would be a reduction in current speeds (of approximately -0.1 to -0.6 m/s) immediately adjacent to the BUF and along the eastern face of the northern part of the WBE reclamation area, as shown in Figure 6.3.

There would also be some increases in current speeds for both the northern and southern sections of the WBE reclamation areas on the western sides (of approximately 0.1 to 1 m/s). The EIS stated that the increase in current speeds of up to 1 m/s on the western face of the WBE reclamation areas (shown in Figure 6.3, highlighted in yellow) would need to be considered during the detailed design of the bund-toe, to minimise the potential for erosion adjacent to and underneath the bund wall.

The proponent has committed to undertaking additional geotechnical investigations and further analysis of appropriate bund wall design and construction methodologies to minimise the potential for erosion. This will occur during the detailed design phase of the project.

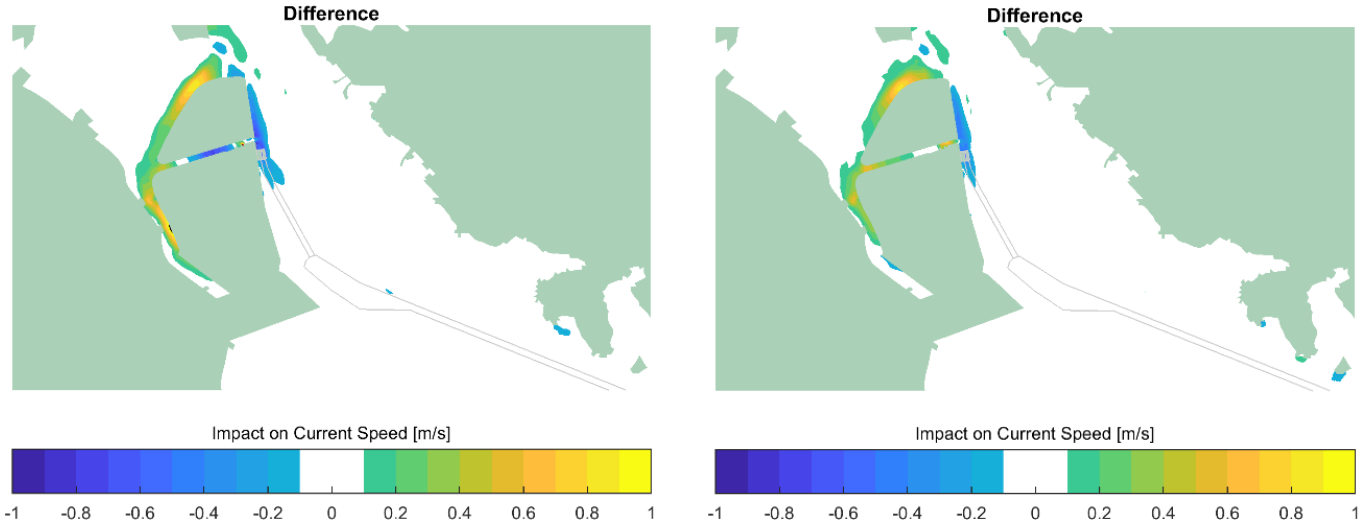


Figure 6.3 Change to the flood tide peak spring velocity (left) and ebb tide peak spring velocity (right)

The proponent has also committed to ensuring that a suitably qualified and experienced person will undertake monitoring of the WBE reclamation areas and existing WB outer bund walls during dredging and from the commencement of dredged material placement, to monitor the structural integrity/function of the bund wall to prevent unexpected sediment plumes. As per the project's Dredging EMP, daily inspections of bund wall will be undertaken; this will include inspection to detect whether dredge material placed within the WBE reclamation areas is being contained appropriately. Should daily inspections observe breaches of the WBE reclamation bund wall, further investigation into additional sediment containment measures and bund wall design considerations will be undertaken. The proponent has also committed to ensuring that the WBE reclamation bund wall will be constructed in accordance with the recommendations from the Independent Review of the Bund Wall at the Port of Gladstone (2014) which includes prescriptive requirements for the inclusion of geotextile materials to filter sediments within bund walls to prevent unauthorised released of sediment occurring.

Wave climate

The EIS predicted that the construction of the WBE reclamation areas would result in a reduction in the wave activity that currently occurs on the shoreline of the mainland located to the west, directly adjacent to the proposed construction areas.

According to the EIS, this shoreline is generally inundated only during high tides, and the WBE reclamation areas would further limit the inundation extent of the tide once it is constructed. However, the shoreline is already very sheltered by the existing WB reclamation area, which restricts inundation of the shoreline to during high tides only, and the EIS considers that the project would not result in significant changes to the existing wave climate within this location.

Sediment dynamics

The EIS predicted that there would be an increase in sediment deposition to the east of the proposed WBE reclamation areas. No increase in siltation rates within the swing basins and berth pockets adjacent to the liquified natural gas facilities on Curtis Island is expected.

The EIS also predicted an increase in sediment deposition in the channel adjacent to Fisherman's Landing due to a reduction in current speeds caused by the increased water depth resulting from dredging.

The deeper channel will reduce the ability of tidal currents to erode sediment from the bottom of the channel at the sea floor, therefore increasing the build-up of sediment. Due to this, the EIS indicates that there would be an increase in maintenance dredging volumes in the vicinity of Fisherman's Landing, corresponding to an additional three days of maintenance dredging required within the Port of Gladstone during a typical annual maintenance dredging campaign.

The EIS also predicted that there is the potential for some erosion and accretion (sediment build-up) to occur in the new channels that would be formed surrounding the new WBE reclamation areas. However, the EIS contends that any such erosion would continue (provided that the material on the sea floor is erodible) only until the channel reaches a new equilibrium depth, where erosion and sediment build-up rates are balanced.

Specifically, the channel to the north-west of the proposed northern WBE reclamation areas is likely to become shallower (accrete) near transect 3 (refer to Figure 6.4), is likely to be stable (neither erode nor accrete) near transect 2 and may show a tendency to become deeper (erode) by up to 1 m near transect 1.

The channel to the west of the southern WBE reclamation areas (the extension of the existing WB reclamation area) is likely to deepen (erode) near transect 4 (refer to Figure 6.4), and the channel between the northern and southern WBE reclamation areas sections (at transects 5, 6 and 7) may experience erosion of up to 2 m.

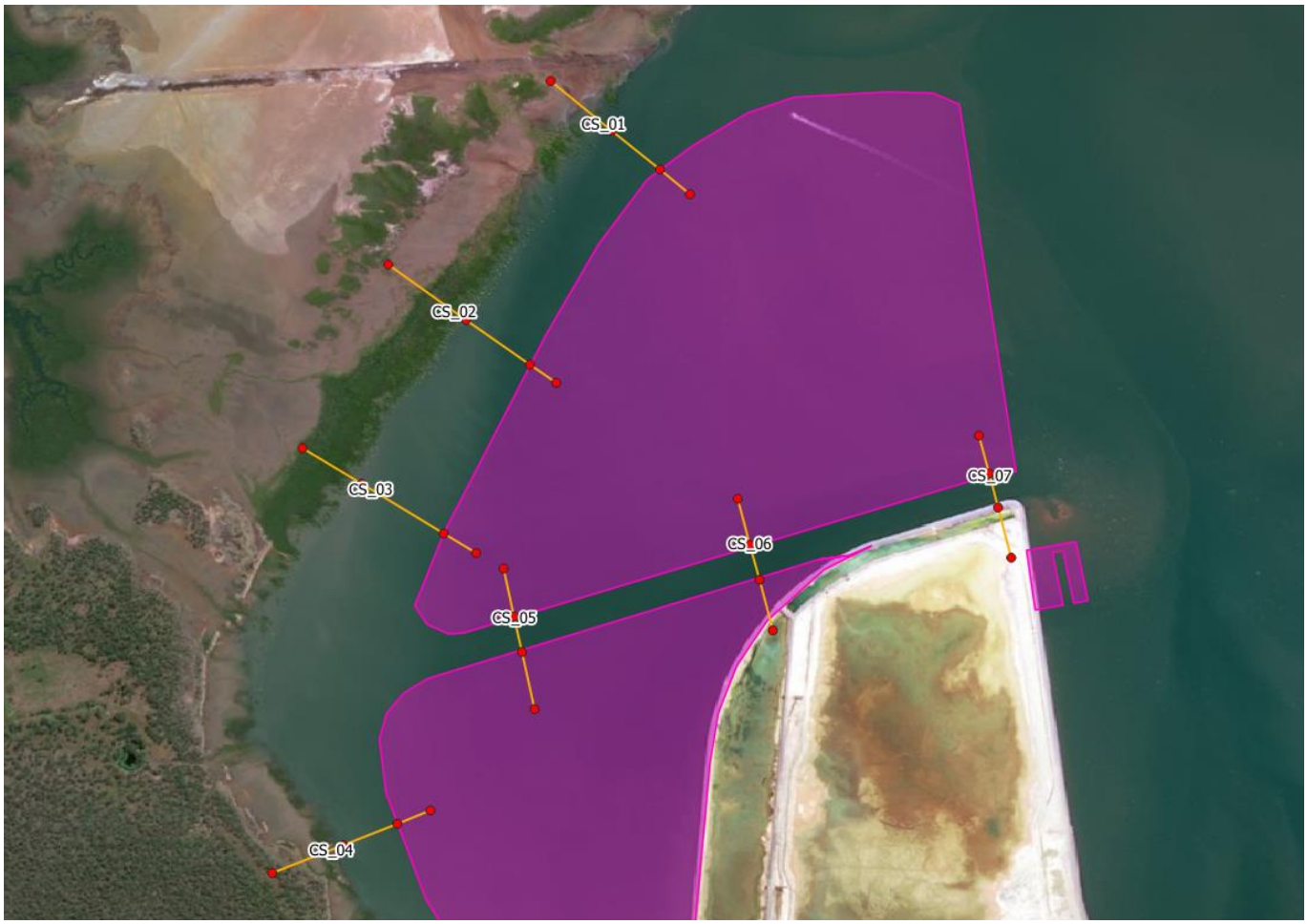


Figure 6.4 Transects analysed for potential morphological changes

The proponent has committed to revising the sediment dynamics assessment during the detailed design phase of the project to determine the likely equilibrium depths of the new channels surrounding the new

WBE reclamation areas. The design of the WBE reclamation will be also optimised to minimise potential erosion, and the detailed design WBE bund wall will take into account the potential for erosion of the adjacent channel.

I note that submitters raised concerns relating to the potential hydrodynamic and sedimentation impacts that have the potential to occur as a result of the construction of the WBE reclamation areas. Submitters also requested that the proponent develop a monitoring program to monitor and identify changes in landforms, tidal areas and the sea floor for areas adjacent to or impacted by the WBE reclamation areas. In response to submitter concerns, the proponent has committed to developing and implementing a monitoring program to observe any changes along the shoreline adjacent to the WBE reclamation areas, including:

- landforms, including coastal and dune vegetation
- existing navigable channels
- intertidal areas, including feeding areas for migratory birds
- wetlands, including groundwater regimes
- existing approved tidal works structures
- MNES and MSES values.

The project's Environmental Monitoring Procedure, which outlines the date requirements for monitoring to be undertaken during the construction of the WBE reclamation areas (including changes in sedimentation rates and water quality monitoring in the vicinity of the WBE reclamation areas), will be used to assist the preparation of the project's REMP required by the stated conditions in this report for the project's EA (Appendix 2). A suitably qualified and experienced person will also undertake monitoring of the WBE reclamation areas and the outer bund walls of the existing WB reclamation area to monitor the structural integrity/function of the bund walls during dredging, in accordance with the DMP. The project will be required to be carried out in accordance with the DMP and Environmental Monitoring Procedure.

I am satisfied that these monitoring programs, committed to by the proponent and the stated conditions for the EAs (Appendix 2), would address the concerns raised by submitters, ensuring that any potential hydrodynamic and sedimentation impacts that may or have occurred in the vicinity of the WBE reclamation areas are identified and appropriate management responses are implemented, such as further investigation into additional sediment containment measures and bund wall design considerations.

Climate change and extreme weather events

Climate change and extreme weather events have the potential to impact on the construction and operational phases of the WBE reclamation areas and BUF. This may be via presenting risks to the timely completion of the bund wall and BUF, during the placement of dredge material (through potential uncontrolled spills, leakages or damage to the bund wall), and during operation of the completed WBE reclamation areas.

To address the risks posed to the WBE reclamation areas by extreme weather events, the preliminary design for the BUF and WBE reclamation areas bund walls has taken into consideration a combined storm tide and sea level change of up to 7 m above LAT. This is a 0.55 m allowance above the predicted 500-year average climate change-influenced average recurrence interval (ARI) storm tide of 6.45 m, as estimated by the EIS and shown in Table 6.1. The proposed WBE bund wall height of +7 m LAT is consistent with the existing WB reclamation area and Fisherman's Landing reclamation area bund wall heights.

Table 6.1 Storm tide level data for Gladstone

Scenario		Storm tide level (mLAT)		
		100-year ARI	500-year ARI	1000-year ARI
Gladstone (2003)	Storm tide level	5.09	5.78	6.07
	Storm surge allowance	0.26	0.95	1.24
Gladstone (with further climate change conditions[13])	Storm tide level	5.60	6.45	6.78
	Storm surge allowance	0.77	1.62	1.95

As part of the revised draft EIS, the proponent undertook further concept design of the proposed WBE reclamation areas' internal dewatering cells, which assist in removing the water from the dredge material so it can be placed in the reclamation area. This included the requirement that the internal cells and variable height weir boxes be designed and maintained so that a freeboard (the distance between the waterline to the top of the bund/ cell wall) of not less than 1 m is maintained at all times during dredging.

A 1 m freeboard is equivalent to an approximate 1 in 500-year rainfall event within Gladstone. Providing this level of freeboard will ensure that sediment-laden water stored within the dewatering cells (including rainfall from a 1 in 500-year event), will not spill over the top of the bund wall and enter the adjacent marine environment.

The proponent has committed to undertaking further detailed analysis of storm surge and climate change requirements for the BUF and WBE reclamation outer bund walls during the detailed design phase, to further understand, and design for, extreme weather design requirements.

The EIS considers that a freeboard of 1 m is sufficient to accommodate extreme climatic events within Gladstone, including any changes in rainfall volume which may be the result of climate change. Additionally, as there would be no catchment draining to the WBE reclamation areas, the actual rainfall which occurs at the Port would be the amount captured; therefore, the proponent considers that there would be no requirement for additional discharge points, other than those already licensed.

Any significant rainfall event within Gladstone that approaches or exceeds a 1 in 500-year event is likely to halt dredging activities due to safety issues, further limiting the likelihood of overflow of water from bund/cell walls during dredging in such conditions.

6.4.4 Coordinator-General's conclusions: coastal processes

I am satisfied that the EIS has assessed the project's potential coastal processes and hydrodynamics impacts due to the construction of the WBE reclamation areas.

I note that the EIS predicted changes in current speeds and sediment deposition in the vicinity of the new WBE reclamation areas, with increased erosion and sediment build-up predicted within the new channels that would form surrounding the reclamation. With regards to extreme weather events, the proponent has ensured that the WBE reclamation bund wall and internal dewatering cells can accommodate extreme climatic events such as flooding and cyclones, including any changes in rainfall volumes caused by climate change.

To address the potential hydrodynamic impacts from the project, the proponent has committed to developing and implementing a monitoring program to observe any changes along the mainland shoreline adjacent to the WBE reclamation areas. The design of the WBE reclamation areas will also be optimised with respect to the predicted changes in sediment erosion in the adjacent channels. The

[13] Based on climate change scenarios for a 50 year planning period

proponent has also committed to undertaking a further detailed analysis of storm surge and climate change requirements during the detailed design phase for the BUF and WBE reclamation outer bund walls.

I am satisfied that, through the implementation of the proponent's commitments at Appendix 4, stated conditions in Appendix 2 and the mitigation measures outlined in the EIS, potential impacts to coastal processes and hydrodynamics resulting from the reclamation works will be managed to avoid unacceptable impacts.

6.5 Matters of state environmental significance

This section addresses the potential impacts associated with the construction and operation of the WBE reclamation areas on prescribed environmental matters (MSES).

The MSES potentially impacted by the construction and operation of the WBE reclamation areas are:

- regulated vegetation:
  - category B areas on the regulated vegetation map that are 'endangered' or 'of concern' regional ecosystems (REs)
- marine plants:
  - a marine plant within the meaning of the Fisheries Act
- wetlands:
  - a wetland that occurs in a WPA shown on the map of referable wetlands
  - a HES wetland shown on the map of referable wetlands
  - a wetland in HEV waters
- protected wildlife habitat:
  - a habitat for an animal that is listed as endangered or vulnerable wildlife, or a special least concern animal under the NC Act
- waterway providing for fish passage:
  - any part of a waterway providing for passage of fish where the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along the waterway.

Four submissions on the draft EIS identified issues associated with impacts to MSES as a concern. The detail of submission have been considered by topic throughout this section.

6.5.1 Overlaps with Commonwealth matter

The Port operates within the GBRWHA and is known to support a diverse range of marine and coastal flora and fauna which contribute to its local expression of OUV and are also listed threatened and migratory species under the EPBC Act which are MNES. This includes marine plants (mangroves, seagrass and macroalgae), marine mammals (dolphins, whales and dugong), marine turtles, fish and sharks; and marine birds (seabirds and shorebirds). As all these values are MNES, they will be assessed as part of a 'controlled action decision' by the Commonwealth Minister for the Environment. See section 4 for more details about the Commonwealth approval process.

As many of the matters being assessed by the State which are MSES are also MNES, any conditions proposed by the Commonwealth will also be relevant to any overlapping MSES values. For example, seagrass is both MNES and MSES, as it is:

- an attribute that contributes to the OUV of the GBRWHA
- a foraging resource for listed threatened and migratory species under the EPBC Act
- a prescribed environmental matter that is an MSES under State legislation (i.e. subject to assessment under State Code 11 (Removal, destruction or damage of marine plants) of the SDAPs of the Queensland Planning Act).

For this project the Commonwealth Minister will assess the project's impacts on seagrass, as both a value that contributes to the OUV of the GBRWHA and as a foraging resource for listed threatened and migratory species.

In their assessment the Minister will also consider the principles of ecological sustainable development. This would include the project's potential impact on seagrass regarding the ecosystem services it provides including a source of food for humans through fisheries, and carbon sequestering and nutrient cycling that support the health of marine ecosystems and the planet.

This chapter only evaluates potential impacts to environmental values which are MSES, however links to where matters may overlap with MNES are discussed where relevant. It should be noted that under the *Environmental Offsets Act 2014* the State cannot duplicate conditions for offsets for prescribed environmental matters that are MSES where the Commonwealth has provided conditions requiring offsets for the same or substantially the same impact and the same or substantially the same prescribed environmental matter.

As such, to ensure best environmental outcome for affected values, the analysis in this chapter has included considerations of both Commonwealth and State laws and protocols about environmental impacts and a complementary degree of assessment, control, prevention and offset has then been applied in conditions set in this report.

As such, conditions included in this chapter complement and do not conflict with anticipated future conditions to be included in the Commonwealth's separate assessment of MNES. This would ensure the best environmental outcome for the impacted matters by aligning the regulatory requirements.

6.5.2 Regulated vegetation

The project is not expected to have a direct impact on any regulated vegetation that are MSES as there are no terrestrial flora known to occur within the WBE reclamation areas and BUF.

The EIS indicates that there are 23.68 ha of mapped REs (including 21.69 ha of least concern REs and 1.99 ha of endangered REs) within the potential indirect areas along the adjacent shoreline within 500 m of the proposed reclamation area. The main vegetation community observed within the potential indirect impact area is dry eucalypt woodland dominated by narrow-leaved ironbark and Queensland peppermint, with some Moreton Bay ash, broad-leaved tea tree and swamp mahogany trees. This area has been previously disturbed and contains some cleared areas and remnant and regrowth vegetation. It is considered that these areas could be indirectly affected by dust generated during reclamation works and the potential introduction and spread of exotic weeds and pests. The proponent has proposed a range of measures in dredging and project EMPs to manage potential impacts during construction. This includes the vegetation, weed and pest management and air quality plans which form part of the project EMP which include a range of measures including but not limited to:

- undertaking pre-construction flora surveys within areas that have the potential to be impacted by project activities and developing measures to manage any potential impact on vegetation identified in high risk areas
- ensuring construction compound and other laydown areas are located within areas outside high value areas
- implementing pest and weed management protocols developed in accordance with best practice and the Queensland *Biosecurity Act 2014*
- conducting air quality monitoring during construction activities and undertaking additional measures where high levels of dust are observed to be collecting in areas of sensitive vegetation.

Based on the information provided in the EIS, I am satisfied that the proponent has adequately identified the projects potential impacts on regulated vegetation and consider the proposed measures in the dredging and project EMP are adequate for managing impacts on regulated vegetation surrounding the reclamation area.

6.5.3 Marine plants

Issues raised in submissions

Key issues raised in the submissions on the EIS regarding impacts to marine plants include:

- the need for the revision of impact values for marine plants provided in the EIS
- the need to include additional water quality monitoring sites at seagrass meadows near the WBE area.

I have considered each submission and the responses provided by the proponent in my evaluation of the project in the relevant sections below.

Presence and distribution in the project area

Intertidal plants (mangroves, samphire and saltmarsh)

The EIS identifies that there are a number of REs mapped in the project area that also meet the definition of marine plants under the Fisheries Act including REs 11.1.2a, 11.1.4a, 11.1.4c, 12.1.2 and 12.1.3 which include mangroves and salt marsh species and melaleuca (paper bark). These were confirmed to be present adjacent to the WBE reclamation areas during field surveys, but outside of the impact footprint.

Seagrass

As discussed in my evaluation of the project's potential impact on marine plants in chapter 5.4, seagrass has been well studied in the Gladstone region and annual monitoring has been ongoing since 2002.

This includes the areas of seagrass within and surrounding the proposed reclamation area. The seagrass beds in this area are considered to provide foraging habitat for a range of threatened and migratory fauna species including marine turtles, dugongs and inshore dolphins and also a nursery ground for commercial, Indigenous and recreational fishery species (i.e. fish, prawns and crabs).

The EIS identifies that seagrass is present or has been historically present within the Western Basin zone area. There are six long-term monitoring meadows in the Western Basin zone (Meadows 4, 5, 6,7,8 and 52-57 in Figure 6.5).

Long-term surveys indicate that the extent and density of seagrass in this zone varies from year to year and over the different seasons.

Surveys in 2018 indicate that the seagrass meadows in this area are made up of aggregated patches of light *Halophila ovalis* and a mix of other species, including *Zostera muelleri* and *Halophila decipiens* covering an area of 943 ± 73 ha. The largest of these meadows occurs to the south of the proposed WBE reclamation areas and the existing Fisherman's Landing (shown as meadow 6 in Figure 6.5), covering an area of 375 ha during 2018 surveys.

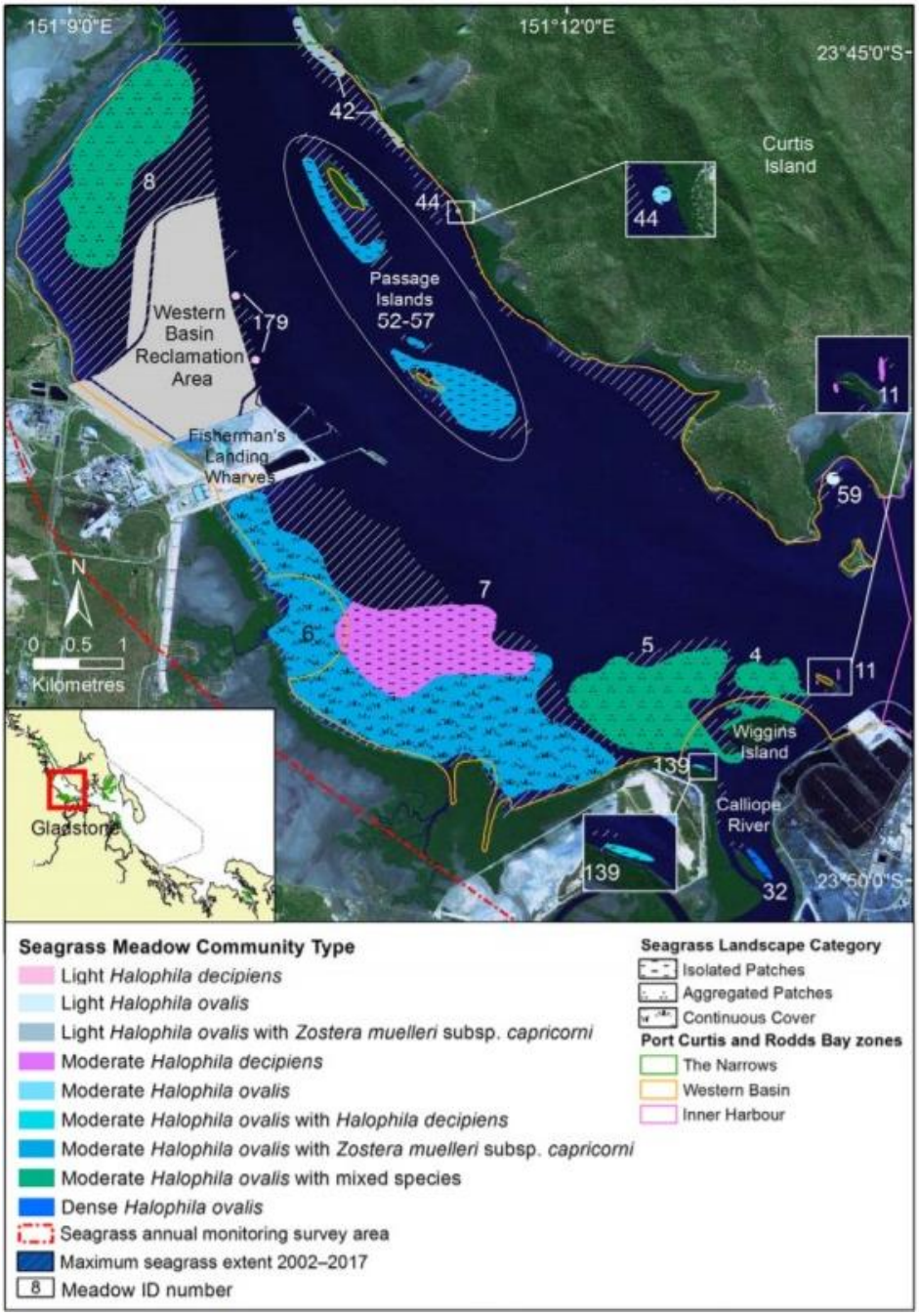


Figure 6.5 Seagrass distribution and community types in the Western Basin zone during 2018 surveys[14]

[14] Chartrand K., Wells J., Carter A., and Rasheed M. 2019. Seagrasses in Port Curtis and Rodds Bay 2018: Annual long-term monitoring. Centre for Tropical Water & Aquatic Ecosystem Research (TropWATER) Publication 19/02, James Cook University, Cairns, accessed 6 May 2020 https://37a60919-af70-449e-a074-269d8ed5cd0e.filesusr.com/ugd/d380da_7d90c342a040449ebddaf59611e809c3.pdf

Macroalgae

The EIS indicates that there is no macroalgae mapped as being present in the proposed WBE reclamation areas and BUF footprints.

Impacts and mitigation – construction/establishment

Direct removal of marine plants

In this section the 'direct removal of/loss of' means an activity that will involve irreversible loss of marine plants, where irreversible means 'lacking a capacity to return or recover to a state resembling that prior to being impacted within a timeframe of five years or less'.

Intertidal plants (mangroves, samphire and saltmarsh) and macroalgae

The EIS indicates that the construction of the reclamation area is not expected to have direct impact on any mangroves, samphire, saltmarsh or macroalgae.

Seagrass

Submitters on the draft EIS raised concern regarding the estimated impact figures provided for seagrass. The impact figures were based on the area of seagrass habitat recorded in the Port during 2017 surveys, which is not considered to be appropriate given that the distribution and extent of seagrass as highly variable.

In response to the submissions, the proponent revised the estimated impact figures based on the historical distribution of seagrass (i.e. between 2002 and 2018). Based on the revised estimates the construction of the WBE reclamation areas is expected to permanently remove a total area of 275.23 ha of seagrass comprising:

- 110.48 ha associated with construction of the southern WBE reclamation area
- 164.75 ha associated with the construction of the northern WBE reclamation area.

To ensure these permanent impacts are minimised, I have stated conditions to be attached to the EA and the preliminary approval for any development permit for removal, destruction or damage of a marine plan which require that dredging is only permitted within the area proposed in the EIS.

Due to the transient nature of seagrass meadows in the Port, I consider that the total impact area on marine plants may be different at commencement of construction. Detailed design still needs to be undertaken for the reclamation area and the proponent has committed to resurvey seagrass in this area to determine the impact at the time of construction.

Indirect impacts – changes to water quality and hydrodynamics

In this section 'indirect impacts' refer to the effects of:

- increased turbidity levels and sediment deposition associated with tailwater discharges from the reclamation area during material placement which exceed the natural tolerance levels of seagrass
- changes to hydrodynamic conditions associated with the construction of the reclamation structure including changes to tidal flow velocities and rates of siltation which make conditions unsuitable for seagrass growth

These indirect effects may restrict or inhibit key ecological processes of seagrass and may be either irreversible or reversible.

Potential impacts – changes to water quality

As discussed in the evaluation of the water quality impacts in chapter 6.3 of this report, dredge material placed within the reclamation area would be managed for dewatering purposes with excess water being discharged to the receiving environment adjacent to the reclamation areas. Based on water quality modelling for the EIS, tailwater discharges are not expected to have an adverse impact on sensitive receptors including marine plants, provided that tailwater is discharged in a controlled manner.

The EIS indicates that water quality monitoring would be undertaken continuously during construction of the reclamation areas to ensure that tailwater discharges do not have an adverse impact on marine plants. If monitoring identifies that water quality of the receiving environment is being adversely affected, the proponent has committed to undertake adaptive measures (i.e. ceasing tailwater discharge until limits can be met) in accordance with the Environmental Monitoring Procedure to prevent adverse impacts on sensitive receptors.

During the public notification of the draft EIS a submitter raised concern regarding the proposed water quality program for the project, noting that additional BPAR monitoring sites should be located at the inshore seagrass meadows near the WBE reclamation areas to detect any impacts to these areas of seagrass.

In response to the submission during the finalisation of the draft EIS, the proponent added an additional BPAR monitoring site to the monitoring program (i.e. site C3) which would measure turbidity near the existing WB reclamation area.

This would be used for identification of potential project water quality impacts during the construction of the BUF and WBE reclamation areas and this site will also be used to measure the potential water quality impacts of the tailwater discharges from the reclamation area.

As this site currently does not have the appropriate level of historical water quality data the proponent has proposed in the Environmental Monitoring Procedure to undertake six months of additional sampling for monitoring site C3. I consider this approach to be acceptable.

To ensure the reclamation works do not have an adverse impact on water quality in the Port, I have stated conditions to be attached to the project EA requiring that tailwater discharges from the reclamation area are only undertaken via licensed discharge points and when the tailwater is meeting the discharge water limits prescribed in the project's EA.

I have also stated conditions for inclusion in the EA requiring that construction of the reclamation area and BUF is carried out in accordance within the measures in the project and dredging EMPs and the Environmental Monitoring Procedure.

Potential impacts – changes to hydrodynamics

The construction of the WBE reclamation areas and BUF would be expected to result in change to water velocities which has the potential to result in erosion and siltation of the foreshore and intertidal environments. Based on modelling, these works are expected to result in:

- a reduction in current speeds (of approximately -0.1 to -0.6 m/s) immediately adjacent to the BUF and along the eastern face of the northern WBE reclamation area
- an increase in current speeds for both the northern and southern WBE reclamation areas on the western sides (of approximately 0.1 to 1 m/s)
- an increase in siltation rates to the east of the WBE reclamation areas, including part of the dredged barge access channel in the vicinity of Fisherman's Landing. It is expected that the volume of maintenance dredging in the Fisherman Landing area would increase by up to 11 per cent.

- some erosion within the channels surrounding the new reclamation areas. This erosion would be expected to continue until the channel reaches a new equilibrium depth.

Following construction, the channel between the northern and southern WBE reclamation area could deepen by up to 2 m; and the channel between the northern section and the mainland could deepen by up to 1 m.

Seagrass

Based on modelling and mapping of historical data on marine plants, the EIS indicates that the construction of the WBE reclamation areas has the potential to have an indirect impact on 99.41 ha of seagrass.

The indirect impact area is based on the area which may experience erosion and sedimentation impacts due to changes in tidal velocities in this area. These changes could result in the permanent loss of seagrass by making conditions unsuitable for growth.

The locations of the direct and indirect impact areas are shown in Figure 6.6.

The EIS states that the effects of the reclamation areas on hydrodynamics in the area would be reassessed during detailed design of the reclamation area and further investigations would be undertaken to determine any design measures that could minimise the potential for erosion. This may also assist in reducing potential impacts on seagrass.

Monitoring undertaken after construction will determine whether the loss of any seagrass within the predicted indirect area is permanent.

Intertidal plants (mangroves, samphire and saltmarsh)

The EIS concludes that changes to hydrodynamics associated with the construction of the WBE reclamation areas are not expected to have an adverse impact on the intertidal marine plants along the adjacent shoreline.

The proponent has committed to investigate design measures that can reduce the potential for erosion of the adjacent channels. In addition, the proponent has committed to undertake a monitoring program to assist identifying and managing any impacts in the channel and along the shoreline adjacent to the WBE reclamation areas. This would include monitoring for potential changes to landforms, including coastal and dune vegetation, wetlands groundwater regimes, intertidal areas including mangroves and saltmarsh communities, migratory shorebird habitat and habitat for other environmental values (MSES and MNES).

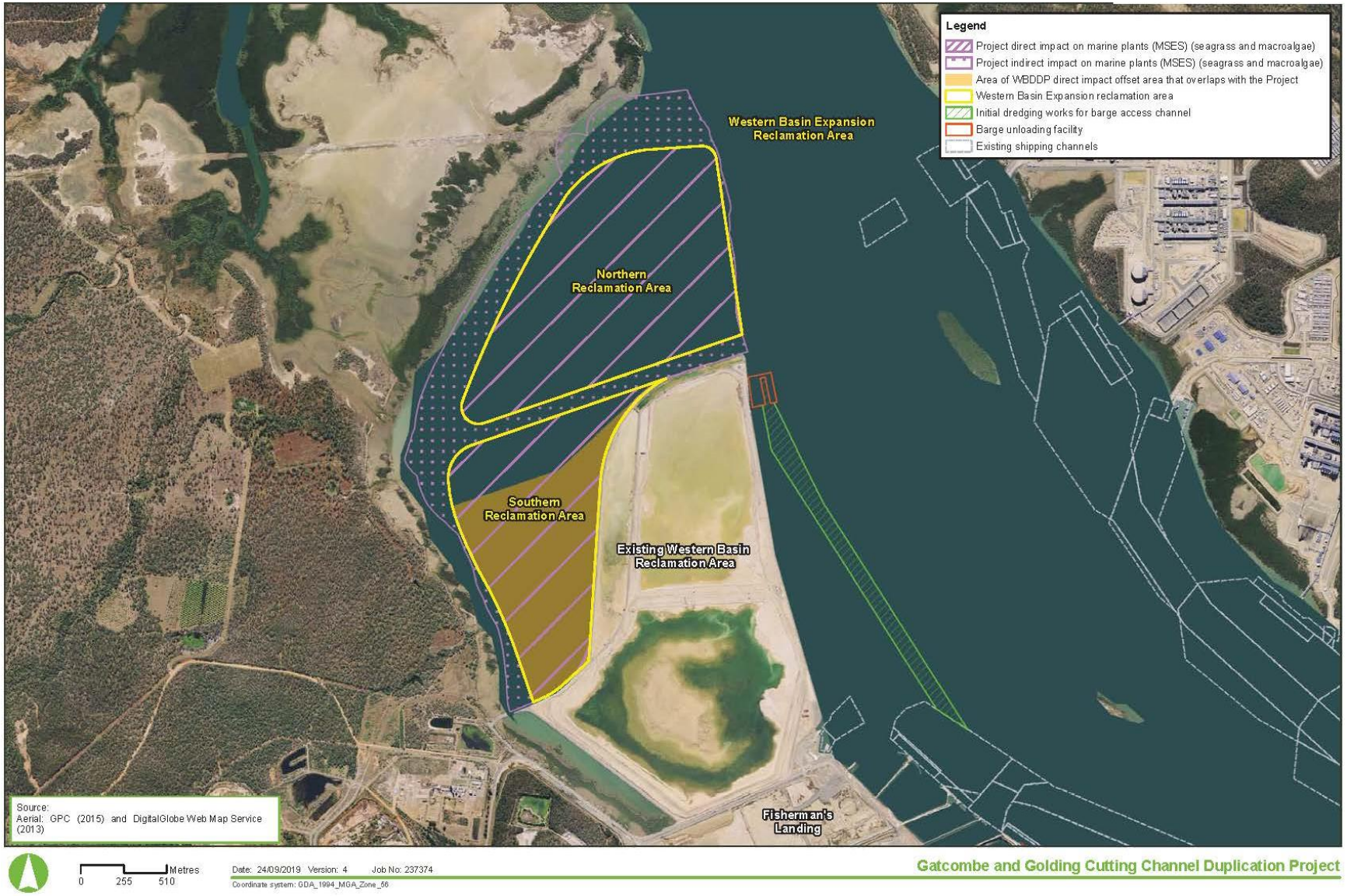


Figure 6.6 Location of expected direct and indirect impacts on seagrass within the Western Basin area

Impacts, avoidance and mitigation – operation

As discussed, in the water quality chapter (chapter 6.3) of this report, the WBE reclamation areas, once completed, would be used for port-related industrial activities, which have the potential for water quality impacts within the Port.

Potential sources of water quality contaminants during the operation of the reclamation area include stormwater runoff, hydrocarbon spills and waste handling. I consider the measures in the EMPs would appropriately mitigate these potential impacts. I also note that proponent has committed to ensuring the all wastewater collected during operations on the reclamation area is be adequately contained and treated before being discharged into the receiving waters.

The EIS also indicates that the stormwater management system for the reclamation area would be designed to locate discharge points away from sensitive ecological receptors, such as seagrass meadows. I agree that this approach is acceptable and therefore consider that operation of the WBE reclamation areas is unlikely to have an adverse on impact marine plants provided that the proponent adheres to the measures outlined in the EMPs, and proponent commitments.

Significant residual impacts and offsets

Direct impacts

Based on the figures provided in the EIS, the construction of the WBE reclamation areas is expected to result in a permanent loss of 275.23 ha of marine plants. This includes the loss of marine plants from the southern WBE reclamation area (110.48 ha) and northern WBE reclamation area (164.75 ha).

As per the State SRI guidelines a permanent loss of an area of marine plants greater than 50m^2 is an SRI. The permanent loss of 275.23 ha of seagrass from the proposed reclamation area is therefore considered to be an SRI requiring an offset to compensate for the loss.

Due to the transient nature of seagrass meadows in the Port I have taken a precautionary approach and have stated a condition to be attached to the preliminary approval which includes the entire marine footprint of works as the final SRI for marine plants.

I note that this number may be revised following additional survey work prior to lodging a development application for the removal, destruction or damage of marine plants. This would inform the project's final SRI and offset obligations.

Indirect impacts

Based on the figures provided in the EIS the construction of the WBE reclamation areas could have an indirect impact on 99.41 ha of seagrass as result of permanent changes to hydrodynamic conditions (i.e. altered depths and tidal velocities affecting suitability of the seabed to support seagrass growth) associated with the construction of the WBE reclamation areas.

As per the State SRI guidelines a permanent loss of an area of marine plants greater than 50 m^2 is an SRI.

Due to the transient nature of seagrass meadows in the Port I have taken a precautionary approach and have stated a condition to be attached to the preliminary approval which includes the entire marine footprint of works as the final SRI for marine plants. I note that this number may be revised following additional survey work prior to lodging a development application for the removal, destruction or damage of marine plants and/or surveys undertaken post construction.

I note that the proponent has committed to undertake baseline surveys prior to the commencement of construction to confirm the area of marine plants likely to be impacted at the time of construction.

I agree that this approach is acceptable and have also stated conditions to be attached to the preliminary approval (marine plant permit) requiring the proponent to undertake additional seagrass surveys in the Port prior to dredging to determine the actual area of seagrass that would be impacted by the project.

With regard to indirect impacts, seagrass within the predicted indirect impact areas would be monitored following construction to determine if the predicted impacts persist following construction.

Additionally, I have stated a condition requiring the implementation of a monitoring and inspection program for the purposes of ongoing monitoring of the recovery of marine plants temporarily disturbed as a result of the project.

The program would involve monitoring the health and extent of marine plants prior to disturbance, and after construction to confirm whether marine plants have returned to the pre-disturbance condition within five years after construction has ceased.

Where the monitoring and inspection program indicates the marine plants in the impacted area have not returned to pre-disturbance condition within five years after dredging has ceased, the impact would be considered to be an SRI requiring an offset. The results of the monitoring would inform the project's final SRI and offset obligation.

Offsets

The EIS concluded the construction of the WBE reclamation areas is likely to result a total permanent loss of 364.64 ha of seagrass from the Western Basin area. This includes a direct loss of 275.23 ha and indirect impact on 99.41 ha of seagrass associated with changes to water quality and hydrodynamics.

As part of the draft offsets strategy that was provided in the EIS documentation, the proponent has proposed a range of offset options which would be considered to compensate for the project's SRI on marine plants. This includes:

- reviewing and investigating the recommendations of the Port studies on resilience of seagrass and determine if there are any actions that can be implemented as direct offsets
- compensatory measures including investigating the need for research into:
  - seagrass meadow creation/expansion (such as intertidal and coastal seagrass), and if natural dispersal can propagate
  - seagrass habitat creation through using maintenance dredged material to create viable seagrass meadows
  - the possibilities of keeping viable seedbanks and using these seedbanks if/when flood events occur and determine if the seed would take and grow
  - confirm the type, frequency and nature of fauna species utilising the seagrass meadows in and adjoining the proposed WBE reclamation areas
- providing a financial contribution to the appropriate parties for research of programs to improve seagrass resilience and result in knowledge which can be applied to seagrass management and contribute to achieving a conservation gain for the impacted matter
- providing a financial contribution to the Queensland Government Offset Fund Management and Delivery Unit.

I note that the proponent would undertake further investigations to assist in finalising the offset strategy to determine the most suitable options to address the project's SRI on marine plants.

As discussed in the previous section, the proponent's final SRI and offset obligation may be different to what was concluded in the EIS and will be subject to further surveys prior to construction and monitoring during and post construction.

I note that the proponent proposes to use some of the offsets that were provided for the WBDDP as advanced offsets to provide part of the offset obligation associated with construction of the southern WBE reclamation areas.

I consider that the proponent would need to register and have any advanced offsets approved prior to lodging any development application to remove, destroy or damage protected marine plants.

As marine plants are also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

Coordinator-General's conclusions: marine plants

I am satisfied that EIS has adequately assessed potential impacts that the construction of the WBE reclamation areas and BUF would have on marine plants.

Based on the information presented in the EIS these works could result in a permanent loss of 364.64 ha of marine plants including:

- a direct impact on 275.23 ha of seagrass associated with the construction of the bund walls and placement of the dredge material
- an indirect impact on 99.41 ha of seagrass associated with changes to hydrodynamics which would affect the suitability of the seabed to support seagrass growth.

As per the State SRI guidelines a permanent loss of an area of marine plants greater than 50 m^2 is an SRI. Due to the transient nature of seagrass meadows in the Port I have taken a precautionary approach and have stated a condition to be attached to the preliminary approval which includes the entire marine footprint of works as the final SRI for marine plants. I note that this number may be revised following additional survey work prior to lodging a development application for the removal, destruction or damage of marine plants and/or surveys undertaken post construction.

I note that the proponent has committed to undertake baseline surveys prior to commencement of construction to confirm the area of marine plants likely to be impacted at the time of construction. The predicted indirect impact areas would also be monitored following construction to determine if the predicted impacts persist following construction.

I have agreed that this approach is acceptable and have also stated conditions to be attached to the preliminary approval (marine plant permit) requiring the proponent to undertake additional seagrass surveys in the Port prior to dredging to determine the actual area of seagrass that would be impacted by the project.

Additionally, I have stated a condition requiring the implementation of a monitoring and inspection program for the purposes of ongoing monitoring of the recovery of marine plants temporarily disturbed as a result of the project.

The program would involve monitoring the health and extent of marine plants prior to disturbance, and after, construction to confirm whether marine plants have returned to the pre-disturbance condition within five years after construction has ceased.

Where the monitoring and inspection program indicates the marine plants in the impacted area have not returned to pre-disturbance condition within five years after dredging has ceased, the impact would be considered to be an SRI requiring an offset.

The results of the monitoring would inform the project's final SRI and offset obligation.

The draft offset strategy provided in the EIS includes a range of options which would be considered to compensate for the project's SRI on marine plants.

I note that the proponent would undertake further investigations to assist in finalising the offset strategy to determine the most suitable options to address the project's SRI on marine plants.

As marine plants are also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

6.5.4 Wetlands

Issues raised in submissions

Key issues raised in the submissions on the EIS regarding impacts to wetlands include:

- indirect impacts on HES wetlands resulting from the construction of the WBE reclamation areas
- request for a program to monitor potential changes to coastal processes due to the construction of the WBE reclamation areas, including potential changes to coastal and dune vegetation, intertidal areas, including feeding areas for migratory birds, wetlands and groundwater regimes.

I have considered each submission and the responses provided by the proponent in my evaluation of the project, and my responses are provided in the relevant sections below.

Presence and distribution in the project area

Wetland mapping indicates that there are HES wetlands mapped within the footprint of the southern section of the proposed WBE reclamation. There are also areas mapped as HES wetlands along the shoreline between the WBE and the landward side of the Port. The location of these HES wetlands are shown in Figure 6.7.The EIS indicates that there is approximately 190.49 ha of HES wetlands mapped within a 500 m radius of the WBE area and BUF. These wetlands provided habitat and foraging areas for turtles, dugongs and migratory shorebirds.

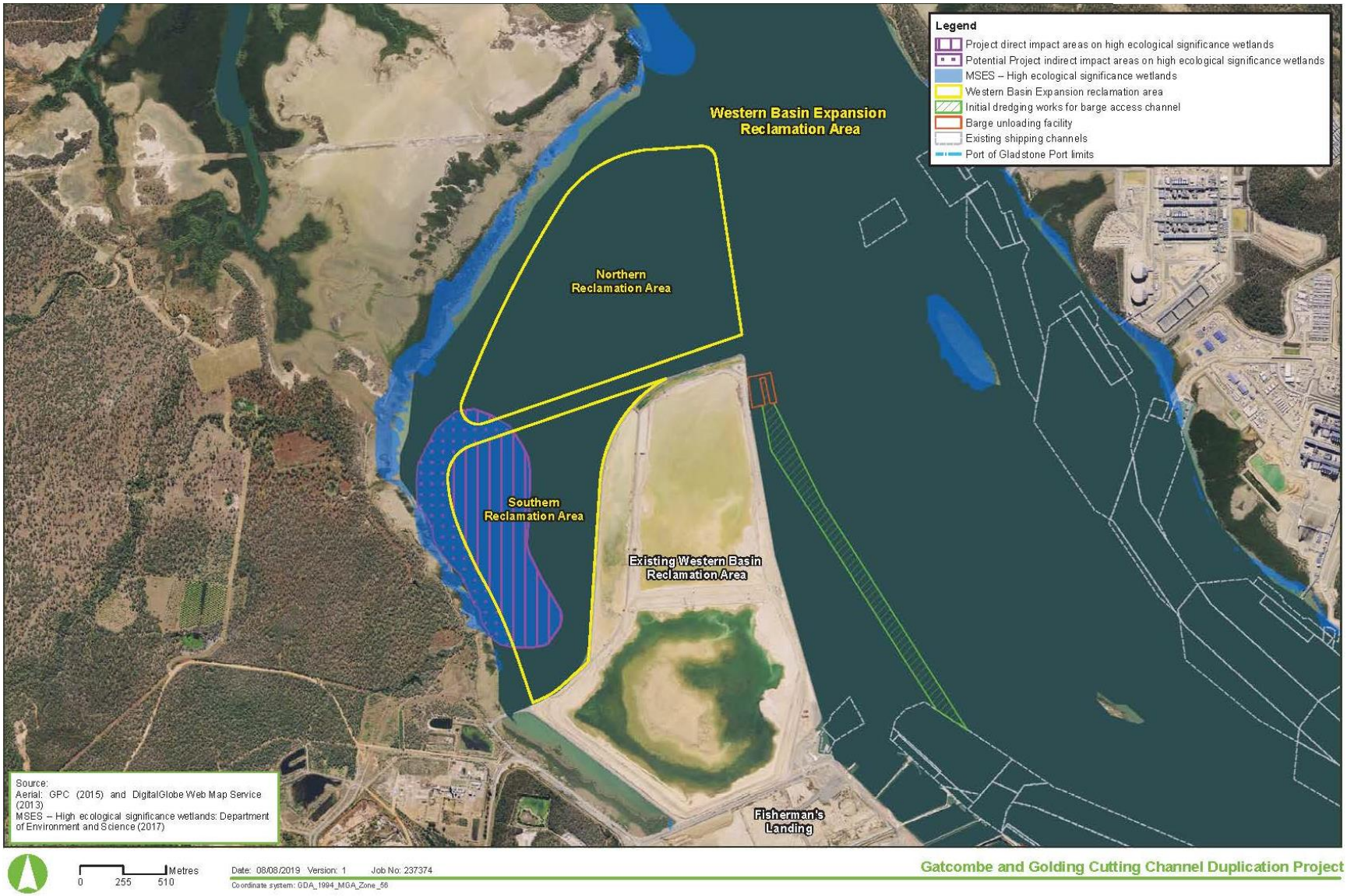


Figure 6.7 Location of HES wetlands in context to the proposed WBE reclamation areas and BUF

Impacts and mitigation

The EIS indicated that the construction of the WBE reclamation areas would have a direct impact on 48.63 ha (47.47 ha southern area; and 1.16 ha northern area) of HES wetlands. The direct removal and disturbance of HES wetlands would have an impact on foraging habitat for migratory and resident shorebird species, dugongs and green turtle, and nursery habitat for commercially important fish and crustaceans.

The EIS also indicates that the construction of the WBE reclamation areas has the potential to indirectly impact on 24.98 ha of mapped HES wetlands in the areas adjacent as result of changes to hydrodynamics and water quality.

The construction and operation of the WBE would result in increased dust, noise, lighting and visual disturbances to fauna which use the wetlands surrounding the project area, and also increase the potential for the introduction and spread of pests and weeds.

To ensure these potential indirect impacts are adequately managed, the proponent has proposed a range of mitigation measures to be included in the dredging and project EMP and associated management plans. Such measures include:

- conducting pre-construction baseline mangrove community surveys within the project indirect impact area. Surveys would be conducted in accordance with the EPP (Water) Monitoring and Sampling Manual[15] which provides guidance on monitoring mangrove forest health for biological assessments
- monitoring the condition of mangrove habitats within areas that have the potential to be impacted by the project every six months. This will be undertaken for the duration of the project activities, and for a two-year period following the completion of construction
- validating the hydrodynamic model for the reclamation area following completion of construction to determine actual sedimentation and erosion impacts and revising proposed management measures if required, to reduce the potential for impacts on water quality and sensitive environmental receptors
- implementation of a weed and pest management plan, which would include measures that would reduce the potential for the introduction and spread of pests into surrounding areas of wetland habitat.

Potential impacts – changes to hydrodynamics

As discussed for marine plants, the construction of the WBE reclamation areas and BUF is expected to have a localised impact on water velocities in the surrounding area. Such changes may result in erosion and siltation of the foreshore and intertidal environments including the areas mapped as HES wetlands.

While modelling indicates that there is expected to be a reduction in tidal velocities to the north of the WBE reclamation areas, tidal flows to intertidal areas will be maintained and no changes to water levels (i.e. inundation of coastal habitats and wetlands) are expected.

The proposed WBE reclamation areas would include a channel approximately 100 m in width between the northern and southern parts of the reclamation areas that would be designed to allow for adequate tidal flushing.

Modelling indicates that there is potential for some erosion to occur within the channels surrounding the new reclamation areas. This erosion would be expected to continue until the channel reaches a new equilibrium depth. Following construction of the reclamation area, the channel between the northern and

[15] Environment Protection (Water) Policy 2009, Monitoring and Sampling Manual, Department of Environment and Science, February 2018, accessed 10 January 2019, https://environment.des.qld.gov.au/__data/assets/pdf_file/0031/89914/monitoring-sampling-manual-2018.pdf

southern WBE reclamation area is predicted to deepen by up to 2 m; and the channel between the northern section and the mainland could deepen by up to 1 m.

The proponent has committed to remodel predicted changes to hydrodynamics during detailed design to optimise the design of the reclamation area to minimise potential erosion within the channels between the reclamation area and the mainland, and between the northern and southern WBE reclamation areas.

A submission on the draft EIS requested that a program be developed to monitor potential changes to coastal processes due to the construction of the WBE reclamation areas, including potential changes to coastal and dune vegetation, intertidal areas, including feeding areas for migratory birds, wetlands and groundwater regimes. In response to the submission the proponent committed to undertake a monitoring program to assist identifying and managing any impacts in the channel and along the shoreline adjacent to the WBE reclamation areas.

Potential impacts – change to water quality

Construction

As discussed in chapter 6.3, sediment from the areas to be dredged is expected to be 'clean' as per the NAGD and therefore is chemically suitable for placement within the WB and WBE reclamation areas. The EIS also indicates that only 'clean' materials would be used for establishing other components of the reclamation area (i.e. bund wall and capping materials) and would not be expected to contain high levels of nutrients. As these materials are expected to be clean, I am satisfied the nearby wetlands are unlikely to be impacted by any elevated nutrients or contaminants.

I note that the proponent has also committed to implement a site-specific ASSMP which would include best practice measures for managing PASS/ASS. Furthermore, I have stated conditions to be attached to the EA requiring that an ASSMP must be prepared for all PASS that may be directly or indirectly disturbed and that the ASSMP/s are submitted to the administering authority (DES) prior to commencing dredging works.

In addition, I have also stated conditions to be attached to the project EA requiring that tailwater discharges from the reclamation area are only undertaken via licensed discharge points and when discharge water quality limits prescribed in the project's EA are being met. This would include water quality limits for nutrients (i.e. nitrogen and phosphorus) and suspended sediments.

I am satisfied that these measures would reduce the potential for the HES wetlands along the adjacent shoreline to be impacted by any elevated nutrients or contaminants.

Operation

During the operation of the reclamation area, the proponent has also committed to implement best practice stormwater management practices and design elements to ensure runoff is adequately managed to protect the water quality of the receiving environment. All stormwater control measures would be designed to comply with Best Practice Erosion and Sediment Control Building and Construction Sites (International Erosion Control Association Australasia).

I am satisfied that these measures would assist in reducing potential water quality impacts on adjacent HES wetlands.

Significant residual impacts and offsets

Significant residual impact

The construction of the WBE reclamation areas is expected to impact on 73.61 ha of HES wetlands, including:

- the direct loss of 48.63 ha from the reclamation footprint
- indirect impact on 24.98 ha of surrounding wetlands associated with changes to hydrodynamics and water quality that are associated with the construction of the WBE reclamation areas.

Based on the State SRI guidelines, I consider that the removal/alteration of 73.61 ha HES wetlands from the proposed reclamation is an SRI. The proposed works would result in areas of the wetland being destroyed and artificially modified, which would be expected to have an adverse impact on the habitat or lifecycle of native invertebrate fauna and fish species, dependent upon the wetland. The area proposed to be removed/disturbed provides important habitat for commercial, Indigenous and recreational fishery species, in addition to foraging habitat for threatened shorebirds and marine megafauna (i.e. dugongs, turtles and dolphins).

Offsets

As part of the draft offsets strategy that was provided in the EIS documentation, the proponent has proposed a range of offset options which would be considered to compensate for the project's SRI on HES wetlands. This includes:

- during the design of bund wall between the northern and southern WBE reclamation areas, investigating the opportunity to include intertidal mangroves (e.g. working with nature) which will improve fish foraging habitat and wetland values
- providing a financial contribution to the appropriate parties for research of programs to improve wetlands
- provide a financial contribution to the Queensland Government Offset Fund Management and Delivery Unit.

The draft offsets strategy also proposes range of investigations to offset water quality impacts which would also have a benefit to MSES wetlands in the Gladstone region including:

- options to reduce upstream sediment sources (e.g. gully erosion) that results in sediment contributions into the GBRWHA during rainfall events
- opportunities to develop marine coastal corridors
- opportunities to enhance the overall value and long-term protection of Boat Creek or Grahams Creek due to the ecological values and potential water quality improvements
- opportunities to contribute into land management plans as part of the priority Port of Gladstone Master Plan (i.e. inshore islands, Curtis Island, Facing Island).

Coordinator-General's conclusions: wetlands

I am satisfied that the EIS has adequately assessed potential impacts that the construction of the WBE reclamation areas and BUF would have on HES wetlands.

I acknowledge the proponent's commitment to remodel predicted changes to hydrodynamics during detailed design to optimise the design of the reclamation area to minimise potential erosion within the channels between the reclamation area and the mainland, and between the northern and southern WBE reclamation areas. I also acknowledge the proponent's commitment to monitor and address any identified impacts to landforms, including coastal and dune vegetation, wetlands, groundwater regimes and intertidal areas. I expect that these measures would assist in mitigating potential impact on HES wetlands.

I am satisfied that the project and dredging EMPs include appropriate mitigation measures to manage impacts on HES wetlands associated with the construction of the WBE reclamation areas. I also

consider the mitigation measures proposed to manage water quality impacts on seagrass would also be applicable to managing potential indirect impacts on HES wetlands. I am also satisfied that the stated conditions to be attached to the EA for managing water quality during the construction of the reclamation area would also ensure potential impacts on HES wetlands are adequately managed.

Based on the information presented in the EIS the project is expected to have an SRI of 73.61 ha of HES wetlands associated with the direct loss of 48.63 ha HES wetlands from the WBE reclamation areas and indirect impacts on surrounding wetlands (24.98 ha) associated with changes to hydrodynamics and water quality associated with the construction of the WBE reclamation areas.

Based on the SRI criteria in the State SRI guidelines I consider that removal/alteration of 73.61 ha HES wetlands from the proposed reclamation is an SRI. The proposed works would result in areas of the wetland being destroyed and artificially modified, which would be expected to have an adverse impact on the habitat or lifecycle of native invertebrate fauna and fish species, dependent upon the wetland being seriously affected. The area proposed to be removed/disturbed provides important habitat for commercial, indigenous and recreational fishery species, in addition to foraging habitat for threatened shorebirds and marine megafauna (i.e. dugongs, turtles and dolphins).

As part of the draft offsets strategy that was provided in the EIS documentation, the proponent has proposed a range of offset options which would be considered to compensate for the project's SRI on HES wetlands. I note that at this stage these options are only under consideration and that I require the proponent to undertake further investigations to assist in finalising the offset strategy to determine the most suitable options to address the project's SRI on HES wetlands.

6.5.5 Protected wildlife habitat

Issues raised in submissions

Key issues raised in the submissions on the EIS regarding impacts to protected wildlife habitat include:

- the need for further information in the draft offset strategy to demonstrate that an offset is appropriate or able to be delivered for those MSES for which an SRI is predicted
- any loss of foraging habitat or mortalities as a result of the project on the loggerhead, hawksbill, flatback, and olive ridley turtles should not be considered as insignificant.

I have considered each submission and the responses provided by the proponent in my evaluation of the project in the sections below.

Terrestrial mammals

Water mouse

The water mouse (*Xeromys myoides*) is listed as vulnerable under the NC and EPBC Acts and has the potentially to occur within the coastal mangrove and saltmarsh communities adjacent to the proposed reclamation area. Water mouse habitat includes mangrove communities and adjacent saline grasslands. Mangrove habitats are particularly important for the water mouse as they provide a variety of micro-habitats such as tidal pools, crab holes and crevices in bark and around roots.

The EIS indicates that the project is unlikely to have any direct impact on water mouse habitat as no mangroves or saltmarsh would be removed as a result of constructing the WBE reclamation areas or BUF. However, changes to water quality and increased erosion and sedimentation of the shoreline may indirectly impact on water mouse by impacting on the availability of prey resources (i.e. crabs and molluscs).

As discussed for marine plants the EIS concludes that changes to hydrodynamics associated with the construction of the WBE reclamation areas are not expected to have an adverse impact on the intertidal marine plants along the adjacent shoreline. The proponent has committed to investigate design measures that can reduce the potential for erosion and to monitor areas of vegetation along the coastline during and post construction of the reclamation area to identify potential adverse impacts. Adaptive management strategies would be undertaken where monitoring identifies any adverse effects on these vegetation communities and associated potential water mouse habitat.

The dredging and project EMPs include mitigation measures to minimise the potential disturbances from noise, dust and lighting; and water quality impacts associated with construction activities and tailwater discharge.

Based on the information presented in the EIS, I am satisfied that the proponent has adequately identified the project's potential impact on the water mouse and that the measures provided in the dredging and project EMPs would be appropriate to ensure that the project does not have an adverse impact on this species. I am also satisfied that the stated conditions to be attached to the EA for managing water quality during the construction of the reclamation area would also ensure potential impacts on water mouse habitat are adequately managed.

Shorebirds

Presence and distribution in the project area

The Port and surrounding region contains a diverse range of marine environments which provide foraging and roosting habitat for a number of the shorebird species. Many of these species are also migratory and visit the area seasonally.

Based on desktop review, nine species of shorebird which are MSES are known or have the high potential to forage within the intertidal areas where the WBE reclamation areas are proposed. These are identified in Table 6.2. All of these species are also listed as migratory and/or threatened under the EPBC Act, with the exception of the beach stone curlew (*Esacus neglectus*). All of these species are also recognised as an attribute which contributes to the OUV of the GBRWHA.

Table 6.2 Shorebirds known or likely to occur within the project impact areas which are MSES

Common name ***Species***	**NC Act listing**	**EPBC Act listing**
Beach stone curlew *Esacus neglectus* (also known as *E.* magnirostris)	Vulnerable	Not listed
Curlew sandpiper *Calidris ferruginea*	Endangered	Critically endangered Migratory
Eastern curlew *Numenius madagascariensis*	Endangered	Critically endangered Migratory
Great knot *Calidris tenuirostris*	Endangered	Critically endangered Migratory
Greater sand plover *Charadrius leschenaultia*	Vulnerable	Vulnerable Migratory
Northern Siberian bar-tailed godwit *Limosa lapponica menzbieri*	Endangered	Critically endangered Migratory
Lesser sand plover	Endangered	Endangered

Common name *Species*	NC Act listing	EPBC Act listing
Charadrius mongolus		Migratory
Red knot *Calidris canutus*	Endangered	Endangered Migratory
Western Alaskan bar-tailed godwit *Limosa lapponica bauera*	Vulnerable	Vulnerable Migratory

Impacts and mitigation

As the port is known to support non-breeding habitat for wide range of migratory shorebirds the construction of the WBE reclamation areas would include activities that are likely to impact on these species, including the loss of foraging habit associated with the direct loss of mudflats within the reclamation area footprint and changes to water quality and hydrodynamics, and increased disturbances from noise and vibration, dust, and lighting. The combination and interaction of these elements is also likely to compound impacts on migratory birds.

Impacts on foraging habitat

Studies undertaken indicate that migratory birds in the Gladstone region appear to return to the same foraging and roosting sites each year and remain at these sites throughout the summer period. Their fidelity to these sites makes them more vulnerable and local population survival rates may be impacted when specific areas of habitat are permanently lost or altered.

These studies also indicate that there is a low density of food available in the Gladstone region and therefore foraging sites are vulnerable to further loss or reduction in quality.

Based on information provided in the EIS the construction of the WBE reclamation areas would result in the direct removal of 275.37 ha (110.39 ha (southern), 164.98 ha (northern)) of potential foraging habitat for the shorebirds species listed in Table 6.2.

The construction of the WBE reclamation areas is also expected to result in increased water velocities in the channel between the reclamation area and the coastline area, which is predicted to increase for erosion and siltation in this area, and subsequently result in a decreased abundance or altered distribution of foraging resources for migratory shorebirds. Water quality in this area is also likely to be impacted during construction of the reclamation area due to increased turbidity associated with direct disturbances to the seabed and tailwater discharges. This may also have a short-term impact on the availability of prey resources for migratory shorebirds in this area.

Impacts on roosting habitat

The closest known roost site of international significance, Yellow Patch estuary on Curtis Island, is approximately 29 km north of the reclamation area. No impacts on the Yellow Patch estuary roost site are predicted as a result of this project.

The EIS indicates that there is a locally important roost site for the eastern curlew 400 m north of the WBE reclamation areas at Friend Point on Kangaroo Island. The EIS acknowledges that this site may constitute critical migratory shorebird habitat for a number of species.

While the project is not expected to have a direct impact on the roost site at Friend Point, the loss of foraging habitat from the proposed WBE reclamation may have impact on roosting behaviour of migratory shorebirds that currently roost at this site. It is noted that migratory shorebirds prefer foraging sites that are located close to roost sites. This means the loss of forage habitat may result in migratory birds relocating to another roost site or having to travel greater distances to find food. This displacement

likely to place stress on birds and result increased energy expenditure looking for food which may potentially impede migratory patterns and foraging behaviours and increase the risk of mortality. The EIS has estimated a potential indirect impact of approximately 203.93 ha associated with the loss of foraging habitat and increased disturbances associated with the construction and operation of the WBE reclamation areas.

Following the finalisation of the EIS, DES advised that the full potential indirect area may have not been considered. While the proponent has included roosting habitat within 400 m of the WBE reclamation areas in the potential indirect area, MSES mapping indicates that there is potential for shorebirds to roost beyond this area that may also be impacted. It is considered that birds roosting in these areas are also likely to move away from the area if the nearby foraging habitat within the proposed WBE reclamation areas footprint is removed. This could have an adverse impact on birds if they must move to find an alternative foraging and roosting area.

As I do not have sufficient information to determine the project's full potential indirect impact on shorebirds, I have not confirmed a maximum disturbance limit for shorebirds in my stated conditions for the EA. I require that the information on the maximum impact area is notified and agreed by the administering authority either prior to or with the application for the EA.

Disturbances – noise, vibration and light pollution

The EIS indicates that project activities are likely to increase noise and dust in areas adjacent to shorebird habitat. These disturbances have the potential to cause disturbance to foraging, roosting and migratory behaviours of migratory shorebirds.

Additionally, lighting using during the construction and operation of the reclamation facility is also likely to disturb birds roosting in this area.

To manage disturbances during the construction of the WBE and BUF the EIS indicates that the population of migratory shorebirds using the adjoining Friend Point roost site will be monitored by a suitably qualified person (e.g. fauna spotter catcher, ecologist). Where the activity is being shown to be impacting on these birds (i.e. resulting in frequent alarm or flight responses, or avoidance of the roost site and foraging habitat) works would be ceased and adaptive management measures would be undertaken to avoid or minimise impacts.

The dredging and project EMPs include mitigation measures to minimise the potential to disturb migratory shorebirds including:

- scheduling the construction works in areas closest to the coastline to occur from March to September (i.e. outside of the critical migratory bird visitation periods for the majority of species visiting Port Curtis)
- using directional lighting (where night lighting cannot be avoided) to avoid light spill into adjacent marine, intertidal and terrestrial areas, and appropriate light bulb types which would reduce potential impacts on marine fauna including migratory birds
- ensuring that a fauna spotter catcher is present where works occur adjacent to sensitive habitats (e.g. shorebird habitat). The spotter catcher would have authority to initiate a stop-work order where an active breeding place is identified and will also relocate any birds that would be displaced by the works.

Significant residual impacts and offsets

Direct impacts on foraging habitat

Based on information provided in the EIS the construction of the WBE reclamation areas would result in the direct removal of 275.37 ha of potential foraging habitat for the shorebirds species listed in Table 6.2. As per the State SRI guidelines the disruption to ecologically significant locations including feeding sites to a species which is listed as endangered or vulnerable under the NC Act is considered to be an SRI. The permanent loss of 275.37 ha of potential foraging habitat to construct the WBE reclamation areas is therefore considered to be an SRI requiring an offset to compensate for the loss.

Indirect impact on foraging and roosting habitat

The EIS also indicates that the construction of the WBE reclamation areas is likely to have an indirect impact of approximately 203.93 ha of shorebird habitat associated with increased disturbances associated with the construction and operation of the WBE reclamation areas, and the loss of foraging habitat from the reclamation area. The loss of habitat may result in shorebirds relocating to another roost site or having to travel greater distances to find food. This displacement is likely to place stress on birds and result in increased energy expenditure looking for food which may potentially impede migratory patterns and foraging behaviours and increase the risk of mortality.

As per the State SRI guidelines the disruption to ecologically significant locations including roosting sites to a species which is listed as endangered or vulnerable under the NC Act is considered to be an SRI. Given the area supports roosting habitat for several threatened shorebird species, I consider any indirect impacts on roosting habitat in this area to be an SRI.

As discussed previously, I do not have sufficient information to determine the project's full potential indirect impact on shorebirds. As there is insufficient information, I have not confirmed a maximum disturbance limit for shorebirds in my stated conditions for the EA and I require that the information on the maximum impact area is notified and agreed by the administering authority either prior to or with the application for the EA. I note that these results of this agreement would also inform the project's final SRI and offset obligation for MSES shorebirds.

Offsets

During the consultation on the draft EIS, DES advised that the draft offset strategy provided as part of the EIS was not sufficient and requested that the draft offset strategy is amended to include further detail regarding the potential method of delivery of offsets for each MSES for which an SRI is determined including the SRI on MSES shorebirds. It was advised that the strategy must provide sufficient detail and justification for DES to determine if a proposed offset delivery method is appropriate and feasible.

In response to DES's comments on the draft offset strategy the proponent provided an updated offset strategy as part of the revised draft EIS which included the following strategies for addressing the project's SRI on MSES shorebirds. Potential direct offset options that are being considered by the project include:

- investigating the possibility of creating additional shorebird habitat through using maintenance dredge material (i.e. using pre-dredged material and/or expanding existing mud islands)
- investigating opportunities for providing a direct offset and investigating the feasibility of these areas as suitable habitat
- investigating the opportunity to dedicate an area/s within the WBE reclamation areas as shorebird habitat. Suitability requirements (sediment and water depth) and availability of the space would be determined during detailed design

- investigating the opportunity to design the bund walls between the northern and southern WBE reclamation areas to include intertidal mangroves (e.g. working with nature)
- other compensatory measures include:
  - providing financial contribution to appropriate parties to undertake research programs to improve knowledge of shorebird usage and foraging in the region
  - providing a financial contribution to the Reef Trust and/or Qld Government Offset Fund Management and Delivery Unit.

I would expect the proponent to undertake further in investigations to determine suitable and feasible offsets option/s which addresses the project's SRI on MSES shorebirds and to provide the adequate level of detail on the selected option/s in the final offset strategy.

As the shorebirds are also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

Coordinator-General's conclusions: shorebirds

I am satisfied that EIS has adequately assessed potential impacts that the WBE reclamation areas and BUF would have on shorebirds that are MSES.

I am satisfied that the project EMP and dredging EMP include appropriate mitigation measures to manage disturbances on shorebirds from increased noise and vibration, dust and light pollution, and the introduction or spread of pest animals and weeds. I also consider the mitigation measures proposed to manage water quality impacts on seagrass would also be applicable to managing potential impacts on foraging habitat for shorebirds.

Based on information provided in the EIS, the direct removal of 275.37 ha of potential foraging habitat from the WBE reclamation areas and BUF for the shorebirds species listed in Table 6.2 is considered to be an SRI requiring to be offset.

The construction of the WBE reclamation areas is also likely to have an indirect impact of approximately 203.93 ha of shorebird habitat associated with the loss of foraging habitat adjacent to existing roost sites and increased disturbances associated with the construction and operation of the WBE reclamation areas. As the loss of foraging habitat from this area is likely to result in displacement of birds currently roosting adjacent to the proposed WBE reclamation areas this impact is considered to be an SRI and is required to be offset.

While the proponent has included roosting habitat within 400 m of the WBE reclamation areas in the potential indirect area, I am of the view that the full potential indirect impact may extend beyond the area considered in the EIS. As I do not have sufficient information to determine the project's full potential indirect impact on shorebirds, I have set a precautionary maximum disturbance limit for shorebirds in my stated conditions for the EA.

I note that draft offsets strategy provided as part of the EIS outlines number of options to be further investigated as part of developing the final offset strategy. As there is currently not enough detail to determine the suitability and feasibility of these offsets, I expect the proponent to update the final strategy to include a sufficient level of detail on an SRI for shorebirds.

As the MSES shorebirds are also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

Marine mammals

Presence and distribution in the project area

Inshore dolphins

The EIS identifies two inshore dolphin species which are MSES that have the potential to occur in the project area including the Australian humpback dolphin (*Sousa sahulensis*) and the Australian snubfin dolphin (*Orcaella heinsohni*).

Both species of inshore dolphin are listed as vulnerable under the NC Act and are listed migratory species under the EPBC Act. Both species are also recognised as an attribute which contributes to the OUV of the GBRWHA.

Australian snubfin dolphin

As discussed in chapter 5.4 the Australian snubfin dolphin has been recorded largely in the Port Alma region to the north of Curtis Island. The closest record of this species to the reclamation area is from the northern part of the Narrows. Therefore, this species has a low likelihood of occurring within the proposed reclamation area and BUF.

Australian humpback dolphin

The EIS indicates that the Australian humpback dolphin has been frequently recorded within the Port including the Western Basin area and the Narrows. Studies undertaken by Dr Cagnazzi in 2013[16] indicate that the Port, including the Western Basin area, form part of this species' known core habitat. As discussed in chapter 5.4 this species occurs mostly within 10 km of the coast, occupying shallow and protected coastal habitats including estuaries, tidal rivers, shallow bays, inshore reefs' and only occasionally observed much further from the shore.

Dugongs

Dugongs are known to forage within all seagrass meadows in the Port including the seagrass meadows within the proposed WBE reclamation areas. As discussed in chapter 5.4, the seagrass meadows in the Port including the proposed reclamation area are important foraging habitat for dugongs.

Impacts and mitigation

The project has the potential to impact on inshore dolphins and dugongs through the removal of foraging habitat, increased interactions with marine vessels and dredging equipment and disturbances from underwater noise from piling and vessels.

Potential impacts–direct loss of foraging habitat

Australian humpback dolphin

The construction of the proposed WBE reclamation areas and BUF are expected to result in the direct removal of 278.2 ha of potential foraging habitat for the Australian humpback dolphin which includes seagrass and benthic habitat. Fish which are primary a food source for this species would be expected to use the areas of seagrass and benthic habitat within the impacted areas. These areas would also support benthic invertebrates which are an occasional food source for

[16] Cagnazzi, D 2013, Review of Coastal Dolphins in central Queensland, particularly Port Curtis and Port Alma regions, report produced for the Ecosystem Research and Monitoring Program Advisory Panel as part of Gladstone Ports Corporation's Ecosystem Research and Monitoring Program, 53pp

the fish which the Australian Humpback dolphin feeds on. As this area forms part of this species' core habitat, I consider the loss of foraging habitat from this area could be a significant impact.

Dugongs

As discussed for marine plants, the establishment of the WBE reclamation areas and BUF is expected to permanently remove 275.23 ha of seagrass. Given that all seagrass in the Port is considered to be important foraging habitat for dugongs and this area is known to support dugong foraging I consider the permanent loss of seagrass in this area to be a significant impact.

Potential impacts – changes to hydrodynamics

As discussed for marine plants, the construction of the WBE reclamation areas could have an indirect impact on 99.41 ha of seagrass as a result of erosion and sedimentation due to changes in tidal velocities adjoining the WBE reclamation areas. The construction of the reclamation area would result in permanent changes to hydrodynamic conditions (i.e. altered depths and tidal velocities) and reduce the suitability of the seabed to support seagrass growth. The seagrass lost from this area includes foraging habitat for dugongs as a primary food source and habitat which supports foraging resources for the Australian humpback dolphin (i.e. fish and benthic invertebrates). I consider the permanent loss of seagrass in this area to be a significant impact for dugongs and potentially a significant impact for the Australian humpback dolphin.

Potential impacts – changes to water quality

Turbidity

Changes to water quality associated with tailwater discharges from the WBE reclamation areas include increased turbidity levels have the potential to impact on the availability of foraging resources for inshore dolphins by causing fish to temporarily move away from this area. While there is potential for fish to move away from the area during construction, this impact is expected to be temporary and fish would be expected to move back into the area after ceasing construction. Increased turbidity levels also have the potential to impact on seagrass and therefore have the potential to impact on foraging habitat for dugongs and inshore dolphins where turbidity levels result in the loss of seagrass.

The EIS states that dewatering activities and discharges during the construction of the reclamation area would be undertaken in accordance with the Dredging EMP and Environmental Monitoring Procedure, to ensure potential water quality impacts are adequately managed to reduce impact on seagrass and other sensitive receptors.

The release of tailwaters from the dredged material would be undertaken from a licensed discharge point and specific water quality criteria would need be met prior to being discharged. The licensed dewatering discharge point would be located near any areas of seagrass or areas where seagrass could grow to ensure no scouring of the seabed occurs in these areas.

The proponent has also committed to undertake continuous monitoring during construction of the reclamation area and to undertake adaptive management measures (i.e. ceasing tailwater discharge until limits can be met) where monitoring identifies water quality limits are not being met.

In addition, to ensure the reclamation works do not have an adverse impact on water quality in the Port, I have stated conditions to be attached to the project EA requiring that tailwater discharges from the reclamation area are only undertaken via licensed discharge points and when the tailwater is meeting the discharge water limits prescribed in the project's EA.

Based on the information provided in the EIS, I am satisfied that tailwater discharges could be appropriately managed to reduce turbidity levels during the placement of material in the reclamation area

It is considered that the above measures and conditions would reduce the potential for tailwater discharges to impact on foraging resources for the dugong and the Australian humpback dolphin.

Toxicants and pollutants

The bioaccumulation of anthropogenic contaminants, particularly pesticides, organochlorine compounds and hydrocarbons, are key threats for marine mammals in the coastal waters of the GBRWHA including inshore dolphins. The primary sources of these contaminants include river discharges, urban stormwater and agricultural and industrial runoff.

As discussed in my evaluation of water quality impacts in Chapter 6.3 of this report, the risk of releasing contaminants from sediments placed in the reclamation area to the water column is expected to be low. Sediment sampling undertaken for the EIS indicates that contaminant levels (i.e. metals, metalloids, organophosphates and other potential toxicants) within the dredge material are within the NAGD guidelines and considered 'clean'. Based on the results of the sediment sampling I consider the project is unlikely to result in any adverse water quality impacts on marine mammals associated with the release of contaminants.

I acknowledge that the proponent has committed to performing additional sediment sampling (prior to the commencement of dredging) to ensure the currency of the data, should dredging be undertaken past the sample validity period (five years).

In my evaluation of the project's water quality impacts in Chapter 6.3 of this report, I concluded that I am satisfied that the proponent will ensure that risk of ASS contamination is adequately managed. I note that proponent's commitment to implement a site-specific ASSMP which would include best practice measures for managing PASS/ASS. Furthermore, I have stated conditions to be attached to the EA requiring that an ASSMP must be prepared for all PASS that may be directly or indirectly disturbed and that the ASSMP/s are submitted to the administering authority prior commencing dredging works.

In addition, I have stated conditions to be attached to the project EA requiring that tailwater discharges from the reclamation area are only undertaken via licensed discharge points and when the tailwater is meeting the discharge water limits prescribed in the project's EA. This includes discharge water limits for a range of heavy metals and other contaminants that could be potentially harmful to the dugong and the Australian humpback dolphin.

Significant residual impacts and offsets

Dugongs

Based on the information in the EIS the construction of the WBE reclamation areas is expected to result in the loss of 374.64 ha of potential foraging habitat for dugongs including:

- the direct removal of 275.23 ha of seagrass within the reclamation area footprint
- indirect impact on 99.41 ha of seagrass as result of erosion and sedimentation due to changes in tidal velocities adjoining the WBE reclamation areas.

To ensure impacts are limited to the predicted impact area I have stated a condition to be attached to the EA which specifies the maximum disturbance limit of 1287.27 ha for the dugong. This includes 374.64 ha as a result of constructing the reclamation area as well as the areas impacted by dredging works in the main channel, which are discussed in chapter 5.4.

The EIS concludes that the permanent loss of 374.64 ha of potential foraging habitat for dugong from the WBE reclamation areas is an SRI requiring an offset. Due to the transient nature of seagrass in the area, the proponent has committed to resurvey seagrass in the reclamation area to confirm the area of

seagrass that would be removed at the time of construction. The results of these surveys may result in the final SRI being slightly different to the estimated number in the EIS.

As part of the draft offsets strategy that was provided in the EIS documentation, the proponent has proposed a range of measures to further investigate to address the project's SRI on dugongs. Direct offsets may include using dredged material from port-wide maintenance dredging programs to create viable seagrass meadows and foraging habitat for dugongs. Other compensatory measures may include research on dugong foraging behaviour in the Port, financial contribution towards dugong conservation research programs or contribution to the State Government to undertake offsets on behalf of the proponent.

I would expect the proponent to undertake further investigations to determine suitable and feasible offsets option/s which addresses the project's SRI on dugongs and to provide the adequate level of detail on the selected option/s in the final offset strategy.

As the dugong is also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

Australian humpback dolphin

Based on the information in the EIS the construction of the WBE reclamation areas and BUF is expected to result in the loss of 377.61 ha of potential foraging habitat for the Australian humpback dolphin including:

- the direct removal of 278.20 ha of seagrass and benthic habitat within the reclamation areas and BUF footprints
- indirect impact on 99.41 ha of seagrass as result of erosion and sedimentation due to changes in tidal velocities adjoining the WBE reclamation areas.

While the EIS has not considered the project to result in an SRI on inshore dolphins given that they are generalist feeders, relying on a variety of food sources, I am of the view that the project could have an SRI on the Australian humpback dolphin. Given the Australian humpback dolphins in the Port are a genetically isolated population, the Port is a regionally significant area to this species and the habitats which support the prey species of this dolphin are important. In accordance with the State SRI guidelines an action is likely to have a significant impact on vulnerable wildlife if it likely to cause disruption to ecologically significant locations including feeding areas.

To ensure impacts are limited to the predicted impact area, I have stated a condition to be attached to the EA which specifies the maximum disturbance limit of 2482.07 ha for the humpback dolphin. This includes 377.61 ha as a result of constructing the reclamation area and BUF as well as the areas proposed to be dredged in the main and barge access channels, which are discussed in chapter 5.4.

Due to the transient nature of seagrass in the area, the proponent has committed to resurvey seagrass in the reclamation area to confirm the area of seagrass that would be removed at the time of construction. The results of these surveys may result in the final SRI being slightly different to the estimated number in the EIS.

I require the proponent to work with the relevant approving authority to confirm the project's final SRI and offset obligations, and to include a range of measures in the final offset strategy to address the project's SRI on the Australian humpback dolphin, where it is confirmed that the project is having an SRI on this species.

As the Australian Humpback dolphin is also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

Coordinator-General's conclusions: marine mammals

I am satisfied that EIS has adequately assessed potential impacts the construction and operation of the WBE reclamation areas and BUF would have on marine mammals that are MSES.

I note the proponent's commitment to implement project and dredge EMPs which would include measures that would mitigate impacts on marine mammals associated with construction of the WBE reclamation areas and BUF. I expect the proponent to adhere to the commitments in the EIS and expect the project and dredging EMPs to be implemented.

I am also satisfied the measures listed in the project EMP to manage noise impacts on marine fauna, would address the potential underwater noise impacts from pile driving on marine mammals.

I am satisfied that the potential marine water quality impacts during construction of the WBE reclamation areas and BUF can be managed through the conditions in the project's EA, the implementation of project and dredging EMP and the Environmental Monitoring Procedure.

Based on the information in the EIS, the construction of the WBE reclamation areas is expected to result in the loss of 374.64 ha of potential foraging habitat for dugongs. Given the importance of seagrass as foraging resource for dugongs in the Port, this impact is considered to be an SRI. I note that the seagrass surveys will be conducted prior to construction and the results of these surveys may result in a different final SRI and offset obligation. I would expect the proponent to undertake further investigations to determine suitable and feasible offsets option/s which addresses the project's SRI on dugongs and to provide the adequate level of detail on the selected option/s in the final offset strategy.

While the EIS concludes that the construction of the WBE reclamation areas and BUF is unlikely to have an SRI on the Australian humpback dolphin, I consider the loss of 377.61 ha of potential foraging habitat could be considered to be an SRI. In accordance with the State SRI guidelines, an action is likely to have a significant impact on vulnerable wildlife if it likely to cause disruption to ecologically significant locations including feeding areas. As the Australian humpback dolphins in the Port are a genetically isolated population, the Port is a regionally significant area to this species. I therefore consider the habitats which support its prey species are important. I require the proponent to work with the relevant approving authority to confirm the project's final SRI and offset obligations, and to include a range of measures in the final offset strategy to address the project's SRI on the Australian humpback dolphin, where it is confirmed that the project is having an SRI on this species.

To ensure impacts are limited to the predicted impact area, I have stated a condition to be attached to the EA which specifies the maximum disturbance limits for the dugong and Australian humpback dolphin.

As the Australian Humpback dolphin and the dugong are also an MNES, the project's impacts and offset obligations on these species will also be considered and addressed in the Commonwealth's assessment.

Marine turtles

A detailed discussion around the specific foraging, nesting and inter-nesting habitat requirements for marine turtles potentially occurring in the Port is provided in my evaluation of impacts associated with the capital dredging and material transfer component in chapter 5.4.

The EIS indicates that the proposed WBE reclamation areas and BUF are likely to provide potential foraging habitat for the green and loggerhead turtles which have been directly observed in the proposed WBE reclamation areas and the hawksbill turtle which is known to occasionally occur in the Port. These species are listed in Table 6.3.

Based on the information provided in the EIS, it is considered that the flatback (*Natator depressus*) and olive ridley (*Lepidochelys olivacea*) turtles are unlikely to forage in the shallow areas of the Port including the WBE reclamation areas and BUF.

Based on literature review the EIS states that adult and sub-adult flatback turtles typically forage in deeper and complex benthic habitats (i.e. banks, shoals, deep holes and valleys) between 60 m to 90 m in depth; and that post hatchlings forage on plankton in deeper pelagic waters.

Likewise, for the olive ridley turtle this species is more commonly found to forage in deeper subtidal soft-bottomed habitats and rarely encountered in shallow intertidal seagrass meadows or reef habitats.

As these two species of marine turtle are unlikely to be found in the shallower areas of the Port, I consider that the construction of the WBE reclamation areas and BUF are unlikely to impact on these species. As such, these species are not further discussed in this section.

Table 6.3 Marine turtles known or likely to occur within the WBE reclamation and BUF impact areas

Common name *Species name*	NC Act listing	EBPC Act listing
Green turtle *Chelonia mydas*	Vulnerable	Vulnerable Migratory
Loggerhead turtle *Caretta caretta*	Endangered	Endangered Migratory
Hawksbill turtle *Eretmochelys imbricata*	Endangered	Vulnerable Migratory

Impacts and mitigation – construction

Potential impacts – direct loss of foraging habitat

The EIS indicates that the proposed WBE reclamation areas and BUF contains seagrass and benthic habitats which support benthic macroinvertebrates (e.g. molluscs and crustaceans). These areas therefore contain potential foraging habitat for marine turtles.

Green turtle

As discussed in chapter 5.4, there are resident populations of green turtle in the Port and this species is known to forage in seagrass beds near the proposed reclamation area and BUF. As adults, the species is primarily herbivorous, feeding mainly on seagrass and macroalgae and occasionally on mangrove leaves and fruit, jellyfish, egg masses and sponges. During the pelagic juvenile stage, this species are more carnivorous, feeding on pelagic crustaceans and molluscs, as well as algae.

The EIS concluded that the construction of the WBE reclamation areas is predicted to impact on 275.23 ha of potential foraging habitat for the green turtle associated with the loss of seagrass from this area. I note that the EIS has only included the area of the seagrass removed in its estimate for impacts on foraging habitat for the green turtle, given it is a primary food source for this species. However, as this species is known to forage on invertebrates during different stages of development, I have also considered the loss 2.1 ha of benthic habitat as potential impact on foraging habitat for the green turtle.

I have therefore included both the area of seagrass and benthic habitat that would be directly impacted by the reclamation works in the total maximum disturbance limit which I have set for the green turtle in my stated conditions to be attached to the EA. Given the importance foraging habitat within the Port, I consider the loss of 278.20 ha of foraging habitat for the green turtle to be significant.

Loggerhead turtle

As discussed in chapter 5.4, the loggerhead turtle is known to occur in the Port. Loggerhead turtles are known to forage in a wide range of tidal and subtidal habitats including rocky reefs, seagrass beds and

areas with soft sand and mud. Adult and large immature loggerheads are carnivorous, feeding mostly on shellfish, crabs, sea urchins and jellyfish, and post-hatchlings are thought to feed on macro-zooplankton. Based on its foraging preferences, this species has the potential to use the WBE reclamation areas and BUF for foraging. The EIS concludes that construction of the WBE reclamation areas and BUF could have a direct impact on 278.20 ha of potential foraging habitat for the loggerhead turtle. This includes removal of 275.23 ha of seagrass and 2.1 ha of benthic habitat. I have included this area of habitat in the maximum disturbance limit for these species, which I have set in my stated conditions to be attached to the EA. I also consider that any reduction in the area of available habitat within the Port could be significant.

Hawksbill turtle

As discussed in chapter 5.4, the hawksbill turtles are known to occasionally occur in the Port. Adult and immature hawksbill turtles are typically found in tidal and subtidal reef habitats and sometimes seagrass meadows. Hawksbill turtles are omnivorous, feeding on algae, sponges, soft corals and other soft-bodied invertebrates. Based on its foraging preferences, this species has the potential to use the WBE reclamation areas and BUF for foraging. The EIS concludes that construction of the WBE reclamation areas and BUF could have a direct impact on 278.20 ha of potential foraging habitat for the hawksbill turtle. This includes removal of 275.23 ha of seagrass and 2.1 ha of benthic habitat. I have included this area of habitat in the maximum disturbance limit for these species, which I have set in my stated conditions to be attached to the EA. I also consider that any reduction in the area of available habitat within the Port could be significant.

Potential impacts – changes to hydrodynamics

The EIS indicates that the construction of the WBE reclamation areas and BUF could also have an indirect impact on 99.41 ha of seagrass as result of erosion and sedimentation due to changes in tidal velocities adjoining the WBE reclamation areas. The permanent changes to hydrodynamic conditions (i.e. altered depths and tidal velocities) in this area would be expected to reduce the suitability of the seabed to support seagrass growth. This would include potential foraging habitat for all five of the marine turtles listed in Table 6.3.

Potential impacts – water quality

Turbidity

Increased turbidity levels also have the potential to impact on seagrass and therefore have the potential to impact on foraging habitat for marine turtles where turbidity levels result in the loss of seagrass. Increased turbidity levels also have the potential to impact filter feeding macroinvertebrates such as bivalves and sea pens which are also foraging resources for marine turtles.

The EIS states that dewatering activities and discharges during the construction of the reclamation area would be undertaken in accordance with the dredging EMP and Environmental Monitoring Procedure, to ensure potential water quality impacts are adequately managed to reduce impact on seagrass and other sensitive receptors.

The release of tailwaters from the dredged material would be undertaken from a licensed discharge point and specific water quality criteria would need be met prior to being discharged. The licensed dewatering discharge point would not be located near any areas of seagrass or area where seagrass could grow to ensure no scouring of the seabed occurs in these areas.

The proponent has also committed to undertake continuous monitoring during construction of the reclamation area and to undertake adaptive management measures (i.e. ceasing tailwater discharge until limits can be met) where monitoring identifies water quality limits are not being met.

In addition, to ensure the reclamation works do not have an adverse impact on water quality in the Port, I have stated conditions to be attached to the project EA requiring that tailwater discharges from the reclamation area are only undertaken via licensed discharge points and when the tailwater is meeting the discharge water limits prescribed in the project's EA.

Based on the information provided in the EIS I am satisfied that tailwater discharges could be appropriately managed to reduce turbidity levels during the placement of material in the reclamation area. It is considered that the above measures and conditions would reduce the potential for tailwater discharges to impact on foraging resources for marine turtles.

Toxicants and pollutants

As discussed in my evaluation of water quality impacts in Chapter 6.3 of this report, the risk of releasing contaminants in the tailwaters is expected to be low. Sediment sampling undertaken for the EIS indicates that contaminant levels (i.e. metals, metalloids, organophosphates and other potential toxicants) within the dredge material are within the NAGD guidelines and considered 'clean'.

I acknowledge that the proponent has committed to performing additional sediment sampling (prior to the commencement of dredging) to ensure the currency of the data, should dredging be undertaken past the past the sample validity period (five years).

As per my evaluation of the project's water quality impacts in Chapter 5.2 of this report, I am satisfied that the proponent will ensure that risk of ASS contamination is adequately managed. I note that the proponent's commitment to implement a site-specific ASSMP which would include best practice measures for managing PASS/ASS.

Furthermore, I have stated conditions to be attached to the EA requiring that an ASSMP must be prepared for all PASS that may be directly or indirectly disturbed and that the ASSMP/s are submitted to administering authority (DES) prior to commencing dredging works.

In addition, I have stated conditions to be attached to the project EA requiring that tailwater discharges from the reclamation area are only undertaken via licensed discharge points and when the tailwater is meeting the discharge water limits prescribed in the project's EA. This includes discharge water limits for a range of heavy metals and other contaminants that could be potentially harmful to marine turtles.

Based on the information provided in the EIS and my proposed stated conditions I consider that the project is unlikely to result in any adverse water quality impacts on marine turtles associated with the release of contaminants.

Potential impacts – other fauna disturbance

Underwater noise

Turtles are most sensitive to low noise frequencies between 100 and 400 Hz and impulsive sounds (i.e. impact piling driving and rock blasting). Studies indicate that the sound exposure level threshold level for mortality and potential mortal injury is 210 dB.

The EIS states that the main source noise during the construction of the WBE reclamation areas and BUF would be associated with the placement of the armour and core material into marine waters; primarily the dumping of rocks from trucks during bund wall construction.

Sheet piling would also be a source of noise from construction of the BUF. Based on modelling, the EIS states that underwater noise generated by these activities would not be expected to exceed a sound exposure level (SEL) of 182 dB re 1µpA^{2}s at 1 m from the rock dumping area.

The SEL threshold for mortality or mortal injury is 210 dB. The EIS states that vibratory sheet piling is likely to be used for BUF construction. This type of piling is expected to generate lower noise emissions that impact pile driving and; is not expected to have significant adverse noise impacts to marine turtles.

I note that the project EMP that was provided as part of the EIS includes a noise and vibration management sub-plan which includes measures for managing and monitoring noise impacts from construction activities that would be expected to mitigate potential underwater noise impacts on marine turtles.

Lighting impacts

The EIS indicates that the inner harbour of the Port already receives elevated artificial light levels from existing Port infrastructure and industrial and residential development on the mainland and Curtis Island.

The EIS states that no night works are proposed as part of the establishment of the WBE reclamation areas and BUF. However, some night works will be required for the placement of dredge material and temporary lighting would be installed on the BUF and the reclamation areas internal road network.

While the project is expected to generate additional light in this area, it is considered the potential for impacts on nesting turtles to be low as works are not located in the vicinity of any known turtle nesting beaches.

Mitigation measures to avoid potential lighting impacts on marine turtles during the establishment of the WBE reclamation areas and BUF are included in the project EMP.

The EIS states that the risk of adverse impacts on marine turtles' post-mitigation, resulting from increased in artificial lighting during establishment of the WBE reclamation areas and BUF, is low for the green turtle, and medium for the hawksbill and loggerhead turtles.

Potential impacts - Entrapment of marine turtles during construction

It is considered that marine turtles have the potential to become entrapped during the construction of WBE reclamation areas. The project EMP and bund wall closure plan will include measures to minimise the potential entrapment of marine fauna including marine turtles.

This includes having a suitably qualified and experienced marine spotter present during the closing of the bund/sheet piling wall to minimise the risk of marine fauna being stranded within the WBE reclamation areas and BUF.

I am satisfied that the risk of entrapment of marine turtles can be adequately managed provided the measures in the project EMP and bund wall closure plan are implemented.

Impacts, avoidance and mitigation – operation

Water quality

As discussed in Chapter 5.2 of this report, the WBE reclamation areas, once completed, would be used for port-related industrial activities, which have the potential for water quality impacts within the Port. The reclamation area would also experience stormwater runoff during rainfall.

I consider the measures in the EMPs would appropriately mitigate potential water quality impacts associated with, hydrocarbon spills and waste handling and stormwater runoff. This includes ensuring that all wastewater collected during operations on the reclamation area is adequately contained and treated before being discharged into the receiving waters.

I therefore consider that operation of the WBE reclamation areas is unlikely to have an adverse impact on marine turtles provided that the proponent adheres to the measures outlined in the EMPs, and other proponent commitments.

Lighting impacts

The proposed WBE reclamation areas are located within an area which is already subject to artificial light from industrial activities. While the reclamation area will result in additional light in this area, the proponent has proposed a number of measures in the EMPs to reduce artificial light pollution including direction lighting and appropriate bulb types.

I am satisfied that the measures listed in the EMPs to minimise light pollution generated by the project would also address potential impacts on marine turtles. I also expect the measures used are consistent with the final *National Light Pollution Guidelines for Wildlife including Marine Turtles, Seabirds and Migratory Shorebirds*.

Significant residual impacts and offsets

Green turtle

Based on the information in the EIS, the construction of the WBE reclamation areas are expected to result in the loss of 377.61 ha of potential foraging habitat for green turtle including:

- the direct removal of 275.23 ha of seagrass within the reclamation area footprint; and 2.1 ha of benthic habitat within the BUF footprint
- indirect impact on 99.41 ha of seagrass as result of erosion and sedimentation due to changes in tidal velocities adjoining the WBE reclamation areas.

While the EIS has concluded that only the removal of seagrass would be considered to be an SRI for the green turtle, I have taken a precautionary approach and have also considered the loss of 2.1 ha benthic habitat from the BUF as potential impact on foraging habitat, as this species is known to forage on invertebrates during different stages of development. As such, I have included this area of habitat in the maximum disturbance limit for the green turtle, which I have set in my stated conditions to be attached to the EA.

In accordance with the State SRI guidelines, an action is likely to have a significant impact on endangered or vulnerable wildlife if it is likely to cause disruption to ecologically significant locations including feeding sites. Given that dredging works could permanently disrupt feeding in this area, I have considered that this impact could be an SRI.

To ensure impacts are limited to the predicted impact area, I have stated a condition to be attached to the EA which specifies the maximum disturbance limit of 2482.07 ha for the green turtle. This includes 377.61 ha as a result of constructing the reclamation area and BUF as well as the areas proposed to be dredged in the main and barge access channels, which are discussed in Chapter 5.4.

I require the proponent to work with the relevant approving authority to confirm the project's final SRI and offset obligations, and to include a range of measures in the final offset strategy to address the project's SRI on the green turtle.

Loggerhead and hawksbill turtles

Based on the information in the EIS the construction of the WBE reclamation area are expected to result in the loss of 377.61 ha of potential foraging habitat for loggerhead and hawksbill turtles including:

- the direct removal of 275.23 ha of seagrass within the reclamation area footprint; and 2.1 ha of benthic habitat within the BUF footprint
- indirect impact on 99.41 ha of seagrass as a result of erosion and sedimentation due to changes in tidal velocities adjoining the WBE reclamation areas.

While the EIS concludes that the construction of the WBE reclamation areas and BUF is unlikely to have an SRI on the loggerhead and hawksbill turtles, I have taken a precautionary approach for these species and have considered the loss of 377.61 ha of potential foraging habitat (seagrass, algae, mollusc and crustaceans) could be an SRI.

I have set a maximum disturbance limit of 2482.07 ha for loggerhead and hawksbill turtles in my stated condition to be attached to the EA. This includes the combined area of seagrass and habitat for benthic invertebrates that would be lost from the WBE reclamation areas and BUF footprints. Likewise, as for the green turtles I have considered this impact could be an SRI, as the removal of material from this area could permanently disrupt feeding for marine turtles in this area.

Offsets

As part of the draft offsets strategy that was provided in the EIS documentation, the proponent has proposed a range of measures to further investigate as part of developing the final offset strategy to address the project's SRI on the green turtle. Direct offsets may include using dredged material from port-wide maintenance dredging programs to create viable seagrass meadows and foraging habitat for green turtles. Other compensatory measures may include research on green turtle foraging behaviour in the Port, financial contribution towards marine turtle conservation research programs or contribution to the State Government to undertake offsets on behalf of the proponent.

I require the proponent to work with the relevant approving authority to confirm the project's final SRI and offset obligations, and to include a range of measures in the final offset strategy to address the project's SRI on the green turtle.

For the other species of marine turtle I also expect the proponent to work with the relevant approving authority to confirm the project's final SRI and offset obligations, and to include a range of measures in the final offset strategy to address the project's SRI, where it is confirmed that the project is having an SRI on these species.

Due to the transient nature of seagrass in the area the proponent has committed to resurvey seagrass in the reclamation area to confirm the area of seagrass that would be removed at the time of construction. The results of these surveys may result in the final SRI being slightly different to the estimated number in the EIS.

As marine turtles are also an MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

Coordinator-General's conclusions: marine turtles

I am satisfied that the EIS has adequately assessed potential impacts that the construction and establishment of the WBE reclamation areas and BUF would have on marine turtles that are MSES.

I am satisfied the measures listed in the project EMP would address the potential underwater noise impacts on marine turtles associated with the construction of the WBE reclamation areas and BUF. I am also satisfied that the measures listed to minimise light pollution during the construction and operation of the WBE reclamation areas and BUF would also address potential impacts on marine turtles. I would expect that the light control measures used for the project would be consistent with the *National Light Pollution Guidelines for Wildlife including Marine Turtles, Seabirds and Migratory Shorebirds*.

I am satisfied that the potential marine water quality impacts associated with the construction of the WBE reclamation areas and BUF and tailwater discharges from placed material can be managed through the conditions in the project's EA, the implementation of the project and dredging EMPs and Environmental Monitoring Procedure.

Based on the information in the EIS, the construction of the WBE reclamation areas is expected to result in the loss of 377.61 ha of potential foraging habitat for the green turtle. Given the importance of seagrass as foraging resource for green turtles in the Port, this impact is considered to be an SRI. I note that the seagrass surveys will be conducted prior to construction and the results of these surveys may result in a different final SRI and offset obligation. As this species is known to forage on invertebrates during different stages of development, I also consider the loss of benthic habitat from the BUF in addition to the loss of seagrass from the reclamation area to be an SRI. I note the proponent has proposed offset options in the draft offset strategy that was provided as part of the EIS. I require the proponent to undertake further investigations to determine suitable and feasible offsets option/s and to provide the adequate level of detail on the selected option/s in the final offset strategy.

While the EIS concludes that the construction of the WBE reclamation areas and BUF is unlikely to have an SRI on the loggerhead and hawksbill turtles, I have taken a precautionary approach and have considered that the loss of 377.61 ha of potential foraging habitat could be considered to be an SRI.

I require the proponent to work with the relevant approving authority to confirm the project's final SRI and offset obligations, and to include a range of measures in the final offset strategy to address the project's SRI on the other species of marine turtle, where it is confirmed that the project is having an SRI on these species.

Due to the transient nature of seagrass in the area the proponent has committed to resurvey seagrass in the reclamation area to confirm the area of seagrass that would be removed at the time of construction. The results of these surveys may result in the final SRI being slightly different to the estimated number in the EIS.

To ensure impacts are limited to the predicted impact area I have stated a condition to be attached to the EA which specifies a maximum disturbance limit of 2482.07 ha for the green, loggerhead and hawksbill turtles.

As marine turtles are also an MNES, the project's impacts and offset obligations on these species will also be considered and addressed in the Commonwealth's assessment.

Coordinator-General's conclusions: Protected wildlife habitat

I am satisfied that the EIS has adequately assessed potential impacts that the construction and establishment of the WBE reclamation areas and BUF material would have on protected wildlife habitat as an MSES.

As all of the species discussed in my evaluation of the project's impacts on protected wildlife habitat as an MSES are also MNES under the EPBC Act, the project's impacts on these matters would also be evaluated by the Commonwealth Minister for the Environment.

I consider that the potential impacts on protected wildlife habitat can be managed, provided the proponent carries out the activity in accordance with the measures outlined in the EIS, including commitments and measures described in the project and dredge EMPs, and the Environmental Monitoring Procedure that were provided as part of the EIS. This includes measures to manage, underwater noise, water quality, the introduction and spread of marine pests and disturbances from noise, dust and light pollution.

I expect the proponent to adhere to the commitments and measures outlined in the EIS to ensure impacts on protected wildlife habitat are adequately addressed and not having an adverse impact on these matters. Furthermore, I expect that the conditions I have stated for inclusion in the EA and operational works approvals would ensure potential impacts on protected wildlife habitat are adequately managed.

While most impacts can be managed, I have concluded that the construction of the proposed WBE reclamation areas and BUF could have SRIs on protected wildlife habitat for the Australian humpback dolphin, the dugong and marine turtles.

I note that the proponent has committed to survey the proposed impact areas to confirm the area of seagrass that would be removed prior to commencement of construction. The proponent would also conduct monitoring after construction to confirm whether marine plants have returned to the pre-disturbance condition within five years after dredging has ceased. The results of these surveys may result in the final SRI being slightly different to the estimated number in the EIS.

As I am unable to confirm the project's final SRI at this stage, I have set the following maximum disturbance limits in my stated conditions to be attached to the EA:

- 2482.07 ha for the Australian humpback dolphin including:
  - the direct removal of 275.23 ha of seagrass within the reclamation area footprint; and 2.1 ha of benthic habitat within the BUF footprint
  - indirect impact on 99.41 ha of seagrass as result of erosion and sedimentation due to changes in tidal velocities adjoining the WBE reclamation areas
  - the areas impacted by dredging works, which are discussed in chapter 5.4
- 1,287.27 ha for the dugong including:
  - 278.20 ha from the establishment of the southern WBE reclamation area
  - indirect impact on 99.41 ha of seagrass as result of erosion and sedimentation due to changes in tidal velocities adjoining the WBE reclamation areas
  - the areas impacted by dredging works, which are discussed in chapter 5.4.
- 2482.07 ha of foraging habitat for green, loggerhead and hawksbill turtles which includes:
  - the direct removal of 275.23 ha of seagrass within the reclamation area footprint; and 2.1 ha of benthic habitat within the BUF footprint
  - indirect impact on 99.41 ha of seagrass as result of erosion and sedimentation due to changes in tidal velocities adjoining the WBE reclamation areas
  - the areas impacted by dredging works, which are discussed in chapter 5.4.

As I do not have sufficient information to determine the project's full potential indirect impact on shorebirds, I have not confirmed a maximum disturbance limit for shorebirds in my stated conditions for the EA. I require that information on the maximum impact area is notified and agreed by the administering authority either prior to or with the application for the EA.

I note that the draft offset strategy provided as part of the EIS outlines a range of options for addressing the project's SRI on green turtle, dugong and shorebirds and that these options would be further investigated, and the selected option appropriately detailed in the final offset strategy.

I require the proponent to work with the relevant approving authority to confirm the project's final SRI and offset obligations for all MSES discussed in this section. I have stated a condition to be attached to the EA requiring that the proponent provide an offset for any MSES which the project is confirmed to have an SRI. I require the final offset strategy to include measures that appropriately compensate for any loss of habitat which constitutes an SRI.

As migratory shorebirds, dugongs, the Australian Humpback dolphin and marine turtles are also a MNES, the project's impacts and offset obligations will also be considered and addressed in the Commonwealth's assessment.

6.5.6 Waterway barrier works

The Fisheries Act defines waterway barrier works as ‘a dam, weir or other barrier across a waterway if the barrier limits fish stock access and movement along a waterway. Assessable development that is operational work that is constructing or raising a waterway barrier requires a development approval under the Planning Act.

Any part of a waterway providing for passage of fish is an MSES only if the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along the waterway.

An action is likely to have a significant impact on a waterway providing for fish passage (an MSES) if there is a real possibility that it will:

- result in the mortality or injury of fish
- result in conditions that substantially increase risks to the health, wellbeing and productivity of fish seeking passage such as through the depletion of fish energy reserves, stranding, increased predation risks, entrapment or confined schooling behaviour in fish
- reduce the extent, frequency or duration of fish passage previously found at a site
- substantially modify, destroy or fragment areas of fish habitat (including, but not limited to in-stream vegetation, snags and woody debris, substrate, bank or riffle formations) necessary for the breeding and/or survival of fish
- result in a substantial and measurable change in the hydrological regime of the waterway, for example, a substantial change to the volume, depth, timing, duration and frequency of flows
- lead to significant changes in water quality parameters such as temperature, dissolved oxygen, pH and conductivity that provide cues for movement in local fish species.

Waterways in the project area

The definition of a ‘waterway’ under the Fisheries Act includes a river, creek, stream, watercourse or inlet of the sea. This definition includes freshwater and tidal waters, both permanent and ephemeral waterways.

Waterways

The EIS indicates that based on the Queensland Globe estuaries mapping, there is an ‘amber waterway’ mapped to the west of the proposed WBE reclamation areas; however, the distance between the mouth of this waterway and the reclamation area is more than 200 m. Given the distance between the waterway and reclamation area it is considered that tidal flow and fish passage into this waterway would not be limited by the construction and operation of the reclamation area.

Tidal waterways

The proposed WBE reclamation areas are located in an area mapped as a ‘tidal’ waterway providing for fish passage.

Issues raised in submissions

Key issues raised in the submissions on the EIS regarding waterway barrier works included:

- the northern reclamation area may constitute waterway barrier works, as it extends more than 10 per cent into a waterway greater than 50 m in width and raises the bed level.

- environmental offsets may be applicable if it is determined that an SRI to waterways providing for fish passage is identified. Information required to determine if fish passage is being affected is required prior to lodging a development application. Hydrodynamic modelling within the main channel should be undertaken to identify/predict the effects on water velocities as a result of the project and how this may or may not impact on fish that are expected to inhabit or move through this area.

While the proponent considers that the northern WBE reclamation area is unlikely to constitute a waterway barrier, the proponent will confirm this during detailed design. The EIS indicates that measures to mitigate impacts on the hydrological and tidal regime in this area will be investigated during detailed design. These measures may mitigate any potential impacts on fish passage through this area.

Given that detailed design for the WBE reclamation is yet to be undertaken, it is not possible at this stage of the process to determine whether the northern reclamation area will constitute waterway barrier works requiring approval under the Planning Act. This will depend on whether the works meet the requirements of being accepted development, or if failing this, whether the works constitute a barrier that limits fish stock access and movement.

To ensure that this issue is properly dealt with the at the application stage I have made a recommendation requiring the proponent to undertake further consultation with DAF following detailed design to determine whether the WBE reclamation areas constitutes waterway barrier works. If so, the proponent is to provide sufficient detail on barriers to fish passage and how they would be addressed and, if required, detail on any offsets measures in the case the barrier is considered to have an SRI on fish passage.

Coordinator-General's conclusions: Waterway barrier works

Based on the information provided in the EIS I am of the view that there is currently not enough information to determine whether the WBE reclamation areas would constitute waterway barrier works requiring approval.

I have therefore made a recommendation requiring the proponent to undertake further consultation with DAF following detailed design to determine whether the WBE reclamation areas constitutes waterway barrier works. If determined to be a waterway barrier, I have required that sufficient detail is provided to DAF on how barriers to fish passage will be addressed and, if required, detail on any offsets measures if the barrier is predicted to result in an SRI on fish passage.

6.5.7 Fish habitat areas

The EIS indicates that there are no FHAs within the proposed BUF and WBE reclamation areas footprints.

The closest declared FHA is the Calliope River FHA which is approximately 12 km from the BUF and WBE reclamation areas. This area is known to support valuable commercial and recreational fisheries resources.

The EIS indicates that while there is potential for short-term water quality declines associated with increases in turbidity resulting from the construction of the WBE reclamation areas and BUF, water quality modelling indicates the project is unlikely to result in adverse impact on the Calliope River FHA. Modelling indicates that this FHA is outside of the predicted zone of impact and increases in turbidity would be temporary.

I consider the mitigation measures proposed in the project EMP, dredging EMP and Environmental Monitoring Procedure to manage water quality impacts on marine plants would also be applicable in managing any potential impacts on the Calliope River FHA. I also consider my stated conditions to be

attached to the EA to protect marine plants and other ecological values would also assist in managing water quality impacts on the Calliope River FHA.

Coordinator-General's conclusions: fish habitat areas

I am satisfied that the EIS has adequately assessed potential impacts that the construction of the WBE reclamation areas and BUF would have on FHAs as an MSES.

Given the distance from the proposed dredging works these activities are unlikely to have an adverse impact on the Calliope River FHA.

I also consider the proposed mitigation measures and stated conditions for managing water quality impacts on marine plants would also be applicable in managing potential impacts on the Calliope River FHA.

6.6 Transport

This section evaluates project impacts on traffic and transport associated with dredge material transfer and reclamation works, including the construction of the WBE reclamation areas and the BUF.

The EIS identifies that the construction of the WBE reclamation areas and BUF bund walls would commence three years prior to the commencement of Channel Duplication dredging activities. The EIS found that subject to actual and predicted Port throughout and associated vessel movements over the next five to ten years, dredging may commence in 2023 or later.

Activities associated with the transportation of quarry materials (core and armour rock) for the construction of the bund walls for the WBE reclamation areas and the BUF have the potential to impact on pavement life, road safety and capacity.

The primary road access to the WBE reclamation areas site is via Landing Road, a two-lane, two-way road under the jurisdiction of GRC. Landing Road operates as an industrial access road servicing existing industry and provides connection between Fisherman's Landing (including the existing WB reclamation area) and Gladstone-Mount Larcom Road. A short section of gravel road on port land connects Landing Road to the WBE reclamation areas along the foreshore and across an existing causeway onto the WB reclamation area. The existing local transport network is shown in Figure 6.8.

The existing Ticor Quarry, which is owned and operated by GPC, is expected to provide approximately 1.13 Mm^3 of quarry material for the construction of the WBE reclamation areas bund walls and BUF bund wall. This quarry is located around 3.5 km west of the site of the WBE reclamation areas in the Targinnie/Yarwun area. The proposed haulage route of the quarry material to the WBE reclamation areas will be via Guerassimoff Road and Landing Road as shown in Figure 6.8.

A general road infrastructure assessment (RIA) was undertaken in accordance with DTMR's 'Guide to Traffic Impact Assessment' (GTIA) to estimate project traffic volumes, evaluate road capacity and assess impacts on local roads. The RIA also included a pavement impact assessment. An RIA wasn't required to be undertaken for state-controlled roads due to low traffic volumes anticipated on any state-controlled roads for the project.

I note that during operation of the WBE reclamation areas the existing GPC workforce will undertake maintenance and stabilisation activities. Vehicle movements will occur on the WBE reclamation areas to undertake environmental management activities such as dust control, erosion and sediment control and landscaping activities.

Operation and maintenance stages are not predicted to significantly increase existing traffic volumes on roads impacted by the project beyond existing use numbers for adjoining reclamation areas. I accept the

EIS conclusion that there will be no adverse impacts on traffic and transport during the operation and maintenance stages of the project, therefore this will not be considered further in this report.

6.6.1 Submissions received

Key traffic and transport issues raised in two submissions on the EIS included the following:

- increased heavy vehicle movement associated with transporting rock material between the quarry and the WBE reclamation areas
- requirement for updated road impact assessment, and plans for road-use management, heavy vehicle haulage management and traffic management
- requirement for a road safety, pavement condition and intersection performance assessment and traffic impact assessment to mitigate any impacts on the local road network.

I have considered each submission and the responses provided by the proponent in my evaluation of the project. My assessment is provided below.

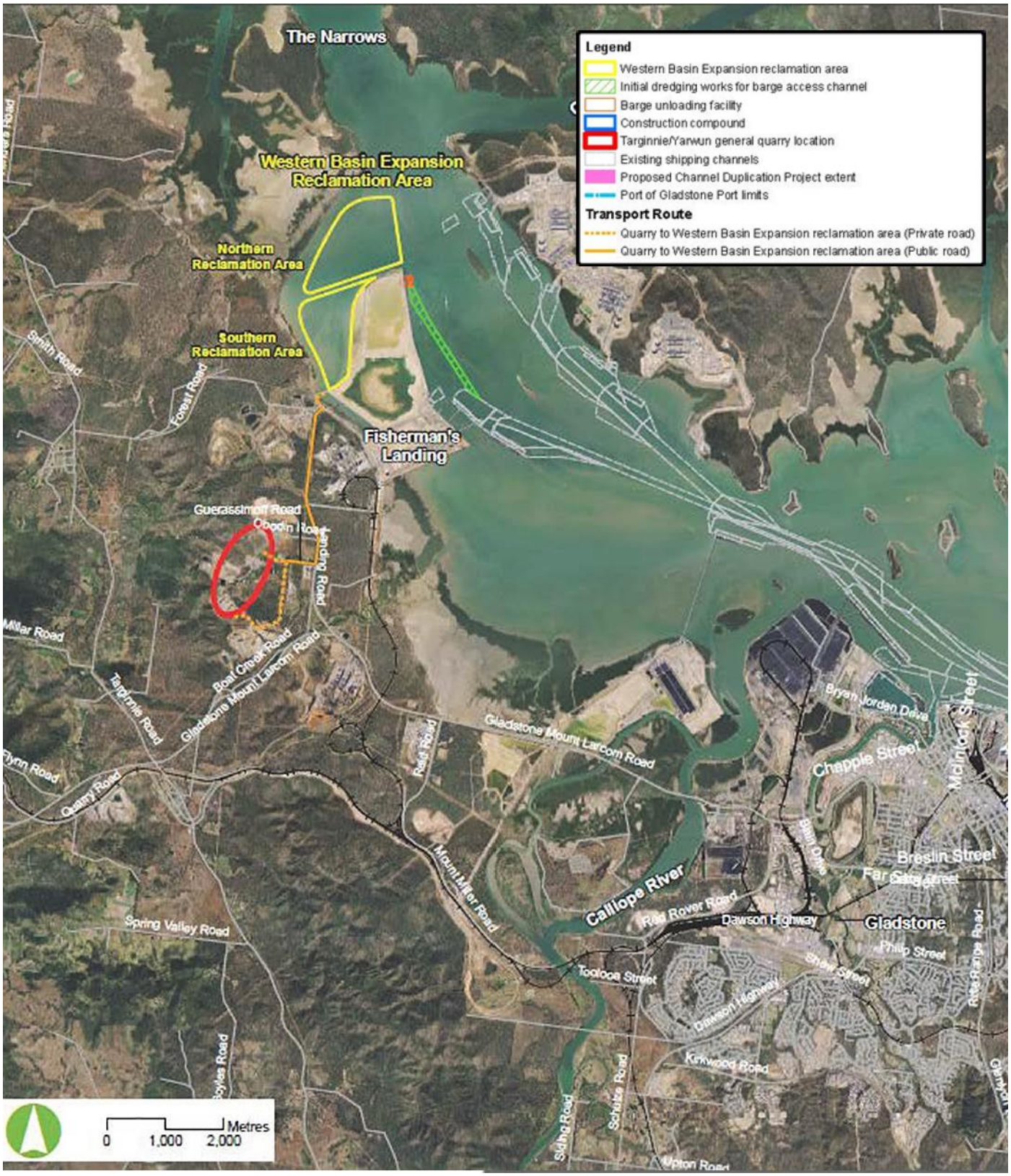


Figure 6.8 Existing local transport network

6.6.2 Impacts and mitigation

Impacts

Potential impacts to the road network were described in the EIS and included the following:

- increased heavy vehicle movement associated with the haulage of core and armour rock material between the quarry and the WBE reclamation areas
- decreased road safety at the Guerassimoff Road and Landing Road intersection due to increased heavy vehicle queuing at the basic right turn treatment at Landing Road
- pavement degradation as a result of increased load intensity during construction.

The EIS reports that there is a potential for impacts on transport infrastructure from the haulage of approximately 1.13 Mm^3 of core and armour rock material from the quarry to the WBE reclamation areas. The EIS notes the northern and southern sections of the WBE reclamation areas' bund walls would be constructed separately in two consecutive stages over a three-year construction period. The BUF bund wall would be constructed in the third year in parallel with the northern WBE reclamation area bund wall.

The daily heavy vehicle traffic demands likely to be generated by the project during the construction phase are as follows:

- construction of the WBE reclamation area (southern) bund wall –
  - Guerassimoff Road - 130 heavy vehicles per day (vpd)
  - Landing Road – 130 heavy vpd
- construction of the WBE reclamation area (northern) and BUF bund walls–
  - Guerassimoff Road – 198 heavy vpd
  - Landing Road - 198 heavy vpd.

The EIS predicts a workforce of up to 216 staff for placement of dredge material and reclamation works, with the assumption that the workforce would be using light vehicles and not carpooling. The potential daily project related workforce traffic volumes for construction activities (two-way) are as follows:

- 20 total trips per day during the three-year construction period for WBE reclamation areas and BUF bund walls
- 196 total trips per day (over two shifts) during the unloading and placement of dredge material within the WBE reclamation areas and WB reclamation area.

The RIA found that:

- an increase in traffic volumes of light vehicle movements of up to 216 per day generated during the construction phase will have minimal impact on existing traffic operations of the Gladstone local road network
- the increase in heavy vehicle traffic of up to 198 heavy vehicles per day will have a temporary, significant impact to Guerassimoff Road and Landing Road during the three year construction period for the WBE reclamation areas and BUF bund walls
- the Guerassimoff Road and Landing Road intersection has adequate capacity to accommodate the increase in heavy vehicle traffic.

The RIA considered potential impacts on the existing road network from all traffic generated during construction and operation and maintenance phases across all project activities.

The RIA found that of the intersection's analyses, all would operate within acceptable limits or below capacity for the construction phase of the project, with the only the Guerassimoff Road/Landing Road Intersection predicted to experience queuing of heavy vehicles. The EIS considered that alterations to the intersection to increase its capacity wouldn't be required because of the short term nature of the construction phase and minimal use by traffic external to the area (i.e. tourist use). As such, safety was proposed to be upheld through non-infrastructure mitigation measures such as temporary speed limit reductions and signage in multiple locations to provide warning of trucks turning.

Pavement impacts

The EIS undertook a pavement impact assessment to identify the likely magnitude of impacts on the pavement condition to Landing Road and Guerassimoff Road due to predicted heavy vehicle movements during the three-year construction phase. As confirmed by DTMR's GTIA, an increase of 5 per cent or greater of background traffic would likely result in pavement impacts.

The assessment found that heavy vehicles being utilised for the construction phase of the project would exceed 5 per cent of background traffic and are predicted to result in pavement impacts.

The EIS notes that further assessment of potential pavement impacts along haulage routes is required during detailed design.

Mitigation

To analyse and mitigate impacts on the safety, efficiency and condition of the state-controlled and local road network as a result of construction activities, the proponent has committed to undertake a detailed traffic impact assessment (TIA) in accordance with the DTMR's GTIA and during the detailed design phase of the project. The TIA will be developed in consultation with TMR and will be approved by them at least 6 months before any construction works can occur. Key components of the TIA include:

- intersection and network performance
- traffic generation and trip distribution
- pavement impact assessment.

The EIS has also included commitments to prepare a:

- road safety, pavement condition and intersection performance assessment during the detailed design phase of the project
- mitigation proposals prior to the commencement of significant construction works
- road management plan (RMP).

The proponent has committed to management measures to improve safety on the state-controlled and local roads during construction, in particular at the Guerassimoff Road and Landing Road intersection, including:

- no over-dimensional vehicles that may affect the road network will be utilised for project activities
- temporary reduction in the speed limit to improve gap acceptance for trucks entering and exiting the traffic stream to and from Landing Road
- clear signage placed in multiple locations in advance of the Landing Road and Guerassimoff Road intersection to provide further warning of temporary speed limit reduction and the turning of trucks.

I am satisfied that the implementation of the above management measures and commitments, along with my recommended condition requiring the RMP to be prepared in accordance with DTMR's *Guide to*

Preparing a Road-Use Management Plan (Appendix 3) will address potential impacts to the road network associated with project activities.

The proponent has committed to undertake further traffic counts closer to the start of construction in 2023 to better reflect road conditions and traffic volumes, and to ensure suitable non-infrastructure mitigation measures have been identified. I accept that this updated information would reflect any changes to project scheduling and will provide inputs into the TIA and RMP.

If the proponent changes the source of quarry material and related haulage route during the detailed design phase, or during construction, the proponent has committed to undertake a reassessment of the project impacts on the State-controlled roads and local roads in consultation with DTMR and GRC.

Should that be required, the EIS confirms local road infrastructure upgrades would likely be required, with timing and associated costs to be determined and agreed with GRC. I am satisfied this would adequately define the scope and responsibilities for the costs of required local road upgrades and result in local road upgrades that would safely and efficiently accommodate project traffic.

In line with state agency advice provided by DTMR, I have recommended in this report that the TIA is to be developed in accordance with DTMR's GTIA. The TIA is to be approved by TMR at least six months prior to the commencement of significant construction works, or as otherwise agreed between the proponent and TMR (Appendix 3). The assessment must identify and detail final impact mitigation proposals, which could include road works, contributions to road works or maintenance or road-use management strategies.

Further, I have recommended the RMP is to be prepared in accordance with DTMR's *Guide to Preparing a Road-Use Management Plan*, with a view to refine traffic movements for the project and minimise trips on state-controlled and local roads (Appendix 3). The RMP is to be approved by TMR at least six months prior to the commencement of significant construction works, or as otherwise agreed between the proponent and DTMR.

To ensure all project-related traffic impacts are adequately managed, I have recommended that the proponent prepare and implement traffic management plans in accordance with DTMR and GRC requirements for each site where road works are to be undertaken (Appendix 3). To manage any excess-mass or over-dimensional loads for heavy vehicles, I have also recommended that the proponent prepare a heavy vehicle haulage management plan for all phases of the project in consultation with DTMR and the Queensland Police Service. The traffic management plans, and heavy vehicle haulage management plan is to be provided to TMR at least three months prior to the commencement of significant construction works.

6.6.3 Coordinator-General's conclusions: traffic and transport

I am satisfied that the EIS adequately investigated and assessed the potential impacts of the project on traffic and transport matters for the current stage of project development. I acknowledge the potential for impacts on road safety at the Guerassimoff Road and Landing Road Intersection and pavement degradation as a result of increased heavy vehicle movements.

The proponent has committed to provide a formal TIA to further analyse and mitigate the impacts of project-related traffic on the safety, efficiency and condition of state-controlled and local roads. I am satisfied that the proponent's TIA and commitment to undertake further traffic counts closer to the commencement of the construction phase will account for changes to transport routes and expected volumes of additional project-related traffic, better reflect the impacts on the Gladstone road network and confirm suitability of the non-infrastructure mitigation measures proposed in the EIS.

The proposed haulage of rock material from Ticor Quarry is regulated under an existing approval obtained by the proponent. The potential pavement impact to the local road network as a result of the

movement of quarry materials would be covered by existing conditions under that approval (reference no. 09/426613), and accordingly, no additional conditions are required regarding ongoing maintenance and rehabilitation costs. However, I note the possibility for rate of construction of the WBE reclamation areas and BUF to surpass the existing approved Ticor Quarry extraction and screening rates. Should this occur and transport of ,quarry material be required from other locations, I expect the proponent to implement the commitment to consult with GRC to determine the maintenance and rehabilitation costs for parts of the local road network not considered by this EIS.

I have recommended a condition in Appendix 3 that requires the proponent to provide the TIA and an RMP at least six months prior to the commencement of construction works for approval by DTMR to ensure that the impacts identified during the detailed design phase are known and can be suitably managed. I am satisfied that this will address the issues raised by submitters regarding the need for an updated impact assessment and a road-use management plan.

To ensure that potential impacts on local and state-controlled road networks are appropriately managed, I have recommended that the proponent prepare a heavy vehicle haulage management plan in consultation with DTMR and Queensland Police Service. I have also recommended that the proponent submit a TMP to DTMR and GRC for road works interfering with local and state-controlled roads.

I am satisfied that through the implementation of the proponent's commitments and my recommendations in this report that potential impacts on traffic and transport would be appropriately identified and managed and issues raised by submitters addressed.

6.7 Noise and vibration

This section discusses the potential terrestrial noise and vibration impacts of the project associated with the construction of the WBE reclamation areas and BUF, unloading and placement of dredged material into the WBE reclamation areas and movement of heavy vehicles on internal and external roads.

Noise and vibration impacts associated with capital dredging, the transport of dredge material and navigational aid works are is considered within Section 5.6 of this report.

While impacts to noise and vibration from the placement of dredge material and reclamation works was not a key issue raised in submissions received on the draft EIS, I acknowledge the potential for noise and vibration impacts and have considered them in the assessment below.

6.7.1 Sensitive receptors

The EIS states that the communities of Gladstone, Targinnie, Boyne Island, Tannum Sands and Facing Island are all located within 30 km of the WBE reclamation areas. Industrial uses are present on the mainland of Gladstone and on Curtis Island, within and surrounding the Gladstone SDA.

Sensitive receptors adopted for the project were selected by the proponent in accordance with the EPP (Noise) guidelines and based on factors including distance from project noise sources, and potential exposure to noise. The nearest sensitive receptors to the existing WB and proposed WBE reclamation areas and BUF are located approximately 4 km west in Targinnie.

The sensitive receptors considered in the EIS are represented in Table 5.7 of Section 5.6 of this report.

6.7.2 Assessment methodology

Noise

In 2014, the proponent conducted background noise monitoring at three sites located within 3 km of the proposed channel duplication project extent and within the Port limits, representative of the nearest residential communities (see Figure 5.15). Data was gathered in accordance with the DES Noise Measurement Manual (2013) and relevant Australian Standards for environmental noise monitoring.

The acoustic quality objectives as defined in Schedule 1 of the EPP (Noise) were used to provide a target criterion for the assessment of noise during construction activities and to inform if mitigation measures were required. The EPP (Noise) states noise limits of 50 dBA $L_{Aeq, adj, 1hr}$ during the day and evening for residences (outdoors) and 35 dBA $L_{Aeq, adj, 1hr}$ during the day and evening and 30 dBA $L_{Aeq, adj, 1hr}$ during the night-time for residences (indoors).

The DTMR 'Transport Noise Management – Code of Practice, Volume 2 – Construction Noise and Vibration' (2016) (Code of Practice (2016)) was used to guide assessment of road traffic noise. The Code of Practice recommends construction traffic does not increase the existing hourly L_{A10} road traffic noise by more than 3 dBA, a change in noise level equivalent to doubling current traffic volumes. The road traffic noise impact criteria applied in the assessment are summarised in Table 6.4.

The assessment of road traffic noise related to the heavy vehicle movements associated with the haulage of quarry material during the construction of the WBE reclamation areas and BUF bund walls.

Table 6.4 Significance of environmental noise exposure changes

Increase over existing noise level dB(A)	Change in subjective loudness	Significance of change
<3	Nil	Insignificant
3-5	Noticeable	Marginal
10	About double	Significant
15 or more	At least triple	Very significant

Vibration

The impact of vibration from the placement of dredge material and reclamation works on human comfort was assessed by applying the vibration impact criteria recommended by the NSW Department of Environment and Conservation's 'Assessing Vibration: A technical guideline 2006', British Standard (BS) 5228-2:2009 Code of Practice for Noise and Vibration Control on Construction and Open Site – Part 2: Vibration (2009) and BS 6472-2008 Evaluation of Human Exposure to Vibration in Buildings (1kHz to 80Hz). In accordance with BS 5228-2:2009, a vibration level of 0.14 mm/s was adopted as the trigger for the management of vibration levels as presented in Table 6.5.

The impact of vibration on buildings was assessed using BS 7385-1993: Evaluation and Measurement for Vibrations in Buildings – Part 2 Guide to Damage Levels from Ground-Borne Vibration (EMVB). The EMVB recommends vibration limits to minimise risk of cosmetic damage to residential and commercial buildings and are summarised in Table 5.10 in Section 5.6 above.

Table 6.5 Vibration impacts criteria – human comfort

Vibration level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situation for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

I am satisfied that the EIS has adequately assessed the project's potential noise and vibration impacts as a result of the placement of dredge material and reclamation works.

6.7.3 Impacts and mitigation

This section deals with the noise and vibration that would be generated during scenarios 1 and 2 (bund wall construction at the WBE reclamation areas) and scenario 3 (construction of the BUF).

Construction – Noise

Noise associated with reclamation works and the placement of dredge material would include noise generated from heavy vehicles associated with the haulage of quarry material to construct the BUF and WBE reclamation areas bund walls from the GPC-owned Ticor Quarry in the Yarwun/Targinnie area along Guerassimoff and Landing roads, and noise from machinery and equipment (i.e. dozers, excavators, generator etc.) associated with the construction of the bund walls and internal transfer of dredge material.

The EIS predicts that the noise levels from internal dredge material transfer and reclamation works would be below the EPP (Noise) acoustic quality objectives for all sensitive receptors.

The EIS states that noise from heavy vehicle movements along Guerassimoff Road and Landing Road would comply with DTMR's Code of Practice (2016). The EIS concluded, based on predicted numbers of heavy vehicle traffic during the construction of the WBE reclamation and BUF bund walls, the traffic noise emissions from Landing Road would increase by 1.5 dBA. The assessment noted that an increase of less than 3 dBA over existing noise levels is considered insignificant. As the predicted transport noise levels would meet the requirements of DTMR's Code of Practice (2016) I am satisfied that impacts on sensitive receptors have been appropriately considered.

Construction – Vibration

Vibration would be generated through the placement of quarry material and dredged material within the proposed WBE reclamation areas and BUF via dump trucks, excavators, dozers, bobcats and rollers.

The Transport for New South Wales 'Construction Noise and Vibration Strategy' and 'Construction Noise and Vibration Guideline' and previous ground vibration measurements by SLR was used to determine minimum safe working distances between construction works and sensitive receptors to manage the risk of potential impacts from ground vibration. The safe working distance criteria applied in the assessment are represented in Table 6.6.

Table 6.6 Safe working distances for sources of vibration

Plant item	Rating / description	Safe working distances (m)	
		Cosmetic damage	Perceptible impact
Vibratory roller	<50 kN (Typically 1-2 tonnes)	5	15
	<100 kN (Typically 2-4 tonnes)	6	20
Excavator	Medium <30 tonnes	5	10

The EIS states all sensitive receptors are located at a minimum distance of 3.6 km from the proposed WBE reclamation areas and BUF and 2.5 km from the proposed quarry material haulage route. Due to the distance between the construction works and the nearest sensitive receptors, the EIS concludes no perceptible impact at all sensitive receptors.

Detailed modelling of vibration impacts from mobile and intermittent sources was not undertaken for the EIS due to the extensive land area for the proposed WBE reclamation areas, and the distance of sensitive receptors from potential vibration generating sources.

Operational impacts

Following placement of dredged material in the WBE reclamation areas, the reclaimed land will be stabilised and developed for future Port land uses. Potential impacts associated with future Port development would be assessed and regulated separately to this project and are therefore not considered by this evaluation report. It is expected however that any future activities would need to comply and align with overarching Port environmental management plans.

6.7.4 Coordinator-General's conclusions: noise and vibration

I am satisfied that the EIS appropriately considered the potential noise and vibration impacts associated with the construction of the WBE reclamation areas and BUF bund walls, unloading and placement of dredged material into the WBE reclamation areas and movement of heavy vehicles for the haulage of quarry material.

I am satisfied with the proponent's conclusion in the assessment that noise generated during the construction phase would comply with the EPP (Noise) acoustic quality objectives. I consider that the assessment of construction vibration provided in the assessment is adequate and that the project's vibration impacts would be minimal. I am satisfied that the nearest sensitive receptors are located at distance far enough, of at least 3.6 km, from the WBE reclamation areas to ensure vibration effects are not experienced.

I note that the proponent has committed to implement mitigation measures detailed in the project EMP and NVMP, including the use of mobile plant with efficient acoustic mufflers on the exhausts and selection of the quietest plant and equipment that can economically undertake the work, to ensure noise and vibration generated by the project is managed appropriately (as outlined in Section 5.6.4 above).

I am satisfied with the assessment of the project's contribution to traffic noise during the construction phase. I note that the usage of Landing Road to transport quarry material 3 kms from Ticor Quarry to the WBE reclamation areas is expected to result in a minor increase of the total traffic noise by 1.5 dBA and is unlikely to be detectable.

I have stated conditions in Appendix 2 for the EA for dredging activities that set requirements for noise monitoring and recording to ensure that noise associated with capital dredging, which includes the

placement of dredged material in the WBE reclamation areas is managed to avoid nuisance at sensitive receptors.

I have also imposed a condition in Appendix 1 requiring the proponent to ensure that impact mitigation strategies are implemented in response to any complaints or feedback received from sensitive receptors. As discussed in chapter 7.2, all complaints and measures taken to rectify issues must be published on the proponent's website.

I am satisfied that through the proponent's commitments and mitigation measures identified and the conditions stated and imposed, the potential for impacts to sensitive receptors from the placement of dredged material and reclamation works can be managed.

6.8 Air quality and greenhouse gas

This section discusses the potential air quality and GHG impacts of the project associated with the construction of the WBE reclamation areas and BUF, unloading and placement of dredged material into the WBE reclamation areas and movement of heavy vehicles on internal and external roads.

6.8.1 Air quality

The existing air quality environment for the project is described in section 5.7.1 above.

The key dust-generating activities for the project will occur during the construction of the WBE reclamation areas bund walls, the construction of the BUF, extraction of earth fill and rock material on land, and the transport of construction material from quarries to the WBE reclamation areas.

Potential air quality impacts during post-dredging operations will be managed through the implementation of the 'Maintenance Dredging Strategy for the Great Barrier Reef World Heritage Area Ports Strategy' by the DTMR. This strategy includes management measures based upon Reef 2050 decision-making principles.

The impact of air quality on migratory bird habitat near the project area is addressed in Chapter 6.5 of this Report.

Submissions

Submissions on the draft EIS requested more details regarding the methodology to estimate air quality factors. These matters were addressed by the proponent in the revised draft EIS. I have considered the matters raised and the proponent's response in my evaluation of the project.

Methodology

The type of plant and equipment, its project activity purpose, the diesel fuel and fuel rate per kilometre or per hour, and the heavy fuel oil per kilowatt hour were used to identify emissions from project activities. The equipment includes graders, dozers, excavators, loaders, small skid-steer loaders, compactor-vibratory rollers, water carts, diesel generators, hydraulic pumps, sheet pile drivers, haul trucks, barges with cranes, and Junttan hydraulic impact hammer.

The baseline assumptions for the hours of use of the equipment and fuel consumption were based on the construction timeframes mentioned above.

Modelling of emissions rates from engines used in project activities included suspended particulates less than 10 micrometres in diameter (PM_{10}) and less than 2.5 micrometres in diameter ($PM_{2.5}$), and total suspended particles (TSP), nitrogen oxides (NO_x), carbon monoxide (CO) and Sulfur dioxide (SO_2).

Impacts and mitigation

Potential impacts on air quality may result from project construction activities generating dust associated with:

- construction of the BUF and the WBE reclamation areas
- placement of dredged material in the WB and WBE reclamation areas and de-watering of the dredged material.

The majority of identified emissions to air are associated with dust caused by the excavation and transport of quarry material for construction of the reclamation area. These matters are regulated by current EAs for existing quarries and are not part of this air quality assessment for project.

The EIS identified that the key dust emissions on-site are associated with the transport of the dredge material within the reclamation site. The dust-generating activities for the construction of bund walls for the BUF and WBE reclamation areas and placement of dredge material are unlikely to impact air quality in the area. Modelled ground level concentrations at all receptor locations are below EPP (Air) quality objectives during the project activities associated with the placement of the dredge material and reclamation works.

The EIS also found that project activities are unlikely to have cumulative impacts on air quality in the vicinity of the WBE reclamation areas bund walls and the BUF, as there was no predicted timing overlap for other dust-generating activities in proximity to the reclamation areas.

Despite no exceedances of EPP (Air) objectives being predicted in the EIS, the project EMP and Dredging EMP in the EIS included a number of measures relevant to minimising potential air quality impacts including:

- commitments to watering of exposed areas to reduce wind-blown dust and watering to ensure material being dozed or graded is damp
- commitment to applying suppressants to further reduce emissions from material haulage over completed sections of bund wall or other transport routes
- control emissions from earthworks through equipment selection, the use of bio-fuel and appropriate maintenance and operational procedures.

6.8.2 Greenhouse Gas Emissions

Existing environment

Section 5.7.1 provides a description of the existing GHG environment for the project.

Submissions

Submissions on the draft EIS requested more information on GHG emissions sources. This information was provided by the proponent in the AEIS. I have considered the matters raised and the proponent's response in my evaluation of the project.

Impacts and mitigation

Two construction scenarios for the WBE reclamation areas were examined to estimate fuel consumption, being a staged approach over a period of 7 years, and a singular campaign over a period of 5 years. The results were that project activities would contribute 8787 to 139,638 tonnes of CO2e over a period of 7 years, or 8787 to 175,421 CO2e over a period of 5 years.

The GHG emissions for the whole project are associated with dredging operations (67 per cent), bund wall construction (11 per cent), and dredged material earthworks (22 per cent).

The assessment included consideration of mitigation measures and corrective actions in the Air Quality Management Plan, the Dredging EMP and the project EMP to monitor dust emissions as required by model operating conditions.

The EIS included commitments to control emissions from these earthworks through equipment selection, the use of bio-fuel and maintenance and operational procedures. The proponent has also made a commitment to update the assessment of annual GHG during the detailed design phase of the project.

6.8.3 Coordinator-General's conclusions: air quality and greenhouse gas emissions

I am satisfied that the EIS has assessed the project's potential air quality and GHG impacts as a result of capital dredging works, transport of dredge material and navigational aid works. The EIS concluded that air quality impacts resulting from construction and establishment of the BUF and WBE reclamation areas and dredge material placement can be managed in accordance with the objectives of the EPP (Air). The proposed Air Quality Management Plan, the Dredging EMP and the project EMP include monitoring requirements and corrective actions for emissions generated during these project activities.

I am satisfied that the Air Quality Management Plan, the Dredging EMP, and the project EMP would manage the potential air quality impacts generated by reclamation works and dredge material placement.

I have also stated conditions in Appendix 2 for the EA for dredging activities that set requirements for air quality monitoring and recording at dredge material placement sites to ensure that any impacts are managed to ensure no impact on air quality at sensitive receptors from the project.

The GHG assessment followed NGER scheme methodology and predicted Scope 1 emissions during the reclamation works and placement of dredge material. The EIS recognised that the actual equipment used for project activities and their specifications may differ from those indicated in this assessment, and that a more accurate estimate of annual GHG will be made during the detailed design phase of the project.

The assessment included a commitment that mitigation measures to control emissions from these project activities will be minimised through equipment selection, maintenance and operational procedures. GHG emissions reporting arrangements will be included as part of the GPC's duties under the NGER scheme.

7. Whole of project matters

7.1 Cultural heritage

7.1.1 Aboriginal and Torres Strait Islander cultural heritage

This section evaluates the proponent's assessment of the potential impacts of the whole project on Aboriginal and Torres Strait Islander (ATSI) peoples' cultural heritage values. The project is located within the GBR which is a World Heritage Property and a National Heritage Place.

ATSI peoples are the traditional owners of the GBR region. There are more than 70 Aboriginal and Torres Strait Islander Traditional Owner clan groups that maintain heritage values for their land and sea country. These values may be cultural, spiritual, economic, social or physical, and demonstrate continuing connections with the GBR and its natural resources.

The Gladstone Healthy Harbour project is an intergovernmental, community and industry collaborative approach to the protection of GBR values. It includes reporting on cultural heritage matters and establishing a monitoring program for cultural heritage matters and sites. These matters will be addressed as part of the environmental impact statement required by the EPBC Decision 2012/6558.

The *Aboriginal Cultural Heritage Act 2003 (Qld)* (ACH Act) imposes a 'duty of care' upon all persons undertaking development activities to take 'all reasonable and practicable' measures to ensure that their activities do not harm matters of ATSI peoples' cultural heritage. The Cultural Heritage Management Plan (CHMP) included within the registered ILUA over the project area meets this legislative requirement.

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* provides for applications made to protect areas of objects of particular Aboriginal significance from specific threats of injury or desecration. There are no existing declared protected areas under this Act which would be impacted by the project. If such areas were identified in the future, they would be recognised and included in the ILUA.

The Port Curtis Coral Coast Traditional Owners (PCCC) finalised an agreement in August 2011 which manages traditional land use activities within their sea country within the GBRWHA in partnership with the Queensland and Australian governments. The traditional owners are responsible for initiating management strategies that will positively impact their sea country. Dugongs and sea turtles are of cultural significance to the traditional owners.

Issues raised in submissions

One submission on the draft EIS raised concerns over potential impacts to ATSI cultural heritage. I have considered this submission and the response provided by the proponent in my evaluation of the project. My assessment is provided below.

Impacts and mitigation

The EIS reported that the PCCC had oversight of, and participated in, the terrestrial and sea country desktop and field survey work to identify the direct and indirect impacts of the project on ATSI cultural heritage matters. The existing ILUA, its Cultural Heritage Protocol, the current CHMP and the traditional land use activities agreement were taken into account and complied with during the survey work.

Consultation with PCCC representatives identified concerns regarding the impact of the project on ecological and archaeological sites that may exist within the project impact areas, and the impact on country connection areas which include Dreaming and Story Places. They were also concerned about loss of access to foreshore and marine areas.

The EIS stated that the avoidance of saltwater and freshwater country cultural heritage sites will be a primary consideration in the design of the WBE reclamation areas, and that project activities will avoid and minimise the impact on recorded and potential cultural heritage sites and the natural environment. Additionally, the Healthy Harbour project managed by the GPC in consultation with community groups, traditional owners and the Queensland and Australian governments, includes a monitoring 'report card' on cultural heritage matters. This monitoring tool will contribute to the identification and protection of cultural heritage.

The EIS included specific commitments on ATSI cultural heritage which are included in Appendix 4 of this report. It also includes detailed environmental measures in the Dredging EMP, which includes an

Aboriginal Cultural Heritage EMP. These commitments and the Dredging EMP include compliance with the Cultural Heritage Protocol, the CHMP, ongoing consultation with the traditional owners to ensure that cultural considerations are taken into account during the design of the project. This includes a commitment that the footprint will not impinge upon the coastal fringe and existing buffer between the shoreline and proposed development area, which will be maintained.

The proponent has also made a number of commitments regarding ATSI peoples' employment, including environmental monitoring. The proponent has committed to employ PCCC Sea Rangers to monitor the potential impacts of the project on seagrass meadows disturbance, and all marine activities as part of the implementation the project EMP and the Dredging EMP.

7.1.2 Queensland cultural heritage

This section evaluates the proponent's assessment of the potential impacts of the whole of the project on Queensland (non-Indigenous) cultural heritage. This assessment will also include an examination of project activities which impact on underwater cultural heritage.

The *Queensland Heritage Act 1992* establishes a framework for the protection and conservation of places and areas of state cultural heritage significance which include historical and archaeological heritage, underwater cultural heritage artefacts and state and local heritage places. The Queensland government's Heritage Register includes matters of state cultural heritage, and the GRC's Local Heritage Register includes matters of local cultural heritage and is included in its planning scheme documentation.

Impacts to Queensland cultural heritage was not a key issue raised in submissions received on the draft EIS. I acknowledge the potential for impacts on Queensland Cultural Heritage and have considered them in my assessment below.

Impacts and mitigation

Desktop searches of these heritage registers were undertaken for the project areas to be dredged, the BUF and WBE reclamation areas, navigational aid locations and areas within a 5 km radius of these project areas.

The searches revealed there are no heritage-listed state or local government places or areas on the heritage registers within the project areas.

Within a 5 km radius of the project areas three local heritage places were identified – Settlement Point on Facing Island, Targinnie cemetery and William Wyndham's gravesite and remnant orchard trees. William Wyndham's gravesite and remnant orchard trees are also listed on the Queensland Heritage Register. The EIS reported that these listed places and areas above high water are highly unlikely to be indirectly impacted by project activities due to the separation distance.

The EIS included specific mitigation measures to protect cultural heritage places and areas in the form of commitments which are included in Appendix 4 of this report and the Cultural Heritage EMP in the Dredging EMP. These commitments and measures include undertaking a survey and report that describes the cultural values of places and areas, how they will be protected, the training of employees to identify cultural heritage sites and places, development of an accidental cultural heritage discovery reporting process to the relevant government agency, and that all work would cease where a cultural heritage find occurred.

7.1.3 Coordinator-General's conclusions: cultural heritage

Aboriginal and Torres Strait Islander cultural heritage

I am satisfied that the EIS has adequately investigated and assessed the potential impacts of the project on ATSI peoples' cultural heritage. An existing ILUA is in place over land-based activities. This ILUA includes a Cultural Heritage Protocol signed by the State, GPC and PCCC and a CHMP approved under the ACH Act.

The proponent has made commitments and prepared an Aboriginal Cultural Heritage EMP as part of the Dredging EMP which includes ongoing consultation with the traditional owners to ensure that cultural considerations are taken into account in the design of the project, construction and implementation of all activities associated with dredging and reclamation. I am satisfied that these commitments and ongoing consultation will address the potential impacts to ATSI peoples' cultural heritage as a result of project activities.

Queensland cultural heritage

I am satisfied that the EIS has adequately investigated and assessed the potential impacts of the project on Queensland cultural heritage matters. The EIS identified no heritage listed state or local government places or areas within the project area.

The proponent has made specific commitments and has a Cultural Heritage EMP in the Dredging EMP which include the undertaking of surveys during the design stage of the project and specific control actions to ensure the training of employees and discovery reporting process. I am satisfied that these commitments and the Cultural Heritage EMP will address the potential impacts on Queensland cultural heritage.

7.2 Social

The Coordinator-General required the EIS include a social impact assessment (SIA) that:

- defined the social and cultural area of influence
- incorporated relevant community engagement requirements
- presented a social baseline study
- developed a project workforce profile and labour supply strategies
- identified potential social impacts
- evaluated potential cumulative impacts
- proposed mitigation and management measures.

The SIA considered potential social impacts in the context of the following areas of influence:

- Central Queensland Region
- Gladstone LGA
- project-specific study areas, being the Gladstone communities of Yarwun, Targinnie, Gladstone Harbour, Gatcombe Head, Boyne Island and Tannum Sands.

7.2.1 Summary of submissions

Four submissions on the draft EIS raised the following concerns with respect to social impacts:

- potential degradation of the marine environment and consequent impacts to marine resource users, including tourism operators, and commercial and recreational fishing
- opportunities for local participation, including employment opportunities for ATSI peoples
- ongoing engagement with and the provision of emergency plans to emergency service providers
- finalisation and distribution of the Social Impact Management Plan (SIMP).

I have considered the submissions and the responses provided by the proponent in my evaluation of the project and my assessment of these matters is provided as part of this chapter.

7.2.2 Methodology

The SIA was developed in accordance with the Coordinator-General's Social Impact Assessment Guideline (March 2018).

The social baseline outlined the social environment of the primary study area in relation to the social indicators of population, housing and accommodation, key industries and employment, education and training, community wellbeing and social infrastructure.

Information presented in the social baseline was informed by data collected from publicly available documents and data sources, and feedback from consultation was used to inform the description of community and Traditional Owners' values.

Potential impacts and proposed management measures were identified through feedback from stakeholder engagement, and review of literature and documentation from other relevant projects. The assessment of potential social impacts was informed by a risk assessment approach, which considered the likelihood and severity of identified potential impacts both pre-mitigation and post-mitigation.

The management measures and monitoring approach proposed by the proponent have been collated in the accompanying draft SIMP. The SIMP provides for the management of social impacts throughout the construction and maintenance of the project.

I note that the proponent has committed to having a finalised SIMP in place prior to the commencement of project construction that incorporates the results of ongoing consultation on the refinement of the action plans, monitoring program and the engagement framework.

Accordingly, I have imposed a condition (Appendix 1) requiring the proponent to prepare a final SIMP for the project construction and operation stages to be submitted for my approval at least three months before the commencement of project construction and dredging works. As part of this condition, I require that the final SIMP be made publicly available via the project website following my approval.

The final SIMP must include performance indicators and desired management outcomes for the identified key impact areas, as per the SIA Guideline.

Overall, I am satisfied with the proponent's methodology for the SIA.

7.2.3 Community and stakeholder engagement

Engagement for the SIA and EIS

Community and stakeholder engagement to inform the SIA was undertaken as part of the project-wide engagement program for the EIS, to reduce the risk of engagement fatigue for stakeholders.

The TOR required the proponent to implement a comprehensive and inclusive engagement strategy for the EIS process. This included documenting the engagement processes used to conduct open and transparent dialogue with stakeholders in a public consultation report.

The proponent undertook initial engagement for the project between 2013 and 2015. This engagement focused on obtaining feedback on the project, proposed reclamation sites and baseline monitoring. Several investigation workshops were held with State and Commonwealth government representatives and Traditional Owner stakeholders to discuss dredged material placement options for the project.

Stakeholder engagement for the EIS occurred from February 2018 to February 2019. The engagement process was guided by a Stakeholder Engagement and Communication Strategy.

The Stakeholder Engagement Report (provided in Appendix N2 of the revised draft EIS) reports that the proponent has conducted comprehensive engagement and engaged with a diverse range of stakeholders, including:

- Commonwealth government departments and agencies
- state government agencies
- local government
- commercial stakeholders and fishing industry groups
- directly affected landholders
- community and environmental groups
- Traditional Owners
- community members.

The proponent also used a variety of methods to engage different stakeholders and ensure participation was inclusive. Key engagement activities included:

- establishment of a Stakeholder Representative Group (SRG), with six meetings held between February 2018 and February 2019
- one-on-one discussions and focus group meetings
- targeted stakeholder briefings
- distribution of project information and updates to stakeholders and the community through:
  - project factsheets and newsletters
  - a project page on GPC's webpage
  - media release
  - announcements on social media platforms.
- collection of general community feedback via a free call 1800 telephone number, email, and online feedback form.

I note that both the SIA and Stakeholder Engagement Report described the SRG as a valuable forum for sharing project information and collaboratively discussing and addressing stakeholders' concerns regarding the project. This engagement mechanism was well received by participating stakeholders who reported positive involvement in the process to GPC. The proponent has accordingly committed to ongoing operation of the SRG during project construction phase, with the frequency of these meetings to be detailed in the project communications and stakeholder engagement plan (CSEP) submitted as part of the final SIMP.

Overall, I consider the stakeholder engagement undertaken by the proponent to inform the SIA and EIS to be acceptable for this stage of the project's development. The proponent has engaged with a wide and relevant range of stakeholders and provided them with timely and relevant information on the project. The engagement processes implemented also provided affected stakeholders adequate opportunity to provide feedback on the project.

While I commend the variety of engagement approaches adopted, I note that the outcomes of the SRG meetings were not publicly published on GPC's website, thus limiting transparency for those stakeholders not directly involved in them. I would expect that the CSEP submitted as part of the final SIMP would include provision for the publication of the SRG meeting outcomes.

Ongoing community and stakeholder engagement

The proponent has committed to ongoing engagement with stakeholders and the local community throughout the project lifecycle. The Stakeholder Engagement Report prepared as part of the EIS indicated the proponent would continue to inform and engage local communities post-EIS through media updates, factsheets, website updates, community forums and continuation of the SRG meetings.

The proponent has also committed to developing a communications plan prior to the commencement of the project's construction works, implementing a complaints management and dispute resolution process, and appointing a project liaison person for the duration of the project. I support these commitments.

I note that the draft SIMP submitted as part of the EIS identifies 'ongoing engagement' as the proposed mitigation measure for several impacts identified in the SIA. I have addressed specific issues identified for ongoing discussion with relevant stakeholders in detail under the relevant key matters below (refer section 7.2.4 to 7.2.7).

To ensure that ongoing community and stakeholder engagement is effective and informs the proactive management and monitoring of potential project impacts during the construction and operations phases, I have imposed a condition (Appendix 1) requiring the proponent to prepare a project CSEP as part of the final SIMP, to be submitted to me for approval at least three months before the commencement of project construction and dredging works.

7.2.4 Workforce management

In line with the requirements of the ToR, the SIA included a summary workforce profile for the construction and post-construction phases of the project. The SIA also included an analysis of the local and regional labour market and its capacity to support the project's proposed labour requirements.

Construction

The project will require an estimated construction workforce of 386 people. Initially, the project will require 20 personnel for the establishment of the WBE reclamation areas and other preparation works, including BUF construction. The construction workforce would increase for later construction stages, with approximately 366 people required for dredging, dredged material placement and navigational aid works.

The SIA indicated that during peak periods of dredging and reclamation works, up to 316 employees could be sourced from the local and regional area. These workers would be engaged in activities associated with dredging (i.e. assistance to trailing suction hopper dredger and cutter suction dredger crew), barge unloading, dredged material placement works and navigation aid works. These activities will require workers with general civil construction and machinery and plant operation skills.

While the proponent has committed to maximising opportunities for local workers, the SIA acknowledges that dredging activities would be contracted to an international dredging contractor. Accordingly, a small

proportion of the construction workforce (an estimated 50 workers) will be sourced internationally. This international workforce is required due to the complex and specialist nature of the dredging works, and the limited availability of dredging contractors in Australia with the capability to complete the required large-scale works.

While the region of Central Queensland is projected to experience a shortage of construction workers from 2019 to 2022, the SIA reported that this is unlikely to affect the project's labour demands given the period of peak construction workforce will not occur until after 2023. Data from the Department of Housing and Public Works[17] projects that this trend will be reversed, with Central Queensland forecasted to have a surplus of construction workers from 2023 to 2028. This supports the proponent's assumption that the existing Gladstone labour pool will be sufficient to supply the majority of the project's workforce requirements for the long-term.

Post-construction

Post-construction, the project workforce is estimated to be 23 people. The post-construction workforce would be involved in stabilisation and maintenance activities on the WBE reclamation areas and annual maintenance dredging. Given the small number of workers required for ongoing post-construction activities, the SIA has assumed that these workers will be sourced from the local Gladstone community.

Potential impacts and management measures

Employment and training

The SIA identified that the increase in availability of local jobs to support dredging activities during construction as a key positive impact arising from the project. The use of a primarily local workforce would also reduce the potential for negative social impacts commonly associated with the influx of a non-local workforce, such as increased pressure on housing, social services and infrastructure (see section 7.2.5 and 7.2.7). The SIA stated, however, that direct local employment opportunities for dredging works would be limited due to the shortage of specialised domestic dredging equipment and operators.

To enhance potential local employment opportunities, the proponent, as part of a draft workforce management plan, has committed to work with both the dredging and bund wall construction contractors to develop appropriate recruitment and training programs. This will include identifying roles that can be filled by local workers, with a focus on recruitment and training opportunities for apprentices, trainees and under-represented groups in the construction industry, such as ATSI Peoples, women or people who identify as having a disability. The SIA also stated the project will comply with the Queensland Government Building and Construction Training Policy, which requires a minimum of 15 per cent of the total labour hours on eligible projects be undertaken by apprentices and/or trainees and through other workforce training.

I acknowledge the proponent's commitments for local employment in general construction activities and the limited opportunities for direct local workforce participation in dredging activities. Whilst I appreciate the likely need for a specialised overseas dredging contractor, I am keen to ensure benefits from construction of the project are maximised for local workers.

The Workforce Management Plan to be prepared as part of the SIMP is to detail actions within the proposed recruitment and training programs to develop the skills base and future local workforce capability specifically in relation to the maritime dredging. This may include actions to help local workers and new entrants gain qualifications in this field, upskill or reskill, or undertake an apprenticeship or

[17]National Institute of Economic and Industry Research (NIEIR), (2018), *Queensland region construction supply and demand analysis: 1995-2028 and quarterly indicators to June 2020*, prepared for the Department of Housing and Public Works, Queensland.

traineeship pathway. This would increase capacity of the local workforce to service the dredging phase of the project and maintain long-term involvement in this specialised industry.

I also recognise a submission on the EIS raised the matter of employment opportunities for Aboriginal and Torres Strait Islander peoples and discussed the potential for the project to incorporate a minimum employment target in line with the GPC Reconciliation Action Plan. I therefore require a target and/or performance indicator for Indigenous employment on the project be established as part of the SIMP (see section 7.2.2). This should be guided by GPC's existing commitments under their Reconciliation Action Plan. In addition to the above, I have imposed a condition requiring that the proponent's CSEP detail how potential project employment opportunities will be effectively communicated to prospective job seekers within the local and regional community. This is required to ensure recruitment is transparent to potential employees and local job opportunities are maximised.

Community cohesion

The SIA considered potential impacts of the project workforce on the social character of the local Gladstone community. It considered that changes to local character and negative impacts on community cohesion were unlikely given the small size of the construction and operation workforce relative to the resident population of Gladstone. Regardless, the proposed workforce management plan included in the draft SIMP contains details of management measures to safeguard against potential impacts on community cohesion, including:

- developing a workforce code-of-conduct which outlines acceptable behaviour, standards for work performance and appropriate ways of interacting with the residents of Gladstone
- embedding the code-of-conduct in all contract documentation as well as training and induction programs before workers commence their employment.

7.2.5 Housing and accommodation

The TOR required the SIA to discuss the capability of existing housing and rental accommodation to meet any additional demands created by the project.

The SIA baseline highlighted that there is a strong availability of affordable housing and rental accommodation in Gladstone LGA. Rental prices in Gladstone LGA were shown to have declined from March 2016 to March 2018, with Gladstone LGA having the lowest median rental price in 2018 compared with all other major North Queensland LGAs. The median house sale price for selected suburbs in Gladstone LGA for the January 2017- 2018 period were shown to vary considerably, ranging from $140,000 in Barney Point to $370,000 in Tannum Sands.

While the SIA baseline did not provide an indication of vacancy trends, the demonstrated affordability of rental and housing accommodation in Gladstone LGA suggest that availability is not a problem in the area at present. Data from Real Estate Institute of Queensland indicates that Gladstone had a healthy rental vacancy rate of 3.1 per cent at March 2019[18], supporting this assumption.

Housing and accommodation strategy

As most of the project construction and operational workforce is expected to reside in Gladstone LGA, the proponent does not propose to provide dedicated accommodation for project personnel. The proponent has indicated that dredge workers sourced internationally would be accommodated in

[18] Real Estate Institute of Queensland (2019), *Queensland Market Monitor: June 2019*. **https://www.reiq.com/REIQ_Docs/Member_Resources/QMM/QMM_Issue42.pdf?utm_source=Informz&utm_medium=EDM&utm_campaign=Email**

Gladstone in short-medium term accommodation when not on board vessels for dredging works. The SIA demonstrated that this strategy is unlikely to impact this form of accommodation as vacancy rates for hotel and motel accommodation in Gladstone has been steadily increasing following completion of the liquified natural gas projects: for example, 61 per cent of hotel and motel rooms were vacant and available in June 2016 compared with 57 per cent in June 2015 and 39 per cent in June 2014.

Potential impacts and management measures

The SIA does not anticipate the selected approach to workforce accommodation to impact negatively on the housing and rental market. This is due to the small population of the project workforce relative to the resident population, and the current affordability and availability of accommodation in the Gladstone LGA. As a safeguard, the proponent has committed to work with local real estate agents in Gladstone to secure accommodation for non-local project employees. The proponent has also stated that during the off-peak and shoulder season (that is, the period between peak and off-peak seasons), the project would utilise the holiday accommodation market where possible to meet short-term accommodation needs for project employees.

The SIA acknowledges that the construction of other projects in the region has potential to increase demand for accommodation with cumulative impacts on availability and affordability. However, it considers this impact unlikely as project construction is not anticipated to coincide with any other projects in Gladstone LGA with significant workforce demands (see section 7.2.1).

I am therefore satisfied that the proponent has proposed housing and accommodation arrangements for the project workforce that will not contribute to significant affordability and availability impacts on housing and accommodation in Gladstone LGA due to the high availability of affordable rental stock relative to the size of the project workforce.

7.2.6 Local business and industry procurement

Potential impacts and mitigation measures

The project will contribute to the regional economy through three avenues: the employment of a predominantly local and regional construction and post-construction workforce (see section 7.2.4), local business procurement, and long-term regional economic growth (see section 7.3 for discussion of this identified benefit).

With respect to local procurement, the proponent has committed to procure personnel, goods and services locally to enhance benefits to the local economy, wherever possible. The SIA indicated that construction of the WBE reclamation areas and BUF as well as barge unloading and dredged material placement activities would require the procurement of general civil construction contracting services, including machine and plant operations. The SIA acknowledged that these works would likely be undertaken by a contractor procured locally given the good availability of these services in the Gladstone LGA.

The proponent has also committed to work with the appointed contractor/s to identify opportunities to source other goods and services from regional businesses and suppliers, including Indigenous businesses. To achieve this objective, the proponent has stated that they will prepare a Local Industry Procurement and Participation Plan in consultation with the Office of Advanced Manufacturing and the Queensland Office of the Industry Capability Network. In addition to this commitment, I require that proponent's CSEP detail how potential procurement opportunities will be communicated to prospective businesses within the local and regional community, including ATSI businesses.

7.2.7 Health and community wellbeing

Potential impacts and mitigation measures

The SIA identified a range of issues that may potentially impact the health and safety, amenity values, and social, cultural and economic wellbeing of communities in the Gladstone area during project activities. These include:

- potential reduced visual amenity for residents from dredging vessel operations and activities associated with the WBE reclamation areas and BUF construction
- disturbance to residents due to noise from project equipment during dredging and installation of navigational aids
- potential impacts to fish resources and the amenity of coastal areas in Gladstone Harbour and the wider Port Curtis area through reduced water quality, with potentially resulting impacts to community lifestyles and the economic wellbeing of water-based industries such as tourism and commercial fishing
- potential impacts on Traditional Owners' cultural, spiritual, and environmental values arising from reduced quality of coastal and water resources
- potential safety risks as a result of increased road and maritime traffic
- potential cumulative impacts on social infrastructure and services arising from the demands of the project construction workforce combined with other projects in the region.

Amenity impacts

Permanent impacts on amenity values due to construction of the WBE reclamation areas and BUF are largely unavoidable and would change the current visual character of the landscape when viewed from Yarwun, Friend Point, The Narrows and the Port near the existing WB reclamation area. However, I find that these changes would be consistent with the visual character of the existing industrial dominant landscape of the Port and the adjacent Western Basin reclamation area.

Other amenity impacts associated with the presence of dredging and construction equipment would be temporary and would resolve once construction is complete. The proponent has committed to carry out ongoing consultation and regularly update the community on the timing and duration of project activities to manage these impacts.

Noise and disturbance impacts

Residents located on Facing Island and Boyne Island may experience noise impacts from dredging and navigational aid installation activities. While methods to control construction and maintenance noise are outlined in the noise and vibration chapters of this report (see chapters 5.6 and 6.7), the proponent has also committed to undertake consultation with residents in these affected areas to establish the least sensitive daytime periods for navigational aid piling and dredging activities.

In addition to this commitment, I have imposed a condition requiring the CSEP (to be submitted as part of the SIMP) (Appendix 1) to set out the specific processes and measures which will be used to provide advanced notice to stakeholders of construction activities. This includes any works which may occur outside of standard working hours, interruptions to utility services, changed traffic, access and parking conditions, or periods of predicted high noise, vibration or traffic activities.

The CSEP must also outline the project's process for registering, managing and resolving community complaints and grievances.

Commercial fishing, recreational fishing and tourism operator impacts

While baseline water conditions are naturally turbid, Gladstone Harbour and the wider Port Curtis area support a variety of commercial and recreationally important fish species. The EIS identified that project construction activities have the potential to reduce existing water quality and cause direct habit loss at the WBE reclamation areas, which may potentially result in impacts to the location of fish stocks and fish catch size.

This may impact on the livelihoods of coastal and water-dependent industry sectors, such as commercial fishing and tourism, as well as the lifestyle of the local and visiting regional community who engage in recreational fishing. In addition to adherence to mitigation measures identified in the project's EIS chapters on water quality, nature conservation and noise and vibration, the proponent has committed to ongoing engagement with commercial fishing groups, recreational fishers and the tourism industry leading up to and during construction. The process and timing of this proposed engagement must be outlined in the project's CSEP as part of the SIMP to be submitted to me for approval at least three months before the commencement of project construction and dredging. I note that any compensation to be negotiated between the proponent and these groups for potential impacts will occur independent of this EIS process. The development of a complaints management process for the project as part of the CSEP will further ensure community complaints and grievances are responded to respectfully and systematically.

Traditional Owner impacts

The coastal fringe and adjacent Port Curtis area (including Port of Gladstone) are of high cultural and spiritual significance to people of the PCCC Traditional Owners. These areas are used regularly by the Traditional Owners for cultural activities such as fishing and hunting, with ongoing use of saltwater and freshwater country providing the basis for personal and group identity, as well as the transfer of cultural knowledge and traditions. PCCC representatives also acknowledge that they have a cultural responsibility to protect the natural ecology of Port Curtis.

While existing access to Port Curtis for cultural activities would not be restricted by the project, possible water quality changes may affect marine flora and fauna in the Port and wider Port Curtis area, which may adversely affect Traditional Owner values to maintain the health and sustainability of these natural resources. According to Chapter 16 of the EIS, PCCC representatives indicated that, where possible, project activities should be designed to minimise impact on recorded and potential cultural heritage sites and the natural environment. They also advised that construction impacts should be minimised so important cultural activities (e.g. fishing, knowledge transfer) can continue unaffected within the Port Curtis area.

To assist in achieving these objectives, the proponent has committed to continue ongoing engagement with Traditional Owners about their values, traditional fishing grounds and addressing potential project impacts on these matters. This engagement will be carried out in accordance with the Cultural Heritage Protocol established under the existing ILUA. The SIA has also indicated that the proponent will contract PCCC Sea Rangers to monitor the potential impacts of project marine activities. In addition to this commitment, I recommend the CSEP (as part of the SIMP) outline the processes, scope and timing for the proposed PCCC Sea Rangers involvement in ongoing project monitoring. These details should be agreed to by the PCCC Sea Rangers.

Maritime and road safety impacts

Project dredging would result in an increase in construction-related maritime traffic in the Port, which may increase congestion and safety risks for other maritime users. The EIS determined there will be 5.6 additional vessel movements per day during Stage 1 and 4.4 additional vessel movements per day during Stage 2 (see section 5.5). The proponent has committed to communicate scheduled dredging

activities to maritime users and provide additional safety information for boating around dredging vessels and barges to address these risks.

The SIA identifies that construction activities associated with the WBE reclamation areas and BUF construction would cause increased traffic movement on Guerassimoff Road and Landing Road (up to 216 of light vehicle movements per day and up to 198 heavy vehicles per day). This may decrease road safety for commercial and industrial users of this local road network, as considered in section 6.6.2. The proponent has committed to undertake consultation and information sessions with the Targinnie and Yarwun communities and local industry about mitigation measures to be implemented by the project to improve safety on these roads during construction.

In addition to these commitments, I have imposed a condition requiring the CSEP (as part of the SIMP) (Appendix 1) to set out the specific processes and measures which will be used to provide advanced notice to stakeholders (i.e. maritime users and local industry) of construction activities, including any works which may occur outside of standard working hours; changed traffic, access and parking conditions; changed marine facility access, or periods of predicted high noise, vibration or traffic activities. The CSEP must also outline the project's process for registering, managing and resolving community complaints and grievances.

I acknowledge a submission on the EIS raised concern about the potential impact of project construction on the operation of maritime safety and other emergency services, as discussed in section 5.5. While the SIA did not examine potential impacts of the project on emergency services planning and response, I note that the proponent has committed to prepare an emergency response plan. To ensure that the project does not adversely impact on the level of service from existing emergency services, I recommend that the proponent develop the emergency service plan in cooperation with the Queensland Police Service, Queensland Ambulance Service, Queensland Fire and Emergency Services and Maritime Safety Queensland prior to construction commencing (Appendix 4).

Cumulative impacts on social infrastructure and services

The SIA included an analysis of the availability of, and an assessment of the project's potential impacts on, existing social infrastructure and services in the Gladstone LGA. This included: education and childcare facilities, health and welfare services, emergency services, entertainment and recreation facilities, and public transport infrastructure.

As most of the project construction and operational workforce are expected to be sourced from Gladstone LGA, and therefore reside locally, the SIA does not anticipate the project workforce to have a significant impact on social services and infrastructure in Gladstone. The SIA also considers the potential for cumulative demand on social services and infrastructure to be minimal as project construction is not anticipated to coincide with any other projects in Gladstone LGA with significant workforce demands.

As a safeguard, the proponent has committed to provide State and local government departments responsible for education, health and other social services with forecasts of workforce numbers to assist with their future service planning. While I accept this commitment, I require the CSEP (as part of the SIMP) to provide details of the timing and specific agencies to which this information would be given (Appendix 1).

7.2.8 Coordinator General's conclusions: social impacts

I am satisfied that the SIA was prepared generally in accordance with the SIA Guideline (2018) and that the strategies prepared as part of the SIA demonstrate the proponent is committed to ensuring that the project does not significantly impact on the local community.

I am satisfied the SIA has been informed by adequate community and stakeholder engagement and stakeholders were given sufficient opportunity to provide comment on the proposed project.

Overall, I consider that the project will deliver social benefits for the Gladstone region as a result of increased employment and business opportunities during dredging construction activities. I note the proponent's commitment to utilise a local workforce, with the possibility that up to 316 employees could be sourced from the Gladstone LGA for general construction activities during dredging and reclamation works.

To ensure the benefits of dredging work are shared locally, I require the proponent's recruitment and training programs proposed as part of the Workforce Management Plan include actions to develop the skills base and future local workforce capability to support maritime dredging.

I consider it unlikely that the project workforce demand will result in local skills shortages or excess demand for housing and accommodation. This is due to the small population of the project workforce relative to the resident population, and the current affordability and availability of accommodation in the Gladstone LGA.

I am also satisfied that the identified potential impacts on health and community wellbeing as a result of the project can be appropriately managed through implementation of the commitments which the proponent has made, along with the requirements of conditions in this report.

To ensure the potential impacts identified by the SIA are avoided, minimised or mitigated, and benefits enhanced, I have imposed a condition (Appendix 1) requiring the proponent to submit a final SIMP for the construction and operations phases of the project. The final SIMP must be submitted for approval at least three months before the commencement of project construction and dredging. The SIMP is to outline the proposed management measures for key impacts and benefits identified in the SIA and must include a monitoring and evaluation framework.

To address potential construction impacts on Traditional Owner values, I have recommended the final SIMP outline the processes, scope and timing for the proposed PCCC Sea Rangers involvement in ongoing project monitoring.

I note that the current draft SIMP identifies 'ongoing engagement' as the proposed mitigation measure for several impacts identified in the SIA. To ensure this occurs, I require that the proponent prepare a CSEP, which outlines the approach to this ongoing engagement, as part of the final SIMP to be submitted for my approval. The CSEP must outline the project's process for registering, managing and resolving community complaints and grievances. It should also outline the frequency of SRG meetings during the project construction phase and include provision for the publication of SRG meeting minutes and outcomes on GPC's website.

I have also imposed a condition requiring the proponent to report annually on the implementation and effectiveness of the SIMP during the construction and dredging stage (Appendix 1).

7.3 Economics

7.3.1 Port overview

The Port is Queensland's largest multi-commodity port and is nationally significant as one of the few naturally sheltered deep-water ports on the east coast of Australia.

The EIS identified that the project would reduce the average anchorage and berth delays, support increased capacity and efficiency of the Port and generate employment and economic activity.

It would also support future growth in coal (primarily metallurgical) and LNG exports and is expected to support the establishment of hydrogen exports from the Gladstone region.

Existing Port capacity and forecast growth

The Port directly supports the resources sector by operating the facilities required to export significant quantities of the state's mineral resources to international markets, and the import of raw materials from national and international markets. Major exports from the Port include coal (primarily metallurgical), LNG, bauxite, alumina, cement, petroleum, ammonia and grain.

The vessels accessing the Port range in size from small fishing vessels, to large bulk carriers known as capesize vessels, with a capacity of up to 220,000 dead weight tonnage (dwt), overall length of 308 m and a draft (hull) of 18 m. The EIS found that there has been a consistent increase in total commercial vessel numbers from 1316 in FY 2010-11 to 1785 in FY 2017-2018, much of which corresponds to the increases in coal and LNG exports from the Port.

In order to understand the current situation and potential economic impacts of the project, the EIS estimated low growth and moderate/high growth scenarios to assess the existing and future demand for Port capacity, with predictions from a base operational capacity of 120 Mtpa in FY 2017-18, with 270 of 1785 total vessel movements being large capesize vessels.

Predicted Port throughput and vessel numbers for each scenario are presented in Table 7.1. The predicted future growth of throughput and vessel numbers for each scenario are based on existing operational capacity, potential expansions and new industrial and resource growth anticipated within the region.

Table 7.1 Predicted growth scenarios for the Port from 2017-18 base operational capacity

	Low growth scenario	Moderate/high growth scenario
Port throughput 2030-31 (Mtpa)	136	172
Total vessel numbers 2030-31	1959	2069
Vessel numbers (capesize) 2030-31	309	385

Entry and exit from the Port is via a series of single width harbour channels, and shallower bypass channels for the Gatcombe, Golding Cutting, Clinton and Auckland channels. Complex interactions between shipping movements, vessel size profiles, shipping channel constraints and tidal conditions limit the total number of annual vessel movements in the Port.

The EIS identified that based on the future projected increases in Port throughput, the number of bulk carrier vessels requiring access to the Port will increase. The project is essential to capitalise on this increase in trade to maximise Queensland's resource industry and export growth.

The existing shipping channels, particularly bypass channels, and the above constraints limit the number of larger vessels that can access the port per year. This means that larger vessels often need to 'queue' to enter the port, referred to as 'anchorage'. Delays at anchorage occur mostly outside the Port limits around the Fairway Buoy, within the GBRWHA. Anchorage can also occur at a small number of defined locations within port limits.

This project is required to improve port throughput efficiency and support predicted increases to shipping movements, particularly for large vessels. The proponent has undertaken vessel simulation modelling for the Port under various throughput scenarios to determine the average length of vessel delays at the anchorage and berths. Predicted port throughput and vessel delays without the duplication of the shipping channels for each scenario are presented in Table 7.2.

The risks in shipping detention and delays has the potential to reduce the competitiveness of ships utilising the Port and their return on investment. This could potentially lead to a loss of business and potential negative impact on the local and regional economy with loss of employment, income and economic growth.

Table 7.2 Existing and predicted delays at the anchorage and berths

	Average annual throughput (tonnage)	Average annual throughput (number of vessels)	Average anchorage delays	Average berth delays
Existing shipping traffic (July 2014-June 2017)	111.85 Mt	1694	5.4 hours/ vessel	2.3 hours/ vessel
Predicted shipping traffic (FY2023-24)	138.30 Mt	2008	6.5 hours/ vessel	2.7 hours/ vessel
Predicted shipping traffic (ultimate case, reasonable maximum future throughput for all current trades)	203.90 Mt	2727	18.7 hours/ vessel	4.5 hours/ vessel

Based on the vessel simulation modelling in the table above, the proponent estimates that this project, once fully delivered, has the potential to result in cost savings for the Port from avoiding fees associated with delays at anchorage and berths (demurrage). This project is estimated to result in a 60 to 80 per cent reduction in average anchorage and berth delays.

Key industries supported by the Port

The increased efficiencies resulting from the project will support an increased throughput to accommodate future expansion of key industry and resources exports.

The Port services an area containing two major coal basins connected to the Port by rail, as well as two minor coal basins. It has a potential resource opportunity catchment area comprising:

- the central and southern Bowen Basin which includes thermal and coking coal reserves
- the Surat Basin which includes agricultural production, thermal coal reserves and coal seam gas reserves
- the Wide Bay Burnett region and the North Burnett Minerals Province which includes coal resources and a range of other potential mineral resources including gold, silver, kaolin, limestone, ilmenite, apatite, scandium, feldspar, siltstone, silica sand, black granite and clay. There is also investigation of coal seam gas in this region.

As reported in the EIS, coal is Australia's and Queensland's largest energy export with exports to China, India, Japan, South Korea expected to increase in the future. The Port exported 67.2 Mtpa of coal in financial year 2017-2018 and is expected to continue as a major coal exporting port. Approximately 80 per cent of coal exported from the Port is high-value metallurgical coal.

There has been extensive investment in the LNG industry in Gladstone with the completion of the Port's three LNG facilities on Curtis Island. It is expected that LNG exports will continue to grow, and the Gladstone LGA has the necessary infrastructure and supply chain to extract, process, store and transport this resource. LNG exports reached full capacity of 20.3 Mt in FY 2017-2018 , and the EIS estimates LNG exports through the Port will increase to over 33 Mt by FY 2020-2021. This export volume is valued at over $13.6 billion (subject to market conditions). The contributions from the LNG projects are likely to extend out to the year 2050.

The EIS states the greatest contributor to the gross regional product (GRP) when based on employment and value-added data measures was the mining industry (15.1 per cent). Value-added impacts are a measure of productivity of an industry sector and represents the economic value added by each local industry, relative to a regional benchmark. This indicator informs the role each industry sector performs in the economy by directly comparing the percentage contribution of each industry to the total size of the GRP (i.e. some industry sectors generate significant turnover but are not big employers).

Other major value-added contributors were the manufacturing industry (12.1 per cent) and the transport, postal and warehousing industry (10.5 per cent) and the construction industry (9.8 per cent).

In comparison, the largest industry employers in the Gladstone LGA were manufacturing (12.5 per cent), retail trade (11.6 per cent), and construction (9.7 per cent). Mining is a relatively small industry employer in the Gladstone LGA overall, employing approximately 3 per cent of the workforce.

7.3.2 Methodology

The proponent used an input-output model to estimate the potential economic impact of the capital cost of the works of the project through a multiplier effect. The input-output model has considered the local investment impact on the economy, income generated from wages and salaries, employment and economic growth measures. I acknowledge that there are limitations of the methodology and assumptions presented in the EIS for predicting job figures and economic benefits, however the EIS has provided sufficient information to indicate that the project would improve the operational and economical efficiencies of the Port as well as the safety of vessel movements, and provide local employment and supply chain opportunities.

The costs associated with maintenance dredging of the duplicated channels and operational management activities of the WBE reclamation areas will form part of the Port-wide annual maintenance dredging and port land management requirements. Therefore, operational impacts were not considered in the input-output analysis.

7.3.3 Impacts and mitigation

Economic benefits

The EIS estimated the potential positive impacts to the local, regional and state economies during the construction and operational phases of the project. The value of impacts depends on fluctuations of global economic factors such as global demand, exchange rates and commodity prices.

The Queensland Government received $73.8 million in dividends from the GPC in the 2018/19 financial year, an increase of 19.2 per cent from the previous year[19]. During that year, the Port accounted for 72.3 Mt of annual exports, an increase of five Mt to coal exports due to improved efficiencies and growing demand. There were also record shipments of 21.5 Mt of LNG exports from the three Curtis Island LNG plants.

The economic benefit of the capital cost of the project to the local economy is estimated to be approximately $250 million, approximately one-third of the capital investment. This proportion is due to dredging work being likely to be contracted to an overseas dredging operator due to a shortage of specialised domestic dredging equipment and operators. Two-thirds of the project expenditure is expected to therefore flow out of the Gladstone region in the form of leasing payments to the dredging

[19] Gladstone Ports Corporation, Annual Report 18/19 accessed on 9 February 2020, https://static.wixstatic.com/ugd/af53ef_98479b40a0cc40669546f91295a00087.pdf

contractor and workforce. Local benefits would be derived from accommodation and living expenses of the local workforce and indirect positive impacts on local businesses, such as locally employed labour.

The EIS includes the commitment to prioritise sourcing of goods and services from the local, regional and wider state economy during construction and maintenance through a Local Industry Participation Plan (LIPP), which is discussed in detail in section 7.2.6.

The proponent anticipates potential economic benefit from the implementation of the Gatcombe and Golding Cutting Channel duplication dredging (both dredging Stages 1 and 2) to be cost savings to the Port from avoiding fees associated with delays at anchorage and berths, in turn increasing the efficiency of shipping movements in the Port. These savings are expected to flow to the State as increases in Port dividends.

The proponent estimates potential future demurrage cost savings are based on an average future demurrage cost per vessel of $20,000 per 24 hours. Based on the simulation modelling for the Port under throughput scenarios outlined in Table 7.2, the proponent estimates the potential cost savings (based on the 2023/24 financial year scenarios) of:

- for a low-growth scenario: between $9.24 million and $12.32 million of savings
- for a high-growth scenario: between $31.64 million and $42.18 million of savings.

The estimated benefits of the project include the revenue due to increased trade and the value of avoiding lost revenue that could occur if the project is not undertaken. Without the duplication of the Gatcombe and Golding Cutting shipping channels, the proponent estimates potential lost opportunity to increase the Queensland Government export royalties once the Port throughput exceeds 150 Mt annually. The EIS estimated the lost opportunity to increase royalties from increased resource sector exports to be between approximately $500 million to $1 billion per year, depending on the annual Port throughput and the type and nature of export products in the future.

The improved efficiency of shipping movements in the Port predicted as a result of this project would also reduce the need for queuing of ships offshore in the GBRWHA while awaiting appropriate tidal conditions.

The project will support future resource and industry expansion and is predicted to provide a direct benefit of $160 million for the state's economy during dredging and construction stages, comprising:

- $73 million from establishment of WBE reclamation areas, BUF and initial dredging works
- $48 million from Stage 1 dredging works
- $39 million from Stage 2 dredging works.

The predicted positive impacts identified for the project in the EIS include:

- an estimated 60 per cent to 80 per cent reduction in the average anchorage and berth delays, and associated reductions to risk of vessel incidents in the Port
- predicted increased in Port dividends to the State, flowing from cost savings between $9.24 million and $42.18 million annually in efficiencies due to reduced delays at anchorage and berths
- the creation of approximately 386 full time equivalent (FTE) jobs during construction and 23 jobs during operations
- the commitment to develop employment, training and supply opportunities for local people, and local employment and training opportunities for school leavers, women, Aboriginal people and the unemployed/underemployed for the construction phase

- the commitment to prioritise sourcing of goods and services from the local, regional and wider state economy during construction and maintenance through a Local Industry Participation Plan (LIPP).

Commercial and recreational fishers

Gladstone Harbour and the wider Port Curtis area support a variety of commercial and recreationally important fish species. The EIS found that project construction activities have the potential to impact on water quality, which may impact on the location of fish stocks and fish catch size. This may affect the livelihoods of coastal and water-dependent industry sectors, such as commercial fishing and tourism, as well as the lifestyle of the local and visiting regional community who engage in recreational fishing activities.

There is the potential for the project to have adverse economic impacts on commercial fishing, local tourism and diving operators in the Gladstone region as Port Curtis and the associated intertidal areas and upstream rivers and creeks are an important resource for commercial fisheries. This area contributes approximately two per cent of Queensland's commercial fish yield. Both inshore and offshore fisheries operate out of this area with commercial fishing activities in the area consisting of crabbing, trawling, net fishing, line fishing and tourist charters.

Port Curtis also supports the recreational fishing industry, which is a key component of the region's tourism industry. Land-based recreational fishing occurs around Port Curtis where there is public access to the shore.

The EIS identified mitigation measures for water quality, nature conservation and noise and vibration which would also address potential impacts on fish. Additionally, I have stated conditions in Appendix 2 requiring the proponent to enter into an agreed delivery arrangement to offset any significant residual impact on marine plants as matters of state environmental significance, which also support fish species.

The proponent has provided a commitment to undertake ongoing community engagement with commercial fishing groups, recreational fishers and the tourism industry to identify any potential socioeconomic impacts associated with the project on commercial and recreational fishers. The process and timing of this proposed engagement is to be outlined in the project's CSEP. I have set this requirement in conditions imposed in Appendix 1.

I am satisfied that the measures proposed to protect marine environmental values (including water quality and fisheries resources) and conditioned requirements for stakeholder engagement are adequate to address concerns around potential impacts to commercial and recreational fishers. Where there may be a potential impact to commercial and recreational fishers, I note that any compensation to be negotiated between the proponent and these groups would occur independent of this EIS process.

Cruise ships and tourism

The EIS identified that since 2016 the Port has been home to the beginnings of a cruise ship industry. In 2018, five cruise ships docked at the Auckland Port Terminal, and 14 cruise ships docked in 2019. The Gladstone Marina comprises 320 mooring booths catering to private, charter and service vessels.

The EIS found that the project is not expected to impact on cruise ship services and their ability to berth at the Auckland Port Terminal with port access and through navigation maintained throughout dredging. The project is therefore unlikely to impact cruise tourism spend and revenue.

The EIS found that tourism-based services (fishing charters and the ferry to Heron Island) and recreational boating (fishing or cruising) located at the Gladstone Marina will not be impacted by the project with port access and through navigation maintained throughout dredging. The operations of the marina (mooring berths catering to private, charter and service vessels) and associated facility will not be affected.

7.3.4 Coordinator-General's conclusions: economics

I am satisfied that the project would provide economic benefits to in the region and facilitate more efficient operation of the Port I am satisfied that the EIS has provided sufficient information to indicate that the project would improve the operational and economical efficiencies of the Port as well as the safety of vessel movements, and provide local employment of 386 FTE during construction and 23 FTE jobs during operations and supply opportunities for local businesses.

The estimated benefits of the project include the revenue due to increased trade and additional Port dividends to the state flowing from estimated costs savings of between $9.24 million and $42.18 million over time, based on modelling using 2023/24 financial year scenarios.

The project is also expected to avoid potential losses to Queensland Government export royalties in the order of $500 million to $1 billion per year. The EIS concluded the direct economic benefit for the state's economy of the project would be approximately $160 million. There will also continue to be direct benefits to the state via payment of dividends as the Port throughput continues to increase, supported by the project.

Notwithstanding the identified economic benefits of the project, I recognise that future development within the Port will be driven by demand for additional berths and portside infrastructure.

To maximise the economic benefits of the project, I expect the proponent to:

- maximise local employment opportunities over the life of the project, including opportunities for indigenous employment
- continue consultation with port users during detailed design and during dredging activities to inform them of upcoming activities and possible project impacts on their operations
- continue consultation with commercial fishing groups in the lead-up to, and during dredging activities
- ensure that Queensland suppliers, contractors and manufacturers are given full, fair, and reasonable opportunity to tender for project-related business activities.

As discussed in section 7.2, the proponent is expected to regularly review and update their LIPP as necessary to ensure that benefits to the local community are maximised. This review should be undertaken at least annually.

The proponent has committed to ongoing engagement with residents and businesses in order to identify and mitigate any potential negative socioeconomic impacts associated with the project from dredging and reclamation works. This includes impacts to businesses such as commercial fishers and tourism operators. To further strengthen this commitment, I have imposed a condition requiring the proponent to prepare a CSEP that details the processes which the proponent will utilise to engage with potentially-impacted stakeholders in order to further develop relevant impact mitigation strategies for the project (Appendix 1). These strategies are to be incorporated into documents such as the construction environmental management plan (CEMP), DMP or other relevant policies or management plans.

I am satisfied that the EIS included sufficient information to indicate that the project would provide significant economic benefits to the Gladstone region and the state and provide local employment opportunities.

8. Conclusion

In undertaking my evaluation, I have considered the EIS (comprising draft EIS and revised draft EIS), submissions on the draft EIS, supplementary agency advice.

I am satisfied that the requirements of the SDPWO Act have been met and that sufficient information has been provided to enable the evaluation of potential impacts, and the development of mitigation strategies and conditions of approval.

The environmental assessment commenced with declaration of this project as a coordinated project in September 2012 and has involved a comprehensive body of work by the proponent. More detailed work will occur in the detailed design phase of the project.

I consider that the mitigation measures and the commitments proposed by the proponent together with the conditions stated and imposed in this report would result in acceptable overall outcomes.

Based on the information provided by the proponent and outlined in this evaluation report, I conclude that the project would enable the Port of Gladstone to accommodate forecast future growth and provide better safety and efficiency for larger vessels navigating the Port. The project would provide local employment opportunities and support established and emerging industries in the Gladstone region.

Accordingly, I recommend the Port of Gladstone Gatcombe and Golding Cutting Channel Duplication project proceed, subject to the conditions in Appendices 1 and 2 and the recommendations in Appendix 3. In addition, I require the proponent's commitments to be fully implemented as presented in the EIS documentation and included in Appendix 4 of this report.

I note that the proponent has committed that the design and construction methodology for the bund walls of the WBE reclamation areas has been developed, and will continue to be refined, in consideration of the findings of the Independent Review of the Bund Wall at the Port of Gladstone (2014). I have also stated conditions to require the bund walls be constructed in accordance with industry best practice.

To proceed further, the proponent will be required to:

- obtain EPBC Act approval
- obtain the relevant development approvals under the *Planning Act 2016* and environmental authorities under the *Environmental Protection Act 1994*
- obtain relevant approvals under the *Fisheries Act 1999*
- finalise and implement the Dredging EMP, project EMP and the Environmental Monitoring Procedure
- finalise the environmental offsets strategy.

If there are any inconsistencies between the project (as described in the EIS) and the conditions in this report, the conditions shall prevail. The proponent must implement all the conditions of this report.

Copies of this report will be issued to:

- DAWE
- DES
- SARA
- DAF
- DTMR
- Queensland Treasury.

A copy of this report will also be available on the Department of State Development, Tourism and Innovation's website at **wwww.dsdmip.qld.gov.au/gladstonechannel**

This report will generally lapse six years following publication date of this report, unless I set another date at a future time that extends the report.

Appendices

Appendix 1. Imposed conditions

This appendix includes conditions imposed by the Coordinator-General under section 54B of the *State Development and Public Works Organisation Act 1971* (SDPWO Act). In accordance with section 54D of the SDPWO Act, these conditions apply to anyone who undertakes the construction and operational aspects of the project, such as the proponent, an assignee, agent, contractor, subcontractor or licensee of the proponent.

All the conditions imposed in this appendix take effect from the date of this Coordinator-General's evaluation report. These conditions do not relieve the obligation for approvals and licences from relevant authorities required under any other Acts to be obtained for the project.

Schedule 1. Social conditions

Condition 1. General

(a) The proponent must advise the Coordinator-General in writing of the commencement of project construction and dredging within twenty (20) business days of the date of commencement.

Condition 2. Social impact management plan

(a) The proponent must submit to the Coordinator-General for approval a finalised social impact management plan (SIMP) at least three months prior to commencement of project construction.

(b) The SIMP must outline the proposed management measures for key impacts identified in the social impact assessment.

(c) The SIMP must include a communications and stakeholder engagement plan in accordance with Condition 3.

(d) The SIMP must include a monitoring and evaluation framework that includes performance indicators and desired management outcomes for the identified key impact areas.

(e) The proponent must publish the SIMP on their website within one month of the Coordinator-General's approval of the plan.

(f) The SIMP is to be reviewed and, if necessary, amended during the construction and dredging stages in response to changed circumstances or increased knowledge of impacts.

Condition 3. Communications and stakeholder engagement plan

(a) The proponent must prepare a communications and stakeholder engagement plan (CSEP) that is to be submitted as part of the SIMP to the Coordinator-General for approval, in accordance with Condition 2 of this schedule.

(b) The CSEP must include the following:

- (i) objectives and key performance indicators
- (ii) a summary profile of the local community, focusing on potentially affected stakeholder groups
- (iii) an analysis of key stakeholders and stakeholder issues
- (iv) communication activities and tools
- (v) roles and responsibilities for engagement
- (vi) engagement schedules and/or action plan
- (vii) monitoring and reporting requirements
- (viii) an appropriately-scaled complaints management process
- (ix) processes for incorporating stakeholder feedback into further development of project-specific impact mitigation strategies

(x) processes for providing timely notification to local job seekers and industry service providers (including Aboriginal and Torres Strait Islander businesses) regarding potential employment and procurement opportunities

(xi) processes for providing advanced notice to the stakeholders of construction activities, including: any works which may occur outside of standard working hours; interruptions to utility services; changed traffic, access and parking conditions; changed marine facility access, or periods of predicted high noise, vibration or traffic activities

(c) The CSEP is to be reviewed and, if necessary, amended during the construction and dredging stages in response to changed circumstances or increased knowledge of impacts.

Condition 4. Reporting on the implementation of social impact management plan

(a) The proponent must report on the implementation and effectiveness of measures to manage the project's social impacts during the construction and dredging stage.

(b) The proponent is to provide an annual social impact management report (SIMR) to the Coordinator-General for each year of construction and dredging works, from the commencement date of project construction.

(c) The SIMR must:

(i) describe the social impact management actions undertaken with respect to each of the key impacts identified in the project EIS social impact assessment and the effectiveness of these actions in achieving the management objectives and performance indicators established for each impact area in the SIMP.

(ii) where relevant, identify any new impacts (negative and positive) on project-affected communities from the project during the relevant construction and dredging phases and the management actions undertaken to address them.

(iii) report community attitudes towards the project and key themes received from consultation and complaint mechanisms, including how key complaints were resolved.

(d) Each SIMR must describe the construction workforce management and mitigation strategies that have been implemented. This must include a description of the number of workers who identify as having a disability, identify as an Aboriginal or Torres Strait Islander or are female.

(e) Each SIMR is to be made publicly available on the proponent's website within one (1) month of review completion by the Coordinator-General.

Appendix 2. Coordinator-General's stated conditions

Schedule 1. Environmental Authority (ERA 16(1)(d)) (dredging) (Stage 1 dredging works)

This schedule includes the Coordinator-General's stated conditions for an environmental authority for Environmentally Relevant Activity 16(1)(d) (dredging) under the *Environmental Protection Act 1994*, stated under section 47C of the *State Development and Public Works Organisation Act 1971*.

The entity with jurisdiction for conditions in this schedule is the Department of Environment and Science.

Schedule A. General

Condition number	Condition
G1	**Activities** conducted under the environmental authority must be conducted in general accordance with the following limitations: (a) **dredging** is limited to **capital dredging** for the purpose of duplicating the Gatcombe and Golding Cutting shipping channels, and providing a barge access channel to allow barges filled with project **dredged material** to be unloaded at a barge unloading facility at the existing Western Basin reclamation area; (b) **dredging activity** may only commence once proposed dredge material has been sampled in accordance with the *National Assessment Guidelines for Dredging 2009* and include sampling of contaminants of concern including PFAS and risk analysis in accordance with the PFAS National Environmental Management Plan. (c) The sampling results and analysis must be submitted to the **administering authority** at least six (6) months prior to the submission of the dredge management plan in accordance with G22 to either of the addresses below: palm@des.qld.gov.au; or Permit and Licence Management Department of Environment and Science GPO Box 2454 Brisbane QLD 4001 (d) **dredging** may only occur in general accordance with the following plans*: (i) Figure 2.9: Gatcombe and Golding Cutting Channel Duplication Area, version 3, dated 18 April 2018, where relevant to Stage 1 dredging works; (ii) Figure 2.10: Proposed area to be dredged – Stage 1 (-13.5m LAT), version 4, dated 13 November 2017; and (iii) Figure 2.17: Proposed area to be dredged for barge access channel and barge unloading facility, version 6, dated 13 December 2018. (e) **dredged material placement** and **construction** must only occur within the Western Basin Expansion reclamation area and the existing Western Basin reclamation area shown in Figure 2.19, version 16, dated 23 November 2018*; (f) a total maximum of 7.25 million cubic metres of **dredged material** as measured in situ may be **removed** from the Gatcombe and Golding Cutting shipping channels as part of the dredging works; (g) a total maximum of 0.25 million cubic metres of **dredged material** as measured in situ may be **removed** from the barge access channel as part of the dredging works; (h) **dredging** must not result in an impact to seagrass meadow condition and extent in the receiving environment unless approved under the *Fisheries Act 1994*. Note:

Condition number	Condition
	*Figures from EIS documents must be updated to meet the following minimum standards: • Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including: – adjacent real property boundaries; – adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area; – relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs); – the location and setting out details for cross-sections; and – any other information required to accurately define the area and to allow the site to be readily identified from the plan. • All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 or GDA2020 projection.
G2	All reasonable and practicable **measures** must be taken to prevent or minimise the likelihood of environmental harm being caused by the **activities**.
G3	Any breach of a condition to this environmental authority must be reported to the **administering authority** as soon as practicable within 24 hours of **you** becoming aware of the breach. **Records** must be kept including full details of the breach and any subsequent actions undertaken.
G4	Other than as permitted by this environmental authority, the **release of a contaminant into the environment** must not occur.
G5	Environmental monitoring results must be kept until surrender of this environmental authority. All other information and **records** that are required by the conditions of this environmental authority must be kept for a minimum of five (5) years. All information and **records** required by the conditions of this environmental authority must be provided to the **administering authority**, or **nominated delegate** in the specified format with each annual return.
G6	An **appropriately qualified and experienced person(s)** must monitor, record and interpret all indicators that are required to be monitored by this environmental authority and in the manner specified by this environmental authority and the **Dredge Management Plan (DMP)**.
G7	All analyses required under this environmental authority must be carried out by a laboratory that has National Association of Testing Authorities (**NATA**) certification, or an equivalent certification, for such analyses. The only exceptions to this condition are for in situ monitoring of: • turbidity; • temperature; • pH; • conductivity; • dissolved oxygen (DO); and • benthic photosynthetically active radiation (BPAR). All monitoring equipment must be calibrated for each monitoring round and monitoring must be conducted in accordance with the latest version of the **administrative authority's** Monitoring and Sampling Manual.
G8	When required by the **administering authority**, monitoring must be undertaken in the manner prescribed by the **administering authority**, to investigate a complaint of **environmental nuisance** arising from the **activity**. The monitoring results must be provided to the **administering authority**, or **nominated delegate**, within the specified time period and in the specified format upon request.
G9	Written notification of the commencement date must be provided to the **administering authority** at least five (5) business days prior to establishing the **dredging activity** and **construction**.
G10	The **activity** must be undertaken in accordance with written procedures that: (a) identify potential risks to the environment from the **activity** during routine operations, closure and an emergency;

<table>
<tr><th>Condition number</th><th>Condition</th></tr>
<tr><td></td><td>(b) establish and maintain control measures that minimise the potential for environmental harm;
(c) ensure plant, equipment and measures are maintained in a proper and effective condition;
(d) ensure plant, equipment and measures are operated in a proper and effective manner;
(e) ensure that staff are trained in and aware of their obligations under the Environmental Protection Act 1994;
(f) ensure that reviews of environmental performance are undertaken at least annually.</td></tr>
<tr><td>G11</td><td>The dredging activity must not commence unless the lawful disposal or placement of the dredged material has been fully authorised under all relevant authorities, licences or other permits issued by the Commonwealth and Queensland governments. Evidence of all necessary approvals must be provided to the administering authority upon request.</td></tr>
<tr><td>G12</td><td>(a) Authorised dredged material placement must only take place within the locations, for the following purposes and at the total maximum volumes set out in Table G1 – Placement locations and purpose of dredged material.
(b) Georeferenced plans for the Western Basin Reclamation Area and Western Basin Expansion reclamation area must be provided prior to the commencement of dredging activities and construction.

Table G1 Placement locations and purpose of dredged material
<table>
<tr><th>Location</th><th>Material</th><th>Purpose</th><th>Total maximum volume</th><th>Total maximum area</th></tr>
<tr><td>Within the existing Western Basin reclamation area (Lot 508 SP239687 and Lot 504 SP245961) and/or the Southern Western Basin Expansion reclamation area as shown on Figure 2.18: Property details and tenure for Western Basin Expansion reclamation area, version 11, dated 10 March 2020*</td><td>Dredged material</td><td>Reclamation of tidal lands</td><td>0.71 Mm^3
(being placement of 0.25 Mm^3 of dredged material as measured in situ from the barge access channel)</td><td>398.12 ha</td></tr>
<tr><td>Within the Southern reclamation area and Northern reclamation area (if required) as shown on Figure 2.18: Property details and tenure for Western Basin Expansion reclamation area, version 11, dated 10 March 2020*</td><td>Dredged material</td><td>Reclamation of tidal lands</td><td>9.06 Mm^3
(being for placement of 7.25 Mm^3 of dredged material as measured in situ from the Gatcombe and Golding Cutting shipping channels)</td><td>276.1 ha</td></tr>
</table>
Table note:
*Plans from EIS documents must be updated appropriate georeferencing/latitude and longitude and provided with development applications.</td></tr>
<tr><td>G13</td><td>Any containment structures at the Western Basin Expansion Reclamation Area in condition G12 must be certified by an appropriately qualified and experienced person(s) (e.g. registered professional engineer of Queensland) and maintained to the certified design.</td></tr>
<tr><td>G14</td><td>Dredged material must not be disposed of in tidal water, unless undertaken in accordance with condition G12.</td></tr>
<tr><td>G15</td><td>Dredged material must not be rehandled in tidal water except for transfers of dredged material from dredgers into barges, and from barges into trucks or other infrastructure for placement within the locations stated in condition G12.</td></tr>
</table>

Condition number	Condition
G16	**Sediment plume associated monitoring (SPAM)** must be undertaken. This must include **continuous logging** at **concern sites** and **control sites**, with a baseline collection phase (**baseline-based assessment** with **control site**-based checking).
G17	Prior to the commencement of the **dredging activity**, a **DMP*** for the **dredging activity** must be developed and implemented, in consultation with the **Dredge Technical Reference Panel**, and the **DMP** must contain the following: (a) Clearly stated aims and objectives including a conceptual model linking the stressors, monitoring indicators and potential impacts to all **sensitive receptors**. (b) Description of dredging operations, including: (i) type of equipment to be used in **dredging**; (ii) volume of **dredged material** to be **removed**, and duration and timing of the **dredging** campaign; (iii) methods to be utilised for transporting **dredged material**; and (iv) **dredged material** disposal or placement methods and management. (c) Description of dredging operations to be repeated for each stage of the project (d) Maps or plans showing: (i) legend, north arrow and scale; (ii) boundaries of **dredging** operation; (iii) estimated or modelled **zone of influence** of sediment plumes; (iv) location of designated disposal sites; (v) up to date location of **sensitive receptors**; (vi) all monitoring locations. (e) A detailed description of **sediment plume-associated monitoring** program, including: (i) Monitoring indicators, sampling frequency and methods; (ii) location of monitoring sites; (iii) quality assurance methods and reporting of results. (f) A detailed description of the assessment methodology to provide data in relation to **trigger values** that will define **alert levels**. (g) Stipulate the **trigger values** and **alert levels** for each monitoring location that would be used to identify whether sediment plumes extend beyond the predicted zone of impact. (h) Clearly set out data handling and evaluation procedures that demonstrate how exceedance of alert levels will be determined. (i) Management actions to be initiated if triggers or **alert levels** are exceeded including the requirement to cease dredging where benthic PAR light requirements are not met as defined in the DMP. (j) Receiving Environment Monitoring Plan (REMP) and Fauna Management Plan need to be reviewed and updated to reflect project activities. (k) Details of the **Dredge Technical Reference Panel** members and their respective roles. (l) Detail on fauna, seagrass and coral monitoring conducted during and following the EIS. Note: *The **DMP** is subject to review and amendment as required by changing regulation, monitoring results or administrating authority.
G18	The **Dredge Technical Reference Panel** membership must include independent experts in the fields of: (a) coral biology (b) seagrass biology (c) marine fauna biology (turtles, fish, dugongs and cetaceans) (d) coastal hydrodynamics and sediment transport

Condition number	Condition
	(e) water quality (f) cultural heritage.
G19	The **Dredge Technical Reference Panel** membership and respective roles must be submitted to the **administering authority** a minimum of twenty (20) business days prior to its first meeting and, if necessary, membership to be amended in accordance with any comments made by the **administering authority**.
G20	The **DMP** and **Dredge Technical Reference Panel** membership must be provided to the **administering authority** at either of the addresses below. palm@des.qld.gov.au; or Permit and Licence Management Department of Environment and Science GPO Box 2454 Brisbane QLD 4001.
G21	The **DMP** must not be implemented or amended in a way that contravenes or is inconsistent with any condition of this authority.
G22	The **DMP** must be submitted to the **administering authority** at least fifty (50) business days prior to the commencement of **dredging activities** and the proponent will amend the **DMP** in accordance with any comments made by the **administering authority** prior to the commencement of **dredging activities**.
G23	Any amendments to the DMP must be submitted to the **administering authority** in accordance with condition G20 and within at least ten (10) business days of the amendment being made. The proponent will further amend the **DMP** in accordance with any comments made by the **administering authority** within twenty (20) business days of comments being provided.
G24	The **dredging activity** must be undertaken in accordance with the **DMP** required in condition G17.
G25	A two-part report validating the hydrodynamic modelling outputs of the dredge plume detailed in the report Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project Additional Information to the Environmental Impact Statement, Appendix D, Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project EIS Coastal Processes and Hydrodynamics Technical Report (prepared by BMT WBM, dated 16 July 2019, reference R.B20020.003.13.coastal_processes_and_hydrodynamics.docx, revision 13), must be submitted to the **Dredge Technical Reference Panel** and the **administering authority**. Part A of the report, as outlined below, must be submitted no more than three (3) months after the commencement of **dredging** within the Gatcombe and Golding shipping channels and Part B of the report must be submitted no more than three (3) months after the commencement of tailwater releases from the reclamation area/s. PART A of the report must: • describe the approaches used to validate the modelling, • provide a comparison between actual and predicted turbidity concentration, • describe measurements of sediment and hydrodynamic information, and • be performed within the **dredge footprint** under representative conditions expected to occur during **dredging activities**, including sediment types, wind and wave conditions. PART B of the report must: • describe the approaches used to validate the modelling, • provide a comparison between actual and predicted total suspended solids and turbidity concentration, • describe the spatial extent of plumes in relation to dredging activities and tailwater releases, and • be performed within the tailwater plume under representative conditions expected to occur during **dredging activities**, including sediment types, wind and wave conditions.

Schedule B. Matters of State Environmental Significance

<table>
<tr><th>Condition number</th><th>Condition</th></tr>
<tr><td>MS1</td><td>
Significant residual impacts to a prescribed environmental matter are not authorised under this environmental authority unless the impact is specified in Table MS1 – Authorised significant residual impacts to prescribed environmental matters. The impacts specified in Table MS1 are only authorised to the maximum extent of impact prescribed in Table MS1.

Table MS1 Authorised significant residual impacts to prescribed enivornmental matters
<table>
<tr><th>Prescribed environmental matter</th><th>Location of impacts*</th><th>Maximum extent of impact (ha) – construction and dredge material placement activities within the Western Basin Expansion northern and southern reclamation areas and barge unloading facility</th><th>Maximum extent of impact (ha) - dredging of the of the Gatcombe and Golding Cutting shipping channels and barge access channel</th><th>Total maximum extent of impact (ha)**</th></tr>
<tr><td>Habitat for an animal that is vulnerable wildlife –
green turtle (Chelonia mydas)^</td><td></td><td>377.61</td><td>2104.46</td><td>2482.07</td></tr>
<tr><td>Habitat for an animal that is endangered wildlife –
loggerhead turtle (Caretta caretta)^</td><td></td><td>377.61</td><td>2104.46</td><td>2482.0</td></tr>
<tr><td>Habitat for an animal that is vulnerable wildlife –
flatback turtle (Natator depressus)^</td><td></td><td>0</td><td>2104.46</td><td>2104.46</td></tr>
<tr><td>Habitat for an animal that is endangered wildlife –
hawksbill turtle (Eretmochelys imbricata)^</td><td></td><td>377.61</td><td>2104.46</td><td>2482.07</td></tr>
<tr><td>Habitat for an animal that is endangered wildlife –
olive ridley turtle (Lepidochelys olivacea)^</td><td></td><td>0</td><td>2104.46</td><td>2104.46</td></tr>
<tr><td>Habitat for an animal that is vulnerable wildlife –
dugong (Dugong dugon)^</td><td></td><td>374.64</td><td>912.63</td><td>1,287.27</td></tr>
</table>
</td></tr>
</table>

Condition number	Condition				
	Habitat for an animal that is vulnerable wildlife – Australian humpback dolphin (*Sousa sahulensis*)^		377.61	2104.46	**2482.07**
	Habitat for an animal that is vulnerable wildlife – beach stone curlew (*Esacus magnirostris*)		480.03	0	**480.03**
	Habitat for an animal that is vulnerable wildlife – eastern curlew (*Numenius madagascariensis*)^		480.03	0	**480.03**
	Habitat for an animal that is vulnerable wildlife – western Alaskan bar-tailed godwit (*Limosa lapponica bauera*)^		480.03	0	**480.03**
	Habitat for an animal that is vulnerable wildlife – greater sand plover (*Charadrius leschenaultii)*^		480.03	0	**480.03**
	Habitat for an animal that is endangered wildlife – red knot (*Calidris canutus*)^		480.03	0	**480.03**
	Habitat for an animal that is endangered wildlife – curlew sandpiper (*Calidris ferruginea*)^		480.03	0	**480.03**
	Habitat for an animal that is endangered wildlife – great knot (*Calidris tenuirostris*)^		480.03	0	**480.03**
	Habitat for an animal that is endangered wildlife – lesser sand plover (*Charadrius mongolus*)^		480.03	0	**480.03**
	Habitat for an animal that is endangered wildlife – Northern Siberian bar-tailed		480.03	0	**480.03**

Condition number	Condition
	godwit (*Limosa lapponica menzbieri*)^				
	A wetland of high ecological significance		73.61	0	**73.61**
	Table notes: ^Impacts on the prescribed environmental matters which are matters of national environmental significance would also be assessed under the EPBC Act. Any offsets for these matters would be delivered as required by the Commonwealth. *Insert georeferenced, scaled maps showing area of impact for each of the prescribed environmental matters listed. **Figures in this column are the maximum extent of impact permissible for all components of the Port of Gladstone Gatcombe and Golding Cutting Duplication project.
MS2	An **environmental offset** must be undertaken for the extent of impact to each of the **prescribed environmental matters** identified in Table MS1— Authorised significant residual impacts to prescribed environmental matters in accordance with the *Environmental Offsets Act 2014*. Note: the deemed conditions listed in the *Environmental Offsets Act 2014* apply. These deemed conditions are detailed in sections 19B, 22, 24 and 25 of the *Environmental Offsets Act 2014*.
MS3	The impacts authorised in condition MS1 may be carried out in stages.
MS4	The environmental offset requirement detailed in condition MS2 can be delivered for each stage of impact.
MS5	A **notice of election** for the staged environmental offset referred to in condition MS4 must be provided to the **administering authority** prior to the commencement of that stage in accordance with the *Environmental Offsets Act 2014*.
MS6	Prior to the commencement of each stage, the **administering authority** must be provided with a report, completed by an **appropriately qualified and experienced person(s)**, which analyses the following: (a) for the forthcoming stage–the estimated impact to each **prescribed environmental matter**; and (b) for the previous stage(s), if applicable–the actual impact to each **prescribed environmental matter**, to date.
MS7	The authority **holder** must have entered into an **agreed delivery arrangement** with the **administering authority**, before starting any works for the stage that impacts on the **prescribed environmental matters** listed in Table MS1 – *Authorised significant residual impacts to prescribed environmental matters*.
MS8	Within six (6) months from the completion of the final stage of the project, a report completed by an **appropriately qualified and experienced person(s)**, that includes the following matters must be provided to the **administering authority**: (a) an analysis of the actual impacts on **prescribed environmental matters** resulting from the final stage; and (b) if applicable, a **notice of election** to address any outstanding offset debits for the authorised impacts.

Schedule C. Air

Condition number	Condition
A1	Other than as permitted within this environmental authority, odours or airborne contaminants must not cause **environmental nuisance** at a **sensitive place** or **commercial place**.
A2	**Air Quality Management Plan** An Air Quality Management Plan must be developed and implemented by an **appropriately qualified and experience person(s)** prior to the commencement of **activities**. The Air Quality Management Plan must be submitted to the **administering authority** at least sixty (60) business days prior to commencement of **dredging activities** and **construction**. The proponent will amend the Air Quality Management Plan in accordance with any comments made by the **administering authority** prior to the commencement of **dredging activities**.
A3	The Air Quality Management Plan required by Condition A2 must include: (a) identification of dust sources and **activities** which impact on dust sensitive areas; (b) a preventative management system for dust control; (c) a **Trigger Action Response Program**; (d) design of an internal operational monitoring program including objectives; (e) performance criteria and monitoring methods; (f) number and location of monitoring sites; (g) quality assurance/quality control (QA/QC) requirements; (h) community liaison and stakeholder consultation; (i) training of staff in dust management practices and their roles and responsibilities; and (j) reporting.
A4	When required by the administering authority, oxides of nitrogen (as NO_2) monitoring of power generators must be undertaken in accordance with the current edition of the **administering authority**'s Air Quality Sampling Manual to determine the impact on the receiving environmental arising from the activity. The monitoring results must be provided to the **administering authority** within 10 business days of completion of monitoring.
A5	**Dust nuisance** The holder of this environmental authority must ensure that all reasonable and feasible avoidance and mitigation **measures** are employed so that the dust and particulate matter emissions generated by the **activity** do not cause exceedances of the following levels when measured at any **sensitive place** or **commercial place**: (a) Dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with the most recent version of *Australian Standard AS3580.10.1 Methods for sampling and analysis of ambient air—Determination of particulate matter—Deposited matter – Gravimetric method* (b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM_{10}) suspended in the atmosphere of 50 micrograms per cubic metre over a 24-hour averaging time, when monitored in accordance with the most recent version of either: (i) Australian Standard AS3580.9.6 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM10 high volume sampler with size-selective inlet – Gravimetric method, or (ii) Australian Standard AS3580.9.9 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM10 low volume sampler—Gravimetric method. (c) A concentration of particulate matter suspended in the atmosphere of 90 micrograms per cubic metre over a 1 year averaging time, when monitored in accordance with the most recent version of *AS/NZS3580.9.3:2003 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—Total suspended particulate matter (TSP)—High volume sampler gravimetric method*.

Condition number	Condition
	Note: an ongoing dust deposition monitoring program must be developed and implemented during the operation of the project. The PM10 and total suspended particles (TSP) air quality monitoring must be conducted in accordance with conditions A6 and A7.
A6	When requested by the **administering authority** or as a result of a complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer), dust and particulate monitoring (including dust deposition, TSP and PM_{10}) must be undertaken, and the results thereof notified to the **administering authority** within fourteen (14) days following completion of monitoring. This includes providing interim reports if the monitoring lasts for more than one (1) month. Monitoring must be carried out at a place(s) relevant to the potentially affected dust **sensitive place**. Monitoring must be conducted in accordance with the appropriate standards.
A7	If the monitoring which is carried out in accordance with Condition A6 indicates an exceedance of the relevant limits in Condition A5, then the holder of this environmental authority must notify the **administering authority** within seven (7) days of an exceedance and investigate whether the exceedance is due to emissions from the **activity**. If the **dredging activity** is found to be the cause of the exceedance, then the holder of this environmental authority must: (a) address the complaint including the use of appropriate dispute resolution if required; and (b) immediately implement dust abatement **measures** so that emissions of dust from the **activity** do not result in further **environmental nuisance**.

Schedule D. Water

Condition number	Condition
WT1	A REMP must be developed and implemented to monitor, identify, describe and respond to any adverse impacts to: (a) marine water quality (b) water flows (c) aquatic flora and fauna (d) corals and (e) any receiving **waters**.
WT2	The REMP must include periodic monitoring for the effects of any release on the receiving environment as a result of contaminant releases to waters from the **dredging activity** and **construction**.
WT3	The REMP must: (a) assess the condition or state of receiving **waters** spatially within the Port of Gladstone (the REMP area) using accurate and reliable monitoring approaches sufficient to describe temporal variation (e.g. seasonality). (b) describe a conceptual model that defines stressors and potential impacts in the receiving environment and identifies the linkages between expected response and the monitoring indicators to be monitored including but not limited to turbidity and Total Suspended Solids (TSS), nutrients, metals and metalloids and justify: (i) the indicators and sampling frequency and timing, and (ii) assumptions and choices made in preparation of the REMP. (c) The monitoring design (i.e. monitoring locations, indicators, sampling frequency and data analysis techniques) must facilitate assessment against water quality objectives for the relevant **environmental values** that need to be protected. (d) detail monitoring locations and water quality indicators pertinent to the **sensitive receptor** types and locations that have been designed to:

<table>
<tr><th>Condition number</th><th>Condition</th></tr>
<tr><td></td><td>(i) determine the baseline condition of water quality and sensitive receptors (i.e. corals and seagrass meadows) within the zone of influence to a sufficient resolution to be capable of reliably detecting lethal and sublethal (stress) impacts,
(ii) based on the draft trigger values contained in Table WT3 and Table WT4 confirm the locally-relevant trigger values for key water quality indicators including turbidity, and
(iii) provide on-line near real-time monitoring capability for key sediment plume-related indicators (including but not limited to turbidity, pH, electrical conductivity).
(e) specify the frequency and timing of sampling required in order to reliably assess ambient conditions and to provide sufficient data to derive site specific background reference values in accordance with the Environmental Protection (Water) Policy 2009 (Curtis Island, Calliope River and Boyne River Basins Environmental Values and Water Quality Objectives) (DEHP 2014)
(f) provide an assessment of seagrass meadow health and extent in the receiving waters
(g) include, where appropriate, monitoring of metals/metalloids in sediments (for example, in accordance with ANZECC & ARMCANZ 2000 and/or the most recent version of Australian Standard 5667.1)
(h) apply procedures and/or guidelines from ANZECC and ARMCANZ 2000 and other relevant guideline documents
(i) describe sampling and analysis methods and quality assurance and control.</td></tr>
<tr><td>WT4</td><td>The REMP must be implemented prior to commencement of dredging activities and construction and not cease until after dredging activities are completed.</td></tr>
<tr><td>WT5</td><td>A report outlining the findings of the REMP, including all monitoring results and interpretations must be prepared and made publicly available on the proponent’s website annually, within one month of its completion and remain accessible for the duration of the action. The first report must be published prior to the commencement of dredging activities and construction. This report must describe the results from the program described above. Reports completed after commencement must include a comparison between conditions before and after commencement of the activity for all indicators.</td></tr>
<tr><td>WT6</td><td>The proponent must not discharge, irrigate or otherwise release potable water, wastewater, stormwater, harvested water, bilge water or sewage effluent unless the discharge complies with discharge criteria defined for this activity and approved by the administering authority.</td></tr>
<tr><td>WT7</td><td>The proponent must ensure that maintenance and cleaning of any vessels, vehicles, plant or equipment within s is not carried out where contaminants can be released into any receiving waters.</td></tr>
<tr><td>WT8</td><td>Other than as permitted within this environmental authority, contaminants must not be released to any waters.</td></tr>
<tr><td>WT9</td><td>The only contaminants to be released to surface waters are:
(a) bed sediments necessarily disturbed during dredging and construction at locations specified in condition G1, and
(b) contaminants released at the tailwater discharge locations specified in Figure 2.19: Western Basin Expansion reclamation area, version 16, dated 23 November 2018 in accordance with Table WT1 - Surface water release limits and the associated monitoring requirements.

Table WT1 Surface water release limits
<table>
<tr><th rowspan="2">Parameter</th><th colspan="2">Release limit</th><th rowspan="2">Monitoring frequency</th></tr>
<tr><th>Minimum</th><th>Maximum</th></tr>
<tr><td>TSS</td><td></td><td>100 mg/L</td><td>Monthly or weekly during discharge events</td></tr>
</table>
</td></tr>
</table>

Condition number	Condition

NTU		62.5[1]	Every two (2) hours during discharge events*
pH	6.5	9.0	Every two (2) hours during discharge events**
DO		100% sat[2]	Monthly or weekly during discharge events
Ammonia (nitrogen)		8 µg/L[2]	Monthly or daily if pH is outside release limits
TN		210 µg/L	Monthly or weekly during discharge events
TP		29 µg/L	Monthly or weekly during discharge events
Aluminium		24 µg/L	Monthly or daily if pH is outside release limits
Arsenic (III) (filtered)		2.3 µg/L[3]	Monthly or daily if pH is outside release limits
Arsenic (V) (filtered)		4.5 µg/L[3]	Monthly or daily if pH is outside release limits
Cadmium (filtered)		0.7 µg/L[5]	Monthly or daily if pH is outside release limits
Chromium (VI) (filtered)		4.4 g/L[4]	Monthly or daily if pH is outside release limits
Copper (filtered)		1.3 g/L[4]	Monthly or daily if pH is outside release limits
Lead (filtered)		4.4 g/L[4]	Monthly or daily if pH is outside release limits
Mercury (filtered)		0.1 µg/L[5]	Monthly or daily if pH is outside release limits
Nickel (filtered)		7.0 µg/L[5]	Monthly or daily if pH is outside release limits
Silver (filtered)		1.4 µg/L[4]	Monthly or daily if pH is outside release limits
Zinc (filtered)		15 µg/L[4]	Monthly or daily if pH is outside release limits
TPH		10 mg/L	Monthly

Associated monitoring requirements:

- * While NTU is to be monitored at the commencement of discharge events and every two (2) hours during discharge events.
- ** While pH is to be sampled at the commencement of discharge events and every two (2) hours during discharge events.
- Monitoring must be in accordance with the methods prescribed in the latest version of the administrative authority's Monitoring and Sampling Manual.
- Samples must be representative of the general condition of the water body or sediments.

Condition number	Condition
	• All determinations must employ analytical practical quantification limits of sufficient sensitivity to enable comparisons to be made against water quality objectives/triggers/limits relevant to the particular water or sediment quality characteristic. • Monitoring must be undertaken during a release and at the frequency stated. • All monitoring devices must be calibrated and maintained according to the manufacturer's instruction manual. <u>Table notes:</u> (1) The NTU release limit is based on the TSS and NTU relationship established within the Port of Gladstone during the Western Basin Dredging and Disposal Project (i.e. TSS = 1.6 x NTU) (2) Source: Table 2A MD2421 Western Basin, 80th percentile (DEHP 2014) (3) Source: Low reliability trigger value, Section 8.3.7 (ANZECC 2000 V2) (4) Source: ANZECC trigger values for marine waters 95th percentile (ANZECC 2000 V2) (5) Source: ANZECC trigger values for marine waters 99th percentile (ANZECC 2000 V2).
WT10	**Exponentially weighted moving average (EWMA) methodology** The EWMA approach is to be implemented in accordance with the *Gatcombe and Golding Cutting Channel Duplication Project, Application of the EWMA approach* document dated 24 January 2020, reference: 237374, revision 1.
WT11	The release of contaminants to **waters** permitted in condition WT2 must not cause environmental harm.
WT12	The release to **waters** permitted in condition WT2 must not produce any slick or other visible evidence of oil or grease, scum, litter or other **visually objectionable matter**.
WT13	All reasonable and practicable **measures** must be taken to minimise the size of the sediment plume and concentration of suspended solids during the conduct of the **dredging activity**.
WT14	Monitoring of turbidity and benthic PAR must be undertaken at the locations and timing specified in **Table WT2 – Water quality monitoring names and locations** and must not exceed the limits specified in **Table WT3 – Water quality management limits** and light associated monitoring requirements in **Table WT4 – Management light limits** and associated monitoring requirements.

Table WT2 Water quality monitoring names and locations

Grouping[1]	Monitoring site name used in Project EIS baseline monitoring	Monitoring site name used in Project Environmental Monitoring Procedure (refer AEIS Appendix H)	Location (WGS84)	Zone[2]	Timing of monitoring[3]	Location description
Offshore	CD1	CD1	S23 57.469 E151 30.115	Open coastal waters		Adjacent to Seal Rocks
	CD2	CD2	S23 52.017 E151 24.380	Open coastal waters		Off East Point off Facing Island
	CD3	MH60 (PCIMP site)	S23 54.989 E151 21.569	Mid Harbour[4]		Located outside the mouth of the Boyne River
	CD4	CD4	S23 46.269 E151 22.639	Open coastal waters		Off the eastern side of Facing Island, adjacent to Pearl Ledge
	CD5	CD5	S23 50.187 E151 27.153	Open coastal waters		Off the eastern side of Facing Island, 3 km northwest of East Banks DMPA
Inshore	P5/MH10	MH10 (PCIMP site)	S23.78382 E151.30647	Mid Harbour[4]		Adjacent to Pelican Banks seagrass meadows
	P2B/WB50	WB50 (PCIMP site)	S23.70204 E151.13865	Western Basin		Outside the mouth of the Calliope River
	QE3	NW50 (PCIMP site)	S23.70204 E151.13865	The Narrows		Adjacent to Worthington Island in The Narrows
	Not applicable	C3	S23.76748 E151.16817	Western Basin		Adjacent to Western Basin reclamation area
Reference site	Not applicable	RB1	S24.06795 E151.650883	Rodds Bay		Rodds Bay (as part of Baffle Basin)

Table notes:

- [1] Type refers to the general term used to group the Project EIS water quality monitoring sites
- [2] Water zones in accordance with EPP (Water) Schedule 1 – Plan WQ1312 (EHP 2014c)
- [3] Timing of monitoring in this column to be populated in relation to project staging
- [4] While CD3 and P5/MH10 were both located in the Mid Harbour Zone they were grouped as 'inshore' and 'offshore', respectively. CD3 was located close to the edge of the Mid Harbour and Outer Harbour Zone boundaries and baseline water quality appeared to show more wind and wave influences. Conversely P5/MH10 was located in a more enclosed coastal location showing a more tidally influenced, well-mixed water column.

Table WT3 Water quality trigger values

Site #	Status	Zone	Parameter	Wet Season triggers (01 Oct to 31 Mar)*	Dry Season triggers (01 Apr to 31 Sep)*	Data requirements
WB50	Compliance	Western Basin	Turbidity (NTU) / Telemetry	**Internal alert** **19.39 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**Internal alert** **15.37 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **35.61 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **22.79 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	
MH10	Compliance	Mid Harbour	Turbidity (NTU) / Telemetry	**Internal alert** **11.45 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**Internal alert** **6.73 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **19.23 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **11.36 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	

Site #	Status	Zone	Parameter	Wet Season triggers (01 Oct to 31 Mar)*	Dry Season triggers (01 Apr to 31 Sep)*	Data requirements
MH60	Compliance	Mid Harbour	Turbidity (NTU) / Telemetry	**Internal alert** **5.40 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**Internal alert** **7.05 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **9.04 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **10.87 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	
QE3	Compliance	The Narrows	Turbidity (NTU) / Telemetry	**Internal alert** **27.51 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**Internal alert** **9.39 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **59.25 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external alert trigger)	**External exceedance notification** **10.70 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external alert trigger)	
CD1	Compliance	Outer Harbour	Turbidity (NTU) / Telemetry	**Internal alert** **3.01 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**Internal alert** **2.32 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **4.83 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **4.30 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	
CD2	Compliance	Outer Harbour	Turbidity (NTU) /	**Internal alert**	**Internal alert**	

Site #	Status	Zone	Parameter	Wet Season triggers (01 Oct to 31 Mar)*	Dry Season triggers (01 Apr to 31 Sep)*	Data requirements
			Telemetry	**3.02 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**3.60 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **5.04 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **5.76 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	
CD4	Compliance	Outer Harbour	Turbidity (NTU) /	**Internal alert** **2.54 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**Internal alert** **1.78 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **4.00 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **3.72 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	
CD5	Compliance	Outer Harbour	Turbidity (NTU) /	**Internal alert** **1.95 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**Internal alert** **1.50 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **6.45 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **2.47 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	
C3[a]	Compliance	Western Basin	Turbidity (NTU) /	**Internal alert**	**Internal alert**	

Site #	Status	Zone	Parameter	Wet Season triggers (01 Oct to 31 Mar)*	Dry Season triggers (01 Apr to 31 Sep)*	Data requirements
				TBD (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**TBD** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification TBD (95th %ile of the 6 hr EWMA applied to background turbidity data – external alert trigger)	External exceedance notification TBD (95th %ile of the 6 hr EWMA applied to background turbidity data – external alert trigger)	

Table note:

- [a] Denotes specific turbidity monitoring sites that lack historic data, and their water quality monitoring triggers will be developed from 6 months of pre-Project monitoring (refer AEIS Appendix H, Table 8) and using EWMA methodology. Turbidity triggers for C3 will be determined upon receipt of the 6 months of water quality data (prior to Project construction commencing).

Table WT4 Management light trigger values

Species	Meadow type	Monitoring site / meadow #	Management threshold (mol photons m-2 d-1)	Integration time (days)[a] (mol photons m-2 d-1)	Internal notification time (days Rolling average below threshold)	External notification time (days)[b] (mol photons m-2 d-1)	Modify activities (days)[c] (mol photons m-2 d-1)	Time to impact (days)[d] (mol photons m-2 d-1)
*Halophila species**	Deep water transitory	CD1 CD2 CD4 CD5	**1.5 to 2** **(July to Dec only)**	**7***	1 (7)*	3 (10)*	5(12)*	7 **(14)***
Zostera muelleri	Coastal enduring	PBN PBS WI BS ST WB	**6**	**14**	1 (14)	7 (21)	10 (24)	14 **(28)**

Species	Meadow type	Monitoring site / meadow #	Management threshold (mol photons m-2 d-1)	Integration time (days)[a] (mol photons m-2 d-1)	Internal notification time (days Rolling average below threshold)	External notification time (days)[b] (mol photons m-2 d-1)	Modify activities (days)[c] (mol photons m-2 d-1)	Time to impact (days)[d] (mol photons m-2 d-1)
Halodule uninervis	Coastal enduring	QI ST TS CI	**5**	**14**	1 (14)	14 (21)	18 (28)	26 **(40)**

Table notes:

Value in brackets represent the total number of days of light below the threshold incorporating the days of integration for the Rolling average (7 for *Halophila*, 14 for other species).

Values in bold font in table are the values identified in Collier et al. (2016)

- [a] Averaging time to describe light history and as first signal to trigger adaptive management plan – Internal Alert Level (Level 1 trigger)
- [b] This is the number of days light can remain below threshold levels before external notification is required. At this stage an inference assessment would begin to compare with reference sites and to determine if BPAR levels are due to dredging or other (natural) cause
- [c] If inference assessment determines BPAR levels are being influenced by Project activities, modification of Project activities would occur by this time
- [d] Time to impact expected – External notification and additional management measures should be implemented before this time
- * For transitory deep water *Halophila* sites management actions are suggested only during July and December when these species and meadows are likely to be present as part of annual growth cycles.

Schedule E. Land

Condition number	Condition
L1	The suitability of (a) **dredged material** for **land** reclamation (b) the proposed reclamation area as a site for dredged material placement must be sampled, assessed and confirmed no more than five (5) years before **dredging** is undertaken using a sediment sampling and analysis plan in accordance with the methodologies provided in the latest editions of the: (i) Water Quality Australia (June 2018) National Acid Sulfate Soils Guidance – Guidelines for the dredging of acid sulfate soils sediments and associated dredge spoil management. (ii) Water Quality Australia (June 2018) National Acid Sulfate Soils Guidance – National acid sulfate soils sampling and identification methods manual. (iii) Queensland Government (2014) Queensland Acid Sulfate Soil Technical Manual. Soil Management Guidelines V4.0. (iv) National Environment Protection (Assessment of Site Contamination) Measure 1999. (v) **PFAS** National Environmental Management Plan (NEMP) (vi) National Assessment Guidelines for Dredging 2009. Note: it is **your** responsibility to determine whether characterisation of dredged sediments are suitable for assessing risks to **environmental values** associated with the dredging campaign to which this environmental authority relates and to ensure that all emerging contaminants of concern are adequately considered.
L2	The sediment sampling and analysis plan report on the suitability of the **dredged material** for **land** reclamation and the findings of the site suitability assessment must be submitted to the **administering authority** at least fifty (50) business days prior to the commencement of the **dredging activity**.
L3	An Acid Sulfate Soil Management Plan (ASSMP) must be prepared for all potential acid sulfate soil (PASS) that may be directly or indirectly disturbed by the **dredging activities**. The ASSMP must be prepared in accordance with the latest edition of the *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines.*
L4	A copy of the ASSMP must be submitted to the **administering authority** at least fifty (50) business days prior to the commencement of the **dredging activity** and the proponent will amend the ASSMP in accordance with any comments made by the **administering authority** prior to the commencement of the **dredging activity**. An **appropriately qualified and experienced person(s)** must design and be responsible for the implementation of the ASSMP.
L5	The ASSMP must be provided to palm@des.qld.gov.au or mailed to: ATTN: Coastal and Marine Assessment Department of Environment and Science Permit and Licence Management Implementation and Support Unit GPO Box 2454 Brisbane Qld 4001
L6	A copy of the Closure Report (including the results of “handover testing”) in accordance with the Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines for the dredged material must be provided to the **administering authority** within twelve (12) months of dredging completion.

Condition number	Condition
L7	**Land** that has been reclaimed under this environmental authority must be maintained in a manner such that: (a) Erosion and sediment control measures are implemented in accordance with the Best Practice Erosion and Sediment Control (BPESC) guidelines for Australia (International Erosion Control Association) and maintained to prevent the release of sediment and prevent erosion both on and off site. (b) the quality of water released from the site does not cause environmental harm; (c) the final landform is stable and protects public safety.

Schedule F. Noise

Condition number	Condition
N1	Noise generated by the **activity** must not cause **environmental nuisance** to any **sensitive place** or **commercial place**.
N2	When requested by the **administering authority**, noise monitoring must be undertaken within a reasonable and practical timeframe nominated by the **administering authority** at any **sensitive place** or **commercial place**, and results of the monitoring results must be submitted to the **administering authority** within fourteen (14) days following completion of monitoring.
N3	Noise monitoring and recording as required under condition N2 must include the following descriptor characteristics and matters: (a) $L_{AN,T}$ (where N equals the statistical levels of 1, 10 and 90 and T = 15 mins); (b) **background noise** L_{A90}; (c) the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels; (d) atmospheric conditions, including temperature, relative humidity and wind speed and directions; (e) effects due to any extraneous factors such as traffic noise; (f) location, date and time of monitoring; (g) if low frequency noise is present, $Max_{LpLIN,T}$ and one third octave band measurements in $dB_{(LIN)}$ for centre frequencies in the 10 to 200 hertz range.
N4	The method of measurement and reporting as required under condition N2 of noise levels must comply with the latest edition of the **administering authority**'s *Noise Measurement Manual.*
N5	To mitigate potential noise impacts on fauna: (a) Create an exclusion/safety zone around the perimeter of pile driving activities. (b) A suitably qualified marine fauna spotter is to be present during the works to ensure that pile driving will not be carried out while: (i) Dugongs, marine turtles, dolphins or whales are within 300m of the works (ii) Migratory birds are within 25 m. (c) Where fauna is observed within the distances identified in b) above, activities will be placed on hold for the period of time it takes the animal to leave the exclusion/safety zone of its own accord. (d) The fauna safety shut-down zones are to also be implemented for continuous impact piling durations using the fauna spotter as identified in Table N1:

<table>
<tr><th>Condition number</th><th>Condition</th></tr>
<tr><td></td><td>
Table N1
<table>
<tr><th colspan="2">Noise exposure threshold based on cumulative SEL (within a 24-hour period)</th><th>Observation zone</th><th>Shut-down zone</th></tr>
<tr><td>Duration with continuous piling @100 strikes/min</td><td>Cumulative SEL <198dB re 1µPa2-S</td><td></td><td></td></tr>
<tr><td>≤ 1 min</td><td>≤ 50 m</td><td>1.0 km</td><td>50 m</td></tr>
<tr><td>10 min</td><td>310 m</td><td>1.0 km</td><td>310 m</td></tr>
<tr><td>60 min</td><td>1.4 km</td><td>2.0 km</td><td>1.4 km</td></tr>
</table>
(e) Where practical, avoid conducting impact piling during the following times:
(i) When marine mammals are likely to be breeding, calving, feeding or resting in a biologically important habitats nearby
(ii) Humpback whale migration season from June to August
(iii) During marine turtle (Loggerhead turtle and flatback turtle) peak nesting activity period from November to December, and February.
</td></tr>
</table>

Schedule G. Waste

Condition number	Condition
W1	All waste generated in carrying out the dredging activity must be reused, recycled or removed to a facility or designated onsite location(s) that can lawfully accept the waste.

Schedule H. Light

Condition number	Condition
Li1	Excluding lighting required for navigation and safety: (a) Only amber LED aeroscreen lighting is to be used for lighting outside of project vessel cabins, cabin portholes (b) No light source within the area if directly visible from outside the project dredging vessel perimeter.

Definitions

Note that where a term is not defined, the definition in the *Environmental Protection Act 1994*, its regulations or environmental protection policies must be used. If a word remains undefined, it has its ordinary meaning.

Activity (activities) means the environmentally relevant activities, whether resource activities or prescribed activities, to which the environmental authority relates.

Administering authority means the Department of Environment and Science or its successors or predecessors.

Agreed delivery arrangement has the same meaning as section 19(4) of the *Environmental Offsets Act 2014*.

Alert level(s) represent tiers in a hierarchy of increasing environmental risk and are defined by **trigger values**. Three **alert levels** (low, moderate, and high) are typically used in a management action framework to indicate adverse conditions and guide management responses that aim to prevent and minimise environmental harm.

Appropriately qualified and experienced person(s) means a person or persons who has professional qualifications, training, skills and experience relevant to the environmental authority (EA) requirement and can give authoritative assessment, advice and analysis in relation to the EA requirement using the relevant protocols, standards, methods or literature.

Background noise means noise, measured in the absence of the noise under investigation, as $LA_{90,\ adj,\ T}$ being the A-weighted sound pressured level exceeded for 90 per cent of the time period of not less than 15 minutes, using Fast response.

Baseline-based assessment means the **DMP** involves a monitoring result assessment methodology that uses assessment criteria developed from a pre-disturbance baseline data collection phase.

Capital dredging means dredging carried out for the purpose of:

- creating or enlarging a channel, basin, port, berth or other similar thing; or
- removing material that is unsuitable as a foundation for a **port facility**; or
- creating a trench for a pipe, cable or tube; or
- an **activity** incidental to an **activity** mentioned in subparagraph (a) to (c);
- but does not include **dredging** carried out for the purpose of:
- maintaining a channel, basin, port, berth or other similar thing for its intended use; or
- protecting human life or property.

Commercial place means a place used as a workplace, an office or for business or commercial purposes and includes a place within the curtilage of such a place reasonably used by persons at that place.

Concern site(s) means a site where a **sensitive receptor** occurs within the **zone of influence** of a sediment plume.

Construction in reference to this EA, means building of the bund walls for the Western Basin Expansion reclamation areas (northern and southern) and barge unloading facility, and ancillary works for the Northern and Southern Western Basin Expansion reclamation areas as per Figure 2.19, version 16, dated 23 November 2018*;

* figures from EIS documents must be updated to meet the following minimum standards:

- Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including:
    - adjacent real property boundaries;
    - adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area;
    - relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs);
    - the location and setting out details for cross-sections; and
    - any other information required to accurately define the area and to allow the site to be readily identified from the plan.
- All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.

Continuous logging means to record instrument-derived data in a memory storage device (a data logger). The frequency of data logging may be, for instance, every 15 minutes, but where a logger device is used in situ, the frequency may be dependent on the memory storage capacity of the logger and the time between logger retrieval events. Alternatively, continuous logging may be performed via telemetry, with the data being broadcast to an ex situ computer or data logger.

Control site(s) refers to a monitoring site located beyond the anticipated **zone of influence** of sediment plumes and has **site pairing** with one or more **test sites** or **sentinel sites.** In monitoring programs, control sites serve the same role as do **reference sites** but only for a defined subset of parameters.

Dredge footprint is the area being dredged, including batters.

Dredge Management Plan (DMP) is an environmental management plan for the **dredging activity**. It defines and describes the:

- scope, timing and duration of the **dredging** operation
- sediment plume-associated monitoring programs
- assessment of data, **trigger values** and **alert levels**, and
- management actions that may be required in response to adverse monitoring results.

The **DMP** includes an aim to prevent and minimise environmental harm to **sensitive receptors** as a result of the **dredging activity.**

Dredge Technical Reference Panel means an assembly of **appropriately-qualified and experienced persons** representing experts in various scientific fields, formed to be capable of assessing **sediment plume-associated monitoring** data and presenting advice relevant to conducting the dredging campaign and protecting **sensitive receptors** as directed under this authority and the **DMP.**

Dredged material means mud, sand, coral, shingle, gravel, clay, earth and other material removed by dredging. Dredged material includes dredge spoil and extracted quarry material.

Dredging means the mechanical removal of material from below naturally occurring surface waters. It excludes minor adjustments to the bed surface to level troughs and peaks and where bed material is only redistributed locally (bed levelling).

Dredging activities (activity) means the following:

- Dredging
- Loading of barges or similar vessels with dredged material
- Movement of barges or similar vessels from the dredge footprint to a barge unloading facility
- Removal of dredged material from barges or similar vessels into trucks or similar infrastructure for transport to the existing Western Basin reclamation area and/or Western Basin Expansion reclamation area
- Placement and dewatering of dredged material within the existing Western Basin reclamation area and/or Western Basin Expansion reclamation area.

Environmental nuisance means as defined in Section 15 of the *Environmental Protection Act 1994*.

Environmental offset has the same meaning as section 7(2) of the *Environmental Offsets Act 2014*.

Environmental value means:

- a quality or physical characteristic of the environment that is conductive to ecological health of public amenity or safety; or
- another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.

Groundwater means water that occurs naturally in, or is introduced artificially into, an aquifer.

High ecological value (HEV) is the 'management intent' for the 'ecosystem condition' as defined in Schedule 1 of the *Environmental Protection Policy (Water and Wetland Biodiversity) 2019* for scheduled waters, or the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 (ANZECC & ARMCANZ 2000) for non-scheduled waters. HEV ecosystems are intact and typically exhibit relatively insignificant levels of anthropogenic impacts

Holder means any person who is the holder of, or is acting under, this environmental authority.

$L_{Aeq, adj, T}$ means the adjusted A weighted equivalent continuous sound pressure level measures on fast response, adjusted for tonality and impulsiveness, during the time period T, where T is measured for a period no less than 15 minutes when the **activity** is causing steady state noise, and no shorter than one hour when the approved **dredging activity** is causing an intermittent noise.

Land means any land, whether above or below the ordinary high-water mark at spring tides (i.e. includes **tidal land**).

Maximum extent of impact means maximum extent of **significant residual impact** to a **prescribed environmental matter**. **Significant residual impact** has the meaning in section 8 of the *Environmental Offsets Act 2014*

Measures has the broadest interpretation and includes:

- **procedural measures** such as standard operating procedures for **dredging** operations, environmental risk assessments, management actions, Departmental directions and relevant guidelines
- **physical measures** such as plant, equipment, physical objects (such as bunding, containment systems etc.), ecosystem monitoring and bathymetric surveys.

NATA means National Association of Testing Authorities.

Nominated delegate means another government agency that provides services to the **administering authority.**

Notice of election means a notice mentioned in section 18(2) of the *Environmental Offsets Act 2014* by which an authority **holder** elects to deliver an environmental offset.

Offset delivery plan has the same meaning as section 18(3) of the *Environmental Offsets Act 2014*.

PFAS means perfluoroalkyl and polyfluoroalkyl substances.

Port facility means a facility or **land** used in the operation or strategic management of a port authority's port. **Port facility** does not include a small-scale port facility to be used for a tourism or recreation purpose. Examples of a small-scale **port facility**-boat ramp, boat harbour, marina.

Prescribed water contaminants means contaminants listed within Schedule 10 of the *Environmental Protection Regulation 2019.*

Prescribed environmental matter has the meaning in Section 10 of the *Environmental Offsets Act 2014*.

Records include breach notifications, written procedures, analysis results, monitoring reports and monitoring programs required under a condition of this authority.

Reference site refers to a monitoring site located not only beyond the anticipated **zone of influence** of a sediment plume, but also beyond other sources of environmental impacts, and has **site pairing** with one or more **test sites** or **sentinel sites.** In monitoring programs, **reference sites** serve the same role as do **control sites** but can generally be suitable for a broader set of parameters.

Rehandled means handling or relocation of **dredged material** from a stockpile.

Release of a contaminant into the environment means to:

- deposit, discharge, emit or disturb the contaminant
- cause or allow the contaminant to be deposited, discharged, emitted or disturbed
- fail to prevent the contaminant from being deposited, discharged emitted or disturbed
- allow the contaminant to escape
- fail to prevent the contaminant from escaping.

Remove (removed, removal) means to:

- extract and collect quarry material from the Allocation Area; or
- take plant, equipment and measures that are associated with the dredging operation, out of the Allocation Area.

(**Remove** does not include the rehandling of **dredged material** or collection of quarry material as part of a geotechnical investigation associated with future tidal works or extraction).

Sediment plume-associated impacts are impacts associated with sediment plumes including turbidity and suspended solids concentrations, light attenuation or sedimentation rates elevated above either **control site** or

reference site readings or baseline conditions for an equivalent time of year. Where **dredged material** possesses acid sulfate soil-related properties, **sediment plume-associated impacts** may also include pH, dissolved oxygen and metal and metalloid-related toxicity impacts.

Sediment plume-associated monitoring (SPAM) means environmental monitoring associated with risk management of **sediment plume-associated impacts**.

Sensitive place includes the following and includes a place within the curtilage of such a place reasonably used by persons at that place:

- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- a motel, hotel or hostel; or
- a kindergarten, school, university or other educational institution; or
- a medical centre or hospital; or
- a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 2004* or a World Heritage Area; or
- a public park or garden; or
- for noise, a place defined as a sensitive receptor for the purposes of the *Environmental Protection (Noise) Policy 2019*.

Sensitive receptor(s) includes biological sensitive receptors together with other **environmental values** sensitive to the effects of dredge-generated **sediment plume-associated impacts**.

Sentinel site is a **test site** that is situated between the disturbance source and the **sensitive receptor** and serves to provide earlier warning of developing adverse conditions than does a **test site.**

Significant residual impact has the meaning in section 8 *Environmental Offsets Act 2014*.

Site pairing refers to monitoring sites that have a functional control-impact relationship, for example, Control site A is referenced to assess monitoring data collected from Concern Sites AA and AB, thus, **Concern Sites** AA and AB share site pairing with **Control Site** A.

Slightly disturbed is the 'management intent' for the 'ecosystem condition' as defined in Schedule 1 of the *Environmental Protection Policy (Water and Wetland Biodiversity) 2019*. **Slightly disturbed** ecosystems should generally be regarded as **high ecological value** ecosystems in all respects except for some relatively minor disturbances (usually water-quality related (e.g. nutrient concentrations exceeding the water quality objective)).

Test site(s) is a **concern site** that functions as a test point for compliance, is a monitoring site situated within the area where a **sensitive receptor** occurs and where environmental monitoring-related assessment criteria (e.g. **trigger values**) apply.

Tidal land means land that is submerged at any time by **tidal water**.

Tidal water means as defined in the *Coastal Protection and Management Act 1995*.

Trigger Action Response Program (TARP) is the prevention and control of fugitive dust through early detection of air quality conditions deemed to be unacceptable with the criteria as set by the Environmental Protection (Air) Policy 2019 and licence conditions.

Trigger values are physicochemical, parameter-specific measurement values used to indicate a condition where an **environmental value** or **sensitive receptor** may be at low, moderate or high risk, or some other risk-related indicator.

Visually objectionable matter means deposits, floating debris/litter, oil, scum and other substances that produce objectionable colour, turbidity and/or non-natural material that can be seen by humans.

Waters includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water, natural or artificial watercourse, bed and bank of any **waters**, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and **groundwater** and any part thereof.

You means the holder of the environmental authority.

Zone of influence of a sediment plume is, in its broadest application, defined by the **dredge footprint** and the area beyond the **dredge footprint** where at least some level of **sediment plume-associated impacts** are expected to occur. The overall **zone of influence** may be broken down into more risk-relevant sub-categories, such as the Zone of Unavoidable Loss (the **dredge footprint** and immediately adjacent areas), the Zone of Moderate Impact, or the Zone of Low Impact, with each zone being defined according to its purpose or role in environmental management.

Schedule 2. Environmental Authority (ERA 16(1)(d)) (dredging) (Stage 2 dredging works)

This schedule includes the Coordinator-General's stated conditions for an environmental authority for Environmentally Relevant Activity 16(1)(d) (dredging) under the *Environmental Protection Act 1994*, stated under section 47C of the *State Development and Public Works Organisation Act 1971*.

The entity with jurisdiction for conditions in this schedule is the Department of Environment and Science.

Schedule A. General

Condition number	Condition
G1	**Activities** conducted under the environmental authority must be conducted in general accordance with the following limitations: (a) **dredging** is limited to **capital dredging** for the purpose of duplicating the Gatcombe and Golding Cutting shipping channels (b) **dredging activity** may only commence once proposed dredged material has been sampled in accordance with the *National Assessment Guidelines for Dredging 2009* and include sampling of contaminants of concern including PFAS and risk analysis in accordance with the PFAS National Environmental Management Plan. (c) The sampling results must be submitted to the **administering authority** at six (6) months prior to the submission of the dredge management plan in accordance with G22 to either of the addresses below: palm@des.qld.gov.au; or Permit and Licence Management Department of Environment and Science GPO Box 2454 Brisbane QLD 4001 (d) **dredging** may only occur in general accordance with the following plans*: (i) Figure 2.9: Gatcombe and Golding Cutting Channel Duplication Area, version 3, dated 18 April 2018, where relevant to Stage 1 dredging works; (ii) Figure 2.11: Proposed area to be dredged – Stage 2 (-16.1m LAT), version 4, dated 13 November 2017; (iii) Figure 2.19: Western Basin Expansion reclamation area showing the 'licenced discharge point (for Western Basin Expansion reclamation area)' and 'licenced discharge points (for existing Western Basin reclamation area)', version 16, dated 23 November 2018. (e) **dredged material placement** and **construction** must only occur within the Western Basin Expansion reclamation area shown in Figure 2.19, version 16, dated 23 November 2018*; (f) a total maximum of 5.35 million cubic metres of **dredged material** as measured in situ may be removed from the Gatcombe and Golding Cutting shipping channels as part of dredging works; (g) **dredging** must not result in an impact to seagrass meadow condition and extent in the receiving environment unless approved under the *Fisheries Act 1994*. <u>Notes:</u> * Figures from EIS documents must be updated to meet the following minimum standards: • Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including: – adjacent real property boundaries; – adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area; – relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs);

Condition number	Condition
	– the location and setting out details for cross-sections; and – any other information required to accurately define the area and to allow the site to be readily identified from the plan. • All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.
G2	All reasonable and practicable **measures** must be taken to prevent or minimise the likelihood of environmental harm being caused by the **activities**.
G3	Any breach of a condition to this environmental authority must be reported to the **administering authority** as soon as practicable within 24 hours of **you** becoming aware of the breach. **Records** must be kept including full details of the breach and any subsequent actions undertaken.
G4	Other than as permitted by this environmental authority, the **release of a contaminant into the environment** must not occur.
G5	Environmental monitoring results must be kept until surrender of this environmental authority. All other information and **records** that are required by the conditions of this environmental authority must be kept for a minimum of five (5) years. All information and **records** required by the conditions of this environmental authority must be provided to the **administering authority**, or **nominated delegate** in the specified format with each annual return.
G6	An **appropriately qualified and experienced person(s)** must monitor, record and interpret all indicators that are required to be monitored by this environmental authority and in the manner specified by this environmental authority and the **Dredge Management Plan (DMP)**.
G7	All analyses required under this environmental authority must be carried out by a laboratory that has National Association of Testing Authorities (**NATA**) certification, or an equivalent certification, for such analyses. The only exceptions to this condition are for in situ monitoring of: • turbidity; • temperature; • pH; • conductivity; • dissolved oxygen (DO); and • benthic photosynthetically active radiation (BPAR). All monitoring equipment must be calibrated for each monitoring round and monitoring must be conducted in accordance with the latest version of the **administrative authority's** Monitoring and Sampling Manual.
G8	When required by the administering authority, monitoring must be undertaken in the manner prescribed by the **administering authority**, to investigate a complaint of **environmental nuisance** arising from the **activity**. The monitoring results must be provided to the **administering authority**, or **nominated delegate**, within the specified time period and in the specified format upon request.
G9	Written notification of the commencement date must be provided to the **administering authority** at least five (5) business days prior to establishing the **dredging activity** and **construction**.
G10	The **activity** must be undertaken in accordance with written procedures that: (a) identify potential risks to the environment from the **activity** during routine operations, closure and an emergency; (b) establish and maintain control **measures** that minimise the potential for environmental harm; (c) ensure plant, equipment and **measures** are maintained in a proper and effective condition; (d) ensure plant, equipment and **measures** are operated in a proper and effective manner; (e) ensure that staff are trained in and aware of their obligations under the *Environmental Protection Act 1994*; (f) ensure that reviews of environmental performance are undertaken at least annually.

<table>
<tr><th>Condition number</th><th>Condition</th></tr>
<tr><td>G11</td><td>The dredging activity must not commence unless the lawful disposal or placement of the dredged material has been fully authorised under all relevant authorities, licences or other permits issued by the Commonwealth and Queensland governments. Evidence of all necessary approvals must be provided to the administering authority upon request.</td></tr>
<tr><td>G12</td><td>(a) Authorised dredged material placement must only take place within the locations, for the following purposes and at the total maximum volumes set out in Table G1 – Placement locations and purpose of dredged material.
(b) Georeferenced plans for the Western Basin Reclamation Area and Western Basin Expansion reclamation area must be provided prior to the commencement of dredging and construction.

Table G1 Placement locations and purpose of dredged material
<table>
<tr><th>Location</th><th>Material</th><th>Purpose</th><th>Total maximum volume</th><th>Total maximum area</th></tr>
<tr><td>Within the Southern Reclamation Area and Northern Reclamation Area as shown on Figure 2.18: Property details and tenure for Western Basin Expansion reclamation area, version 11, dated 10 March 2020*</td><td>Dredged material</td><td>Reclamation of tidal lands</td><td>6.69 Mm^3
(being for placement of 5.35 Mm^3 of dredged material as measured in situ from the Gatcombe and Golding Cutting shipping channels)</td><td>276.1 ha</td></tr>
</table>
Note: * plans from EIS documents must be updated to include appropriate georeferencing/latitude and longitude and provided with development applications.</td></tr>
<tr><td>G13</td><td>Any containment structures at the Western Basin Expansion Reclamation Area in condition G12 must be certified by an appropriately qualified and experienced person(s) (e.g. registered professional engineer of Queensland) and maintained to the certified design.</td></tr>
<tr><td>G14</td><td>Dredged material must not be disposed of in tidal water, unless undertaken in accordance with condition G12.</td></tr>
<tr><td>G15</td><td>Dredged material must not be rehandled in tidal water except for transfers of dredged material from dredgers into barges, and from barges into trucks or other infrastructure for placement within the locations stated in condition G12.</td></tr>
<tr><td>G16</td><td>Sediment plume associated monitoring (SPAM) must be undertaken. This must include continuous logging at concern sites and control sites, with a baseline collection phase (baseline-based assessment with control site-based checking).</td></tr>
<tr><td>G17</td><td>Prior to the commencement of the dredging activity, a DMP[1] for the dredging activity must be developed and implemented, in consultation with the Dredge Technical Reference Panel, and the DMP must contain the following:
(a) Clearly stated aims and objectives including a conceptual model linking the stressors, monitoring indicators and potential impacts to all sensitive receptors.
(b) Description of dredging operations, including:
(i) type of equipment to be used in dredging;
(ii) volume of dredged material to be removed, and duration and timing of the dredging campaign;
(iii) methods to be utilised for transporting dredged material; and
(iv) dredged material disposal or placement methods and management.
(c) Description of dredging operations to be repeated for each stage of the project
(d) Maps or plans showing:</td></tr>
</table>

Condition number	Condition
	(i) legend, north arrow and scale; (ii) boundaries of **dredging** operation; (iii) estimated or modelled **zone of influence** of sediment plumes; (iv) location of designated disposal sites; (v) up to date location of **sensitive receptors**; (vi) all monitoring locations. (e) A detailed description of **sediment plume-associated monitoring** program, including: (i) Monitoring indicators, sampling frequency and methods (ii) location of monitoring sites (iii) quality assurance methods and reporting of results. (f) A detailed description of the assessment methodology to provide data in relation to **trigger values** that will define **alert levels**. (g) Stipulate the **trigger values** and **alert levels** for each monitoring location that would be used to identify whether sediment plumes extend beyond the predicted zone of impact. (h) Clearly set out data handling and evaluation procedures that demonstrate how exceedance of **alert levels** will be determined. (i) Management actions to be initiated if triggers or **alert levels** are exceeded, including the requirement to cease dredging where benthic PAR light requirements are not met as defined in the DMP. (j) **Receiving Environment Monitoring Plan (REMP)** and Fauna Management Plan need to be reviewed and updated to reflect project activities. (k) Details of the **Dredge Technical Reference Panel** members and their respective roles. (l) Detail on fauna, seagrass and coral monitoring conducted during and following the EIS. Note: [1] The **DMP** is subject to review and amendment as required by changing regulation, monitoring results or administrating authority.
G18	The **Dredge Technical Reference Panel** membership must include independent experts in the fields of: (a) coral biology (b) seagrass biology (c) marine fauna biology (turtles, fish, dugongs and cetaceans) (d) coastal hydrodynamics and sediment transport (e) water quality (f) cultural heritage.
G19	The **Dredge Technical Reference Panel** membership and respective roles must be submitted to the **administering authority** a minimum of twenty (20) business days prior to its first meeting and, if necessary, membership to be amended in accordance with any comments made by the **administering authority**.
G20	The **DMP** and **Dredge Technical Reference Panel** membership must be provided to the **administering authority** at either of the addresses below. palm@des.qld.gov.au; or Permit and Licence Management Department of Environment and Science GPO Box 2454 Brisbane QLD 4001
G21	The **DMP** must not be implemented or amended in a way that contravenes or is inconsistent with any condition of this authority.

Condition number	Condition
G22	The **DMP** must be submitted to the **administering authority** at least fifty (50) business days prior to the commencement of **dredging activities** and the proponent will amend the **DMP** in accordance with any comments made by the **administering authority** prior to the commencement of **dredging activities**.
G23	Any amendments to the DMP must be submitted to the **administering authority** in accordance with condition G20 and within at least ten (10) business days of the amendment being made. The proponent will further amend the **DMP** in accordance with any comments made by the **administering authority** within twenty (20) business days of comments being provided**.**
G24	The **dredging activity** must be undertaken in accordance with the **DMP** required in condition G17.
G25	A two-part report validating the hydrodynamic modelling outputs of the dredge plume detailed in the report Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project Additional Information to the Environmental Impact Statement, Appendix D, Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project EIS Coastal Processes and Hydrodynamics Technical Report (prepared by BMT WBM, dated 16 July 2019, reference R.B20020.003.13.coastal_processes_and_hydrodynamics.docx, revision 13) must be submitted to the **Dredge Technical Reference Panel** and the **administering authority:** Part A of the report, as outlined below, must be submitted no more than three (3) months after the commencement of **dredging** within the Gatcombe and Golding shipping channels and Part B of the report must be submitted no more than three (3) months after the commencement of tailwater releases from the reclamation area/s. PART A of the report must: • describe the approaches used to validate the modelling, • provide a comparison between actual and predicted turbidity concentration, • describe measurements of sediment and hydrodynamic information, and • be performed within the **dredge footprint** under representative conditions expected to occur during **dredging activities,** including sediment types, wind and wave conditions. PART B of the report must: • describe the approaches used to validate the modelling, • provide a comparison between actual and predicted total suspended solids and turbidity concentration, • describe the spatial extent of plumes in relation to dredging activities and tailwater releases, and • be performed within the tailwater plume under representative conditions expected to occur during **dredging activities,** including sediment types, wind and wave conditions.

Schedule B. Matters of State Environmental Significance

Condition number	Condition
MS1	**Significant residual impacts** to a **prescribed environmental matter** are not authorised under this environmental authority unless the impact is specified in Table MS1 – *Authorised significant residual impacts to prescribed environmental matters*. The impacts specified in Table MS1 are only authorised to the maximum extent of impact prescribed in Table MS1

Table MS1 Authorised significant residual impacts to prescribed enivornmental matters

Prescribed environmental matter	Location of impacts*	Maximum extent of impact (ha) – construction and dredge material placement activities within the Western Basin Expansion northern and southern reclamation areas and barge unloading facility	Maximum extent of impact (ha) - dredging of the of the Gatcombe and Golding Cutting shipping channels and barge access channel	Total maximum extent of impact (ha)**
Habitat for an animal that is vulnerable wildlife – green turtle (*Chelonia mydas*)*		377.61	2104.46	**2482.07**
Habitat for an animal that is endangered wildlife – loggerhead turtle (*Caretta caretta*)*		377.61	2104.46	**2482.07**
Habitat for an animal that is vulnerable wildlife – flatback turtle (*Natator depressus*)*		0	2104.46	**2104.46**
Habitat for an animal that is endangered wildlife – hawksbill turtle (*Eretmochelys imbricata*)*		377.61	2104.46	**2482.07**
Habitat for an animal that is endangered wildlife – olive ridley turtle (*Lepidochelys olivacea*)*		0	2104.46	**2104.46**
Habitat for an animal that is vulnerable wildlife – dugong (*Dugong dugon*)*		374.64	912.63	**1,287.27**
Habitat for an animal that is vulnerable wildlife –		377.61	2104.46	**2482.07**

Condition number	Condition				
	Australian humpback dolphin (*Sousa sahulensis*)*				
	Habitat for an animal that is vulnerable wildlife – beach stone curlew (*Esacus magnirostris*)		480.03	0	**480.03**
	Habitat for an animal that is vulnerable wildlife – eastern curlew (*Numenius madagascariensis*)*		480.03	0	**480.03**
	Habitat for an animal that is vulnerable wildlife – western Alaskan bar-tailed godwit (*Limosa lapponica bauera*)*		480.03	0	**480.03**
	Habitat for an animal that is vulnerable wildlife – greater sand plover (*Charadrius leschenaultii)**		480.03	0	**480.03**
	Habitat for an animal that is endangered wildlife – red knot (*Calidris canutus*)*		480.03	0	**480.03**
	Habitat for an animal that is endangered wildlife – curlew sandpiper (*Calidris ferruginea*)*		480.03	0	**480.03**
	Habitat for an animal that is endangered wildlife – great knot (*Calidris tenuirostris*)*		480.03	0	**480.03**
	Habitat for an animal that is endangered wildlife – lesser sand plover (*Charadrius mongolus*)*		480.03	0	**480.03**

<table>
<tr><th>Condition number</th><th>Condition</th></tr>
<tr><td></td><td>
<table>
<tr><td>Habitat for an animal that is endangered wildlife – Northern Siberian bar-tailed godwit (Limosa lapponica menzbieri)*</td><td></td><td>480.03</td><td>0</td><td>480.03</td></tr>
<tr><td>A wetland of high ecological significance</td><td></td><td>73.61</td><td>0</td><td>73.61</td></tr>
</table>
Table notes:
^Impacts on the prescribed environmental matters which are matters of national environmental significance would also be assessed under the EPBC Act. Any offsets for these matters would be delivered as required by the Commonwealth.
*Insert georeferenced, scaled maps showing area of impact for each of the prescribed environmental matters listed.
**Figures in this column are the maximum extent of impact permissible for all components of the Port of Gladstone Gatcombe and Golding Cutting Duplication project.
</td></tr>
<tr><td>MS2</td><td>An environmental offset must be undertaken for the extent of impact to each of the prescribed environmental matters identified in Table MS1— Authorised significant residual impacts to prescribed environmental matters in accordance with the Environmental Offsets Act 2014.
Note: the deemed conditions listed in the Environmental Offsets Act 2014 apply. These deemed conditions are detailed in sections 19B, 22, 24 and 25 of the Environmental Offsets Act 2014.</td></tr>
<tr><td>MS3</td><td>The impacts authorised in MS1 may be carried out in stages.</td></tr>
<tr><td>MS4</td><td>The environmental offset requirement detailed in MS2 can be delivered for each stage of impact.</td></tr>
<tr><td>MS5</td><td>A notice of election for the staged environmental offset referred to in condition MS4 must be provided to the administering authority prior to the commencement of that stage in accordance with the Environmental Offsets Act 2014.</td></tr>
<tr><td>MS6</td><td>Prior to the commencement of each stage, the administering authority must be provided with a report, completed by an appropriately qualified and experienced person(s), which analyses the following:
(a) for the forthcoming stage – the estimated impact to each prescribed environmental matter; and
(b) for the previous stage(s), if applicable – the actual impact to each prescribed environmental matter, to date.</td></tr>
<tr><td>MS7</td><td>The authority holder must have entered into an agreed delivery arrangement with the administering authority, before starting any works for the stage that impacts on the prescribed environmental matters listed in Table MS1 – Authorised significant residual impacts to prescribed environmental matters.</td></tr>
<tr><td>MS8</td><td>Within six (6) months from the completion of the final stage of the project, a report completed by an appropriately qualified and experienced person, that includes the following matters must be provided to the administering authority:
(a) an analysis of the actual impacts on prescribed environmental matters resulting from the final stage; and
(b) if applicable, a notice of election to address any outstanding offset debits for the authorised impacts.</td></tr>
</table>

Schedule C. Air

Condition number	Condition
A1	Other than as permitted within this environmental authority, odours or airborne contaminants must not cause **environmental nuisance** at a **sensitive place** or **commercial place**.
A2	**Air Quality Management Plan** An Air Quality Management Plan must be developed and implemented by an **appropriately qualified and experienced person(s)** prior to the commencement of **activities**. The Air Quality Management Plan must be submitted to the **administering authority** at least sixty (60) business days prior to commencement of **dredging activities** and **construction**. The proponent will amend the Air Quality Management Plan in accordance with any comments made by the **administering authority** prior to the commencement of **dredging activities.**
A3	The Air Quality Management Plan required by Condition A2 must include: (a) identification of dust sources and **activities** which impact on dust sensitive areas; (b) a preventative management system for dust control; (c) a **Trigger Action Response Program**; (d) design of an internal operational monitoring program including objectives; (e) performance criteria and monitoring methods; (f) number and location of monitoring sites; (g) quality assurance/quality control (QA/QC) requirements; (h) community liaison and stakeholder consultation; (i) training of staff in dust management practices and their roles and responsibilities; and (j) reporting.
A4	When required by the administering authority, oxides of nitrogen (as NO_2) monitoring of power generators must be undertaken in accordance with the current edition of the **administering authority**'s Air Quality Sampling Manual to determine the impact on the receiving environmental arising from the activity. The monitoring results must be provided to the **administering authority** within 10 business days of completion of monitoring.
A5	**Dust nuisance** The holder of this environmental authority must ensure that all reasonable and feasible avoidance and mitigation **measures** are employed so that the dust and particulate matter emissions generated by the **activity** do not cause exceedances of the following levels when measured at any **sensitive place** or **commercial place**: (a) Dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with the most recent version of *Australian Standard AS3580.10.1 Methods for sampling and analysis of ambient air—Determination of particulate matter—Deposited matter – Gravimetric method* (b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM_{10}) suspended in the atmosphere of 50 micrograms per cubic metre over a 24-hour averaging time, when monitored in accordance with the most recent version of either: (i) Australian Standard AS3580.9.6 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM10 high volume sampler with size-selective inlet – Gravimetric method, or (ii) Australian Standard AS3580.9.9 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM10 low volume sampler—Gravimetric method. (c) A concentration of particulate matter suspended in the atmosphere of 90 micrograms per cubic metre over a 1 year averaging time, when monitored in accordance with the most recent version of *AS/NZS3580.9.3:2003 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—Total suspended particulate matter (TSP)—High volume sampler gravimetric method*.

Condition number	Condition
	Note: an ongoing dust deposition monitoring program must be developed and implemented during the operation of the project. The PM10 and total suspended particles (TSP) air quality monitoring must be conducted in accordance with conditions A6 and A7.
A6	When requested by the **administering authority** or as a result of a complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer), dust and particulate monitoring (including dust deposition, TSP and PM_{10}) must be undertaken, and the results thereof notified to the **administering authority** within fourteen (14) days following completion of monitoring. This includes providing interim reports if the monitoring lasts for more than one (1) month. Monitoring must be carried out at a place(s) relevant to the potentially affected dust **sensitive place**. Monitoring must be conducted in accordance with the appropriate standards.
A7	If the monitoring which is carried out in accordance with Condition A6 indicates an exceedance of the relevant limits in Condition A5, then the holder of this environmental authority must notify the **administering authority** within seven (7) days of an exceedance and investigate whether the exceedance is due to emissions from the **activity**. If the **dredging activity** is found to be the cause of the exceedance, then the holder of this environmental authority must: (a) address the complaint including the use of appropriate dispute resolution if required; and (b) immediately implement dust abatement **measures** so that emissions of dust from the **activity** do not result in further **environmental nuisance**.

Schedule D. Water

Condition number	Condition
WT1	A REMP must be developed and implemented to monitor, identify, describe and respond to any adverse impacts to: (a) marine water quality (b) water flows (c) aquatic flora and fauna (d) corals, and (e) any receiving waters.
WT2	The REMP must include periodic monitoring for the effects of any release on the receiving environment as a result of contaminant releases to waters from the **dredging activity** and **construction**.
WT3	The REMP must (a) assess the condition or state of receiving **waters** spatially within the Port of Gladstone (the REMP area) using accurate and reliable monitoring approaches sufficient to describe temporal variation (e.g. seasonality). (b) describe a conceptual model that defines stressors and potential impacts in the receiving environment and identifies the linkages between expected response and the monitoring indicators to be monitored including but not limited to turbidity and Total Suspended Solids (TSS), nutrients, metals and metalloids and justify: (i) the indicators and sampling frequency and timing, and (ii) assumptions and choices made in preparation of the REMP. (c) The monitoring design (i.e. monitoring locations, indicators, sampling frequency and data analysis techniques) must facilitate assessment against water quality objectives for the relevant **environmental values** that need to be protected. (d) detail monitoring locations and water quality indicators pertinent to the **sensitive receptor** types and locations that have been designed to:

<table>
<tr><th>Condition number</th><th>Condition</th></tr>
<tr><td></td><td>(i) determine the baseline condition of water quality and sensitive receptors (i.e. corals and seagrass meadows) within the zone of influence to a sufficient resolution to be capable of reliably detecting lethal and sublethal (stress) impacts,
(ii) based on the draft trigger values contained in Table WT3 and Table WT4 confirm the locally-relevant trigger values for key water quality indicators including turbidity, and
(iii) provide on-line near real-time monitoring capability for key sediment plume-related indicators (including but not limited to turbidity, pH, electrical conductivity).
(e) specify the frequency and timing of sampling required in order to reliably assess ambient conditions and to provide sufficient data to derive site specific background reference values in accordance with the Environmental Protection (Water) Policy 2009 (Curtis Island, Calliope River and Boyne River Basins Environmental Values and Water Quality Objectives) (DEHP 2014)
(f) provide an assessment of seagrass meadow health and extent in the receiving waters
(g) include, where appropriate, monitoring of metals/metalloids in sediments (for example, in accordance with ANZECC & ARMCANZ 2000 and/or the most recent version of Australian Standard 5667.1)
(h) apply procedures and/or guidelines from ANZECC and ARMCANZ 2000 and other relevant guideline documents
(i) describe sampling and analysis methods and quality assurance and control.</td></tr>
<tr><td>WT4</td><td>The REMP must be implemented prior to commencement of dredging activities and construction and not cease until after dredging activities are completed.</td></tr>
<tr><td>WT5</td><td>A report outlining the findings of the REMP, including all monitoring results and interpretations must be prepared and made publicly available on the proponent’s website annually, within one month of its completion and remain accessible for the duration of the dredging activities. The first report must be published prior to the commencement of dredging activities and construction. This report must describe the results from the program described above. Reports completed after commencement must include a comparison between conditions before and after commencement of the activity for all indicators.</td></tr>
<tr><td>WT6</td><td>The proponent must not discharge, irrigate or otherwise release potable water, wastewater, stormwater harvested water, bilge water or sewage effluent unless the discharge complies with discharge criteria defined for this activity and approved by the administering authority.</td></tr>
<tr><td>WT7</td><td>The proponent must ensure that maintenance and cleaning of any vessels, vehicles, plant or equipment within Port of Gladstone waters is not carried out where contaminants can be released into any receiving waters.</td></tr>
<tr><td>WT8</td><td>Other than as permitted within this environmental authority, contaminants must not be released to any waters.</td></tr>
<tr><td>WT9</td><td>The only contaminants to be released to surface waters are:
(1) bed sediments necessarily disturbed during dredging and construction at locations specified in condition G1, and
(2) contaminants released at the tailwater discharge locations specified in Figure 2.19: Western Basin Expansion reclamation area, version 16, dated 23 November 2018 in accordance with Table WT1 - Surface water release limits and the associated monitoring requirements.

Table WT1 Surface water release limits
<table>
<tr><th rowspan="2">Parameter</th><th colspan="2">Release limit</th><th rowspan="2">Monitoring frequency</th></tr>
<tr><th>Minimum</th><th>Maximum</th></tr>
<tr><td>TSS</td><td></td><td>100 mg/L</td><td>Monthly or weekly during discharge events</td></tr>
</table>
</td></tr>
</table>

Condition number	Condition

NTU		62.5[1]	Every two (2) hours during discharge events*
pH	6.5	9.0	Every two (2) hours during discharge events**
DO		100% sat[2]	Monthly or weekly during discharge events
Ammonia (nitrogen)		8 µg/L[2]	Monthly or daily if pH is outside release limits
TN		210 µg/L	Monthly or weekly during discharge events
TP		29 µg/L	Monthly or weekly during discharge events
Aluminium		24 µg/L	Monthly or daily if pH is outside release limits
Arsenic (III) (filtered)		2.3 µg/L[3]	Monthly or daily if pH is outside release limits
Arsenic (V) (filtered)		4.5 µg/L[3]	Monthly or daily if pH is outside release limits
Cadmium (filtered)		0.7 µg/L[5]	Monthly or daily if pH is outside release limits
Chromium (VI) (filtered)		4.4 g/L[4]	Monthly or daily if pH is outside release limits
Copper (filtered)		1.3 g/L[4]	Monthly or daily if pH is outside release limits
Lead (filtered)		4.4 g/L[4]	Monthly or daily if pH is outside release limits
Mercury (filtered)		0.1 µg/L[5]	Monthly or daily if pH is outside release limits
Nickel (filtered)		7.0 µg/L[5]	Monthly or daily if pH is outside release limits
Silver (filtered)		1.4 µg/L[4]	Monthly or daily if pH is outside release limits
Zinc (filtered)		15 µg/L[4]	Monthly or daily if pH is outside release limits
TPH		10 mg/L	Monthly

Associated monitoring requirements:

- * While NTU is to be monitored at the commencement of discharge events and every two (2) hours during discharge events.
- ** While pH is to be sampled at the commencement of discharge events and every two (2) hours during discharge events.
- Monitoring must be in accordance with the methods prescribed in the latest version of the administrative authority's Monitoring and Sampling Manual.
- Samples must be representative of the general condition of the water body or sediments.

Condition number	Condition
	• All determinations must employ analytical practical quantification limits of sufficient sensitivity to enable comparisons to be made against water quality objectives/triggers/limits relevant to the particular water or sediment quality characteristic. • Monitoring must be undertaken during a release and at the frequency stated. • All monitoring devices must be calibrated and maintained according to the manufacturer's instruction manual. <u>Notes:</u> (1) The NTU release limit is based on the TSS and NTU relationship established within the Port of Gladstone during the Western Basin Dredging and Disposal Project (i.e. TSS = 1.6 x NTU) (2) Source: Table 2A MD2421 Western Basin, 80th percentile (DEHP 2014) (3) Source: Low reliability trigger value, Section 8.3.7 (ANZECC 2000 V2) (4) Source: ANZECC trigger values for marine waters 95th percentile (ANZECC 2000 V2) (5) Source: ANZECC trigger values for marine waters 99th percentile (ANZECC 2000 V2).
WT10	**Exponentially weighted moving average (EWMA) methodology** The EWMA approach is to be implemented in accordance with the *Gatcombe and Golding Cutting Channel Duplication Project, Application of the EWMA approach* document dated 24 January 2020, reference: 237374, revision 1.
WT11	The release of contaminants to **waters** permitted in condition WT2 must not cause environmental harm.
WT12	The release to **waters** permitted in condition WT2 must not produce any slick or other visible evidence of oil or grease, scum, litter or other **visually objectionable matter**.
WT13	All reasonable and practicable **measures** must be taken to minimise the size of the sediment plume and concentration of suspended solids during the conduct of the **dredging activity**.
WT14	Monitoring of turbidity and benthic PAR must be undertaken at the locations and timing specified in **Table WT2 – Water quality monitoring names and locations** and must not exceed the limits specified in **Table WT3 – Water quality management limits** and light associated monitoring requirements in **Table WT4 – Management light limits** and associated monitoring requirements.

Table WT2 Water quality monitoring names and locations

Grouping[1]	Monitoring site name used in Project EIS baseline monitoring	Monitoring site name used in Project Environmental Monitoring Procedure (refer AEIS Appendix H)	Location (WGS84)	Zone[2]	Timing of monitoring[3]	Location description
Offshore	CD1	CD1	S23 57.469 E151 30.115	Open coastal waters		Adjacent to Seal Rocks
	CD2	CD2	S23 52.017 E151 24.380	Open coastal waters		Off East Point off Facing Island
	CD3	MH60 (PCIMP site)	S23 54.989 E151 21.569	Mid Harbour[4]		Located outside the mouth of the Boyne River
	CD4	CD4	S23 46.269 E151 22.639	Open coastal waters		Off the eastern side of Facing Island, adjacent to Pearl Ledge
	CD5	CD5	S23 50.187 E151 27.153	Open coastal waters		Off the eastern side of Facing Island, 3 km northwest of East Banks DMPA
Inshore	P5/MH10	MH10 (PCIMP site)	S23.78382 E151.30647	Mid Harbour[4]		Adjacent to Pelican Banks seagrass meadows
	P2B/WB50	WB50 (PCIMP site)	S23.70204 E151.13865	Western Basin		Outside the mouth of the Calliope River
	QE3	NW50 (PCIMP site)	S23.70204 E151.13865	The Narrows		Adjacent to Worthington Island in The Narrows
	Not applicable	C3	S23.76748 E151.16817	Western Basin		Adjacent to Western Basin reclamation area
Reference site	Not applicable	RB1	S24.06795 E151.650883	Rodds Bay		Rodds Bay (as part of Baffle Basin)

Table notes:

- 1: Type refers to the general term used to group the Project EIS water quality monitoring sites

- 2: Water zones in accordance with EPP (Water) Schedule 1 – Plan WQ1312 (EHP 2014c)
- 3: Timing of monitoring in this column to be populated in relation to project staging
- 4: While CD3 and P5/MH10 were both located in the Mid Harbour Zone they were grouped as 'inshore' and 'offshore', respectively. CD3 was located close to the edge of the Mid Harbour and Outer Harbour Zone boundaries and baseline water quality appeared to show more wind and wave influences. Conversely P5/MH10 was located in a more enclosed coastal location showing a more tidally influenced, well-mixed water column.

Table WT3 Water quality trigger values

Site #	Status	Zone	Parameter	Wet Season triggers (01 Oct to 31 Mar)*	Dry Season triggers (01 Apr to 31 Sep)*	Data requirements
WB50	Compliance	Western Basin	Turbidity (NTU) / Telemetry	**Internal alert** **19.39 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**Internal alert** **15.37 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **35.61 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **22.79 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	
MH10	Compliance	Mid Harbour	Turbidity (NTU) / Telemetry	**Internal alert** **11.45 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**Internal alert** **6.73 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **19.23 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **11.36 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	
MH60	Compliance	Mid Harbour	Turbidity (NTU) /	**Internal alert**	**Internal alert**	

Site #	Status	Zone	Parameter	Wet Season triggers (01 Oct to 31 Mar)*	Dry Season triggers (01 Apr to 31 Sep)*	Data requirements
			Telemetry	**5.40 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**7.05 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **9.04 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **10.87 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	
QE3	Compliance	The Narrows	Turbidity (NTU) / Telemetry	**Internal alert** **27.51 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**Internal alert** **9.39 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **59.25 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external alert trigger)	**External exceedance notification** **10.70 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external alert trigger)	
CD1	Compliance	Outer Harbour	Turbidity (NTU) / Telemetry	**Internal alert** **3.01 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**Internal alert** **2.32 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **4.83 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **4.30 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	
CD2	Compliance	Outer Harbour	Turbidity (NTU) /	**Internal alert**	**Internal alert**	

Site #	Status	Zone	Parameter	Wet Season triggers (01 Oct to 31 Mar)*	Dry Season triggers (01 Apr to 31 Sep)*	Data requirements
			Telemetry	**3.02 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**3.60 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **5.04 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **5.76 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	
CD4	Compliance	Outer Harbour	Turbidity (NTU) /	**Internal alert** **2.54 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**Internal alert** **1.78 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **4.00 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **3.72 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	
CD5	Compliance	Outer Harbour	Turbidity (NTU) /	**Internal alert** **1.95 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**Internal alert** **1.50 NTU** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **6.45 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	**External exceedance notification** **2.47 NTU** (95th %ile of the 6 hr EWMA applied to background turbidity data – external notification trigger)	
C3[a]	Compliance	Western Basin	Turbidity (NTU) /	**Internal alert**	**Internal alert**	

Site #	Status	Zone	Parameter	Wet Season triggers (01 Oct to 31 Mar)*	Dry Season triggers (01 Apr to 31 Sep)*	Data requirements
				TBD (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	**TBD** (80th %ile of the 6 hr EWMA applied to background turbidity data – internal alert trigger)	Real time data feed to GPC. De-confounded data + 6 hourly EWMA plot.
				External exceedance notification **TBD** (95th %ile of the 6 hr EWMA applied to background turbidity data – external alert trigger)	**External exceedance notification** **TBD** (95th %ile of the 6 hr EWMA applied to background turbidity data – external alert trigger)	

Table note:

(a) [a] Denotes specific turbidity monitoring sites that lack historic data, and their water quality monitoring triggers will be developed from 6 months of pre-Project monitoring (refer AEIS Appendix H, Table 8) and using EWMA methodology. Turbidity triggers for C3 will be determined upon receipt of the 6 months of water quality data (prior to Project construction commencing).

Table WT4 Management light trigger values

Species	Meadow type	Monitoring site / meadow #	Management threshold (mol photons m-2 d-1)	Integration time (days)[a] (mol photons m-2 d-1)	Internal notification time (days Rolling average below threshold)	External notification time (days)[b] (mol photons m-2 d-1)	Modify activities (days)[c] (mol photons m-2 d-1)	Time to impact (days)[d] (mol photons m-2 d-1)
*Halophila species**	Deep water transitory	CD1 CD2 CD4 CD5	**1.5 to 2** **(July to Dec only)**	**7***	1 (7)*	3 (10)*	5(12)*	7 **(14)***
Zostera muelleri	Coastal enduring	PBN PBS WI BS ST	**6**	**14**	1 (14)	7 (21)	10 (24)	14 **(28)**

Species	Meadow type	Monitoring site / meadow #	Management threshold (mol photons m-2 d-1)	Integration time (days)[a] (mol photons m-2 d-1)	Internal notification time (days Rolling average below threshold)	External notification time (days)[b] (mol photons m-2 d-1)	Modify activities (days)[c] (mol photons m-2 d-1)	Time to impact (days)[d] (mol photons m-2 d-1)
		WB						
Halodule uninervis	Coastal enduring	QI ST TS CI	**5**	**14**	1 (14)	14 (21)	18 (28)	26 **(40)**

Table notes:

Value in brackets represent the total number of days of light below the threshold incorporating the days of integration for the Rolling average (7 for *Halophila*, 14 for other species).

Values in bold font in table are the values identified in Collier et al. (2016)

- [a] Averaging time to describe light history and as first signal to trigger adaptive management plan – Internal Alert Level (Level 1 trigger)
- [b] This is the number of days light can remain below threshold levels before external notification is required. At this stage an inference assessment would begin to compare with reference sites and to determine if BPAR levels are due to dredging or other (natural) cause
- [c] If inference assessment determines BPAR levels are being influenced by Project activities, modification of Project activities would occur by this time
- [d] Time to impact expected – External notification and additional management measures should be implemented before this time
- * For transitory deep water *Halophila* sites management actions are suggested only during July and December when these species and meadows are likely to be present as part of annual growth cycles.

Schedule E. Land

Condition number	Condition
L1	The suitability of (a) **dredged material** for **land** reclamation (b) the proposed reclamation area as a site for dredged material placement must be sampled, assessed and confirmed no more than five (5) years before **dredging** is undertaken using a sediment sampling and analysis plan in accordance with the methodologies provided in the latest editions of the: (i) Water Quality Australia (June 2018) National Acid Sulfate Soils Guidance – Guidelines for the dredging of acid sulfate soils sediments and associated dredge spoil management. (ii) Water Quality Australia (June 2018) National Acid Sulfate Soils Guidance – National acid sulfate soils sampling and identification methods manual. (iii) Queensland Government (2014) Queensland Acid Sulfate Soil Technical Manual. Soil Management Guidelines V4.0. (iv) National Environment Protection (Assessment of Site Contamination) Measure 1999. (v) PFAS National Environmental Management Plan (NEMP) (vi) National Assessment Guidelines for Dredging 2009. Note: it is **your** responsibility to determine whether previous characterisation of dredged sediments are suitable for assessing risks to environmental values associated with the dredging campaign to which this environmental authority relates and to ensure that all emerging contaminants of concern are adequately considered.
L2	The sediment sampling and analysis plan report on the suitability of the **dredged material** for **land** reclamation and the findings of the site suitability assessment must be submitted to the **administering authority** at least fifty (50) business days prior to the commencement of the **dredging activity**.
L3	An Acid Sulfate Soil Management Plan (ASSMP) must be prepared for all potential acid sulfate soil (PASS) that may be directly or indirectly disturbed by the **dredging activities**. The ASSMP must be prepared in accordance with the latest edition of the *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines.*
L4	A copy of the ASSMP must be submitted to the **administering authority** at least fifty (50) business days prior to the commencement of the **dredging activity** and, the proponent will amend the ASSMP in accordance with any comments made by the **administering authority** prior to the commencement of the **dredging activity.** An **appropriately qualified person(s)** must design and be responsible for the implementation of the ASSMP.
L5	The ASSMP must be provided to palm@des.qld.gov.au or mailed to: ATTN: Coastal and Marine Assessment Department of Environment and Science Permit and Licence Management Implementation and Support Unit GPO Box 2454 Brisbane Qld 4001
L6	A copy of the Closure Report (including the results of “handover testing”) in accordance with the Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines for the dredged material must be provided to the **administering authority** within twelve (12) months of dredging completion.
L7	**Land** that has been reclaimed under this environmental authority must be maintained in a manner such that: (a) Erosion and sediment control measures are implemented in accordance with the Best Practice Erosion and Sediment Control (BPESC) guidelines for Australia (International

Condition number	Condition
	Erosion Control Association) and maintained to prevent the release of sediment and prevent erosion both on and off site. (b) the quality of water released from the site does not cause environmental harm; (c) the final landform is stable and protects public safety.

Schedule F. Noise

Condition number	Condition
N1	Noise generated by the **activity** must not cause **environmental nuisance** to any **sensitive place** or **commercial place**.
N2	When requested by the **administering authority**, noise monitoring must be undertaken within a reasonable and practical timeframe nominated by the **administering authority** at any **sensitive place** or **commercial place**, and results of the monitoring results must be submitted to the **administering authority** within fourteen (14) days following completion of monitoring.
N3	Noise monitoring and recording as required under condition N2 must include the following descriptor characteristics and matters: (a) $L_{AN,T}$ (where N equals the statistical levels of 1, 10 and 90 and T = 15 mins); (b) **background noise** L_{A90}; (c) the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels; (d) atmospheric conditions, including temperature, relative humidity and wind speed and directions; (e) effects due to any extraneous factors such as traffic noise; (f) location, date and time of monitoring; (g) if low frequency noise is present, $Max_{LpLIN,T}$ and one third octave band measurements in $dB_{(LIN)}$ for centre frequencies in the 10 to 200 hertz range.
N4	The method of measurement and reporting as required under condition N2 of noise levels must comply with the latest edition of the **administering authority**'s *Noise Measurement Manual.*
N5	To mitigate potential noise impacts on fauna: (a) Create an exclusion/safety zone around the perimeter of pile driving activities. (b) A suitably qualified marine fauna spotter is to be present during the works to ensure that pile driving will not be carried out while: (i) Dugongs, marine turtles, dolphins or whales are within 300m of the works (ii) Migratory birds are within 25 m. (c) Where fauna is observed within the distances identified in (2) above, activities will be placed on hold for the period of time it takes the animal to leave the exclusion/safety zone of its own accord. (d) The fauna safety shut-down zones are to also be implemented for continuous impact piling durations using the fauna spotter as identified in Table N1: **Table N1**

Noise exposure threshold based on cumulative SEL (within a 24-hour period)		Observation zone	Shut-down zone
Duration with continuous piling @100 strikes/min	Cumulative SEL <198dB re 1µPa2-S		
≤ 1 min	≤ 50 m	1.0 km	50 m
10 min	310 m	1.0 km	310 m

Condition number	Condition
	60 min | 1.4 km | 2.0 km | 1.4 km (e) Where practical, avoid conducting impact piling during the following times: (i) When marine mammals are likely to be breeding, calving, feeding or resting in a biologically important habitats nearby (ii) Humpback whale migration season from June to August (iii) During marine turtle (Loggerhead turtle and flatback turtle) peak nesting activity period from November to December.

Schedule G. Waste

Condition number	Condition
W1	All waste generated in carrying out the **dredging activity** must be reused, recycled or removed to a facility or designated onsite location(s) that can lawfully accept the waste.

Schedule H. Light

Condition number	Condition
Li1	Excluding lighting required for navigation and safety: (a) Only amber LED aeroscreen lighting is to be used for lighting outside of project vessel cabins, cabin portholes (b) No light source within the area if directly visible from outside the project dredging vessel perimeter.

Definitions

Note that where a term is not defined, the definition in the *Environmental Protection Act 1994*, its regulations or environmental protection policies must be used. If a word remains undefined, it has its ordinary meaning.

Activity (activities) means the environmentally relevant activities, whether resource activities or prescribed activities, to which the environmental authority relates.

Administering authority means the Department of Environment and Science or its successors or predecessors.

Agreed delivery arrangement has the same meaning as section 19(4) of the *Environmental Offsets Act 2014*.

Alert level(s) represent tiers in a hierarchy of increasing environmental risk and are defined by **trigger values**. Three **alert levels** (low, moderate, and high) are typically used in a management action framework to indicate adverse conditions and guide management responses that aim to prevent and minimise environmental harm.

Appropriately qualified and experienced person(s) means a person or persons who has professional qualifications, training, skills and experience relevant to the environmental authority (EA) requirement and can give authoritative assessment, advice and analysis in relation to the EA requirement using the relevant protocols, standards, methods or literature.

Background noise means noise, measured in the absence of the noise under investigation, as $LA_{90,\ adj,\ T}$ being the A-weighted sound pressured level exceeded for 90 per cent of the time period of not less than 15 minutes, using Fast response.

Baseline-based assessment means the **DMP** involves a monitoring result assessment methodology that uses assessment criteria developed from a pre-disturbance baseline data collection phase.

Capital dredging means dredging carried out for the purpose of:

- creating or enlarging a channel, basin, port, berth or other similar thing; or

- removing material that is unsuitable as a foundation for a **port facility**; or
- creating a trench for a pipe, cable or tube; or
- an **activity** incidental to an **activity** mentioned in subparagraph (a) to (c);
- but does not include **dredging** carried out for the purpose of:
- maintaining a channel, basin, port, berth or other similar thing for its intended use; or
- protecting human life or property.

Commercial place means a place used as a workplace, an office or for business or commercial purposes and includes a place within the curtilage of such a place reasonably used by persons at that place.

Concern site(s) means a site where a **sensitive receptor** occurs within the **zone of influence** of a sediment plume.

Construction in reference to this EA, means building of the bund walls for the Western Basin Expansion reclamation areas (northern and southern) and barge unloading facility, and ancillary works for the Northern and Southern Western Basin Expansion areas as per Figure 2.19, version 16, dated 23 November 2018*;

* figures from EIS documents must be updated to meet the following minimum standards:

- Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including:
  - adjacent real property boundaries;
  - adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area;
  - relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs);
  - the location and setting out details for cross-sections; and
  - any other information required to accurately define the area and to allow the site to be readily identified from the plan.
- All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.

Continuous logging means to record instrument-derived data in a memory storage device (a data logger). The frequency of data logging may be, for instance, every 15 minutes, but where a logger device is used in situ, the frequency may be dependent on the memory storage capacity of the logger and the time between logger retrieval events. Alternatively, continuous logging may be performed via telemetry, with the data being broadcast to an ex situ computer or data logger.

Control site(s) refers to a monitoring site located beyond the anticipated **zone of influence** of sediment plumes and has **site pairing** with one or more **test sites** or **sentinel sites.** In monitoring programs, control sites serve the same role as do **reference sites** but only for a defined subset of parameters.

Dredge footprint is the area being dredged, including batters.

Dredge Management Plan (DMP) is an environmental management plan for the **dredging activity**. It defines and describes the:

- scope, timing and duration of the **dredging** operation
- **sediment plume-associated monitoring** programs
- assessment of data, **trigger values** and **alert levels**, and
- management actions that may be required in response to adverse monitoring results.

The **DMP** includes an aim to prevent and minimise environmental harm to **sensitive receptors** as a result of the **dredging activity.**

Dredge Technical Reference Panel means an assembly of **appropriately-qualified persons** representing experts in various scientific fields, formed to be capable of assessing **sediment plume-associated monitoring** data and presenting advice relevant to conducting the dredging campaign and protecting **sensitive receptors** as directed under this authority and the **DMP.**

Dredged material means mud, sand, coral, shingle, gravel, clay, earth and other material removed by dredging. Dredged material includes dredge spoil and extracted quarry material.

Dredging means the mechanical removal of material from below naturally occurring surface waters. It excludes minor adjustments to the bed surface to level troughs and peaks and where bed material is only redistributed locally (bed levelling).

Dredging activities (activity) means the following:

- Dredging
- Loading of barges or similar vessels with dredged material
- Movement of barges or similar vessels from the dredge footprint to a barge unloading facility
- Removal of dredged material from barges or similar vessels into trucks or similar infrastructure for transport to the existing Western Basin reclamation area and/or Western Basin Expansion reclamation area
- Placement and dewatering of dredged material within the existing Western Basin reclamation area and/or Western Basin Expansion reclamation area.

Environmental nuisance means as defined in Section 15 of the *Environmental Protection Act 1994*.

Environmental offset has the same meaning as section 7(2) of the *Environmental Offsets Act 2014*.

Environmental value means:

- a quality or physical characteristic of the environment that is conductive to ecological health of public amenity or safety; or
- another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.

Groundwater means water that occurs naturally in, or is introduced artificially into, an aquifer.

High ecological value (HEV) is the 'management intent' for the 'ecosystem condition' as defined in Schedule 1 of the *Environmental Protection Policy (Water and Wetland Biodiversity) 2019* for scheduled waters, or the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 (ANZECC & ARMCANZ 2000) for non-scheduled waters. HEV ecosystems are intact and typically exhibit relatively insignificant levels of anthropogenic impacts

Holder means any person who is the holder of, or is acting under, this environmental authority.

$L_{Aeq,\ adj,\ T}$ means the adjusted A weighted equivalent continuous sound pressure level measures on fast response, adjusted for tonality and impulsiveness, during the time period T, where T is measured for a period no less than 15 minutes when the **activity** is causing steady state noise, and no shorter than one hour when the approved **dredging activity** is causing an intermittent noise.

Land means any land, whether above or below the ordinary high-water mark at spring tides (i.e. includes **tidal land**).

Maximum extent of impact means maximum extent of significant residual impact to a prescribed environmental matter. Significant residual impact has the meaning in section 8of the *Environmental Offsets Act 2014.*

Measures has the broadest interpretation and includes:

- **Procedural measures** such as standard operating procedures for **dredging** operations, environmental risk assessments, management actions, Departmental directions and relevant guidelines
- **Physical measures** such as plant, equipment, physical objects (such as bunding, containment systems etc.), ecosystem monitoring and bathymetric surveys.

NATA means National Association of Testing Authorities.

Nominated delegate means another government agency that provides services to the **administering authority.**

Notice of election means a notice mentioned in section 18(2) of the *Environmental Offsets Act 2014* by which an authority **holder** elects to deliver an environmental offset.

Offset delivery plan has the same meaning as section 18(3) of the *Environmental Offsets Act 2014*.

PFAS means perfluoroalkyl and polyfluoroalkyl substances.

Port facility means a facility or **land** used in the operation or strategic management of a port authority's port. **Port facility** does not include a small-scale port facility to be used for a tourism or recreation purpose. Examples of a small-scale **port facility**-boat ramp, boat harbour, marina.

Prescribed water contaminants means contaminants listed within Schedule 10 of the *Environmental Protection Regulation 2019.*

Prescribed environmental matter has the meaning in Section 10 of the *Environmental Offsets Act 2014*.

Records include breach notifications, written procedures, analysis results, monitoring reports and monitoring programs required under a condition of this authority.

Reference site refers to a monitoring site located not only beyond the anticipated **zone of influence** of a sediment plume, but also beyond other sources of environmental impacts, and has **site pairing** with one or more **test sites** or **sentinel sites.** In monitoring programs, **reference sites** serve the same role as do **control sites** but can generally be suitable for a broader set of parameters.

Rehandled means handling or relocation of **dredged material** from a stockpile.

Release of a contaminant into the environment means to:

- deposit, discharge, emit or disturb the contaminant
- cause or allow the contaminant to be deposited, discharged, emitted or disturbed
- fail to prevent the contaminant from being deposited, discharged emitted or disturbed
- allow the contaminant to escape
- fail to prevent the contaminant from escaping.

Remove (removed, removal) means to:

- extract and collect quarry material from the Allocation Area; or
- take plant, equipment and measures that are associated with the dredging operation, out of the Allocation Area.

(**Remove** does not include the rehandling of **dredged material** or collection of quarry material as part of a geotechnical investigation associated with future tidal works or extraction).

Sediment plume-associated impacts are impacts associated with sediment plumes including turbidity and suspended solids concentrations, light attenuation or sedimentation rates elevated above either **control site** or **reference site** readings or baseline conditions for an equivalent time of year. Where **dredged material** possesses acid sulfate soil-related properties, **sediment plume-associated impacts** may also include pH, dissolved oxygen and metal and metalloid-related toxicity impacts.

Sediment plume-associated monitoring (SPAM) means environmental monitoring associated with risk management of **sediment plume-associated impacts**.

Sensitive place includes the following and includes a place within the curtilage of such a place reasonably used by persons at that place:

- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- a motel, hotel or hostel; or

- a kindergarten, school, university or other educational institution; or
- a medical centre or hospital; or
- a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 2004* or a World Heritage Area; or
- a public park or garden; or
- for noise, a place defined as a sensitive receptor for the purposes of the *Environmental Protection (Noise) Policy 2019*.

Sensitive receptor(s) includes biological sensitive receptors together with other **environmental values** sensitive to the effects of dredge-generated **sediment plume-associated impacts**.

Sentinel site is a **test site** that is situated between the disturbance source and the **sensitive receptor** and serves to provide earlier warning of developing adverse conditions than does a **test site.**

Significant residual impact has the meaning in section 8 *Environmental Offsets Act 2014*.

Site pairing refers to monitoring sites that have a functional control-impact relationship, for example, Control site A is referenced to assess monitoring data collected from Concern Sites AA and AB, thus, **Concern Sites** AA and AB share site pairing with **Control Site** A.

Slightly disturbed is the 'management intent' for the 'ecosystem condition' as defined in Schedule 1 of the *Environmental Protection Policy (Water and Wetland Biodiversity) 2019*. **Slightly disturbed** ecosystems should generally be regarded as **high ecological value** ecosystems in all respects except for some relatively minor disturbances (usually water-quality related (e.g. nutrient concentrations exceeding the water quality objective)).

Test site(s) is a **concern site** that functions as a test point for compliance, is a monitoring site situated within the area where a **sensitive receptor** occurs and where environmental monitoring-related assessment criteria (e.g. **trigger values**) apply.

Tidal land means land that is submerged at any time by **tidal water**.

Tidal water means as defined in the *Coastal Protection and Management Act 1995*.

Trigger Action Response Program (TARP) is the prevention and control of fugitive dust through early detection of air quality conditions deemed to be unacceptable with the criteria as set by the Environmental Protection (Air) Policy 2019 and licence conditions.

Trigger values are physicochemical, parameter-specific measurement values used to indicate a condition where an **environmental value** or **sensitive receptor** may be at low, moderate or high risk, or some other risk-related indicator.

Visually objectionable matter means deposits, floating debris/litter, oil, scum and other substances that produce objectionable colour, turbidity and/or non-natural material that can be seen by humans.

Waters includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water, natural or artificial watercourse, bed and bank of any **waters**, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and **groundwater** and any part thereof.

You means the holder of the environmental authority.

Zone of influence of a sediment plume is, in its broadest application, defined by the **dredge footprint** and the area beyond the **dredge footprint** where at least some level of **sediment plume-associated impacts** are expected to occur. The overall **zone of influence** may be broken down into more risk-relevant sub-categories, such as the Zone of Unavoidable Loss (the **dredge footprint** and immediately adjacent areas), the Zone of Moderate Impact, or the Zone of Low Impact, with each zone being defined according to its purpose or role in environmental management.

Schedule 3. Development Permit for Material Change of Use for Environmentally Relevant Activity (dredging) (concurrence ERA16) (Stage 1 dredging works)

This schedule includes the Coordinator-General's stated conditions for a material change of use under *Planning Act 2016*, stated under section 37 of the State Development and Public Works Organisation Act 1971.

The entities with jurisdiction for conditions in this schedule is the Department of Environment and Science.

Condition number	Condition
1	The development must be carried out generally in accordance with the following plans*: (a) Figure 2.9: Gatcombe and Golding Cutting Channel Duplication Area, version 3, dated 18 April 2018 where relevant to Stage 1 dredging works; (b) Figure 2.10: Proposed area to be dredged – Stage 1 (-13.5m LAT), version 4, dated 13 November 2017; (c) Figure 2.17: Proposed area to be dredged for barge access channel and barge unloading facility, version 6, dated 13 December 2018; (d) Figure 2.19: Western Basin Expansion reclamation area showing the 'licenced discharge point (for Western Basin Expansion reclamation area)' and 'licenced discharge points (for existing Western Basin reclamation area)', version 16, dated 23 November 2018. **Timing: For the duration of dredging works** Notes: * figures from EIS documents must be updated to meet the following minimum standards: • Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including: – adjacent real property boundaries; – adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area; – relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs); – the location and setting out details for cross-sections; and – any other information required to accurately define the area and to allow the site to be readily identified from the plan. • All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.
2	Development authorised under this approval for ERA 16(1)(d) is limited to the dredging of 7.25 million cubic metres of dredged material as measured in situ from the Gatcombe and Golding Cutting shipping channels; and dredging of 0.25 million cubic metres of dredged material as measured in situ from the barge access channel. **Timing: For the duration of the relevant works**
3	(a) An erosion and sediment control plan must be prepared by a suitably qualified person, in accordance with the Best Practice Erosion and Sediment Control (BPESC) guidelines for Australia (International Erosion Control Association).

Condition number	Condition
	Timing: Prior to the dredging occurring (b) Provide the erosion and sediment control plan to: palm@des.qld.gov.au or mailed to: Permit and Licence Management Department of Environment and Science GPO Box 2454 Brisbane QLD 4001 **Timing: Prior to the dredging occurring** (c) Undertake the development generally in accordance with the erosion and sediment control plan. **Timing: While the dredging is occurring** (d) Provide written evidence from a suitably qualified person that all elements of this condition have been complied with. **Timing: Upon completion of the dredging**
4	All material used in the reclamation of land from tidal water must be wholly contained within the reclaimed area noted on plans* as: (a) 'Existing Western Basin Reclamation Area' on Figure 2.19: Western Basin Expansion reclamation area, version 16, dated 23 November 2018, or (b) 'Western Basin Expansion Reclamation Area' on Figure 2.19: Western Basin Expansion reclamation area, version 16, dated 23 November 2018. **Timing: At all times during dredging** <u>Notes:</u> * figures from EIS documents must be updated to meet the following minimum standards: • Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including: – adjacent real property boundaries; – adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area; – relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs); – the location and setting out details for cross-sections; and – any other information required to accurately define the area and to allow the site to be readily identified from the plan. • All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.

Schedule 4. Development Permit for Material Change of Use for Environmentally Relevant Activity (dredging) (concurrence ERA16) (Stage 2 dredging works)

This schedule includes the Coordinator-General's stated conditions for a material change of use under *Planning Act 2016*, stated under section 37 of the *State Development and Public Works Organisation Act 1971*.

The entities with jurisdiction for conditions in this schedule is the Department of Environment and Science.

Condition number	Condition
1	The development must be carried out generally in accordance with the following plans*: (a) Figure 2.9: Gatcombe and Golding Cutting Channel Duplication Area, version 3, dated 18 April 2018 where relevant to Stage 1 dredging works; (b) Figure 2.10: Proposed area to be dredged – Stage 1 (-13.5m LAT), version 4, dated 13 November 2017; (c) Figure 2.17: Proposed area to be dredged for barge access channel and barge unloading facility, version 6, dated 13 December 2018; (d) Figure 2.19: Western Basin Expansion reclamation area showing the 'licenced discharge point (for Western Basin Expansion reclamation area)' and 'licenced discharge points (for existing Western Basin reclamation area)', version 16, dated 23 November 2018. **Timing: For the duration of dredging works.** Notes: * figures from EIS documents must be updated to meet the following minimum standards: • Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including: – adjacent real property boundaries; – adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area; – relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs); – the location and setting out details for cross-sections; and – any other information required to accurately define the area and to allow the site to be readily identified from the plan. • All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.
2	Development authorised under this approval for ERA 16(1)(d) is limited to the dredging of 7.25 million cubic metres of dredged material as measured in situ from the Gatcombe and Golding Cutting shipping channels; and dredging of 0.25 million cubic metres of dredged material as measured in situ from the barge access channel. **Timing: For the duration of the relevant works.**
3	(a) An erosion and sediment control plan must be prepared by a suitably qualified person, in accordance with the Best Practice Erosion and Sediment Control (BPESC) guidelines for Australia (International Erosion Control Association).

Condition number	Condition
	Timing: Prior to the dredging occurring (b) Provide the erosion and sediment control plan to: palm@des.qld.gov.au or mailed to: Permit and Licence Management Department of Environment and Science GPO Box 2454 Brisbane QLD 4001. **Timing: Prior to the dredging occurring** (c) Undertake the development generally in accordance with the erosion and sediment control plan. **Timing: While the dredging is occurring** (d) Provide written evidence from a suitably qualified person that all elements of this condition have been complied with. **Timing: Upon completion of the dredging**
4	All material used in the reclamation of land from tidal water must be wholly contained within the reclaimed area noted on plans* as: (a) 'Existing Western Basin Reclamation Area' on Figure 2.19: Western Basin Expansion reclamation area, version 16, dated 23 November 2018, or (b) 'Western Basin Expansion Reclamation Area' on Figure 2.19: Western Basin Expansion reclamation area, version 16, dated 23 November 2018. **Timing: At all times during dredging** <u>Notes:</u> * figures from EIS documents must be updated to meet the following minimum standards: • Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including: – adjacent real property boundaries; – adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area; – relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs); – the location and setting out details for cross-sections; and – any other information required to accurately define the area and to allow the site to be readily identified from the plan. • All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.

Schedule 5. Preliminary Approval for Operational Work – Tidal Works within a Coastal Management District (Western Basin Expansion reclamation areas (southern area) and barge unloading facility)

This schedule includes the Coordinator-General's stated conditions for Preliminary Approval for Tidal Works under the *Planning Act 2016*, stated under Section 39 of the *State Development and Public Works Organisation Act 1971*.

The entity with jurisdiction for conditions 1 to 11 in this schedule is the Department of Environment and Science.

The entity with jurisdiction for conditions 12 to 14 in this schedule is the Department of Transport and Main Roads.

Condition number	Condition
1	The development must be carried out generally in accordance with the following plans*: (a) Figure 2.17: Proposed area to be dredged for barge access channel and barge unloading facility, version 6, dated 13 December 2018, in relation to the barge unloading facility; (b) Figure 2.18: Property details and tenure for Western Basin Expansion reclamation area, version 11, dated 10 March 2020, in relation to the southern reclamation area; (c) Figure 2.20: Western Basin Expansion typical section of peripheral bund wall – armour, core and geotextile (bund wall type B1), included in *Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project Draft Environmental Impact Statement* Chapter 2, revision 0, dated 26 March 2019; (d) Figure 2.21: Western Basin Expansion typical section of bund wall – core and geotextile (bund wall type B2), included in draft EIS Chapter 2, revision 0, dated 26 March 2019. **Timing: For the duration of the construction works.** Notes: * figures from EIS documents must be updated to meet the following minimum standards: • Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including: – adjacent real property boundaries; – adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area; – relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs); – the location and setting out details for cross-sections; and – any other information required to accurately define the area and to allow the site to be readily identified from the plan. • All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.
2	The development must be carried out generally in accordance with the *Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project Draft Environmental Impact Statement* (Draft EIS), revision 0, dated 26 March 2019 and the *Port of Gladstone Gatcombe and Golding Cutting Channel Duplication*

Condition number	Condition
	Project Additional Information to the Environmental Impact Statement (AEIS), revision 0, dated 25 September 2019, in particular: (a) Chapter 2: Project description (Draft EIS), including Sections 2.5, 2.6 and 2.10 where relevant to the Western Basin Expansion reclamation area (southern area) and barge unloading facility; (b) Appendix G: Project Environmental Management Plan (AEIS) where relevant to the Western Basin Expansion reclamation area (southern area) and barge unloading facility; (c) Appendix H: Project Environmental Monitoring Procedure (AEIS) where relevant to the Western Basin Expansion reclamation area (southern area) and barge unloading facility. **Timing: For the duration of the construction works.**
3	Prior to the commencement of works, submit Registered Professional Engineer of Queensland (RPEQ)[1] certified plans prepared by a registered engineer for the following structures to palm@des.qld.gov.au or mail to: Permit and Licence Management Department of Environment and Science GPO Box 2454 Brisbane QLD 4001 The relevant structures are those whose purpose includes: (a) The containment of dredged material and other earth material required to allow development to occur on the reclaimed area. **Timing: Twenty (20) business days prior to the commencement of construction works.** Note: [1]the Department of Environment and Science requires that plans submitted as part of an environmental approval or development application be GPS referenced and approved by a suitably qualified and experienced person who is a Registered Professional Engineer of Queensland (RPEQ).
4	(a) An erosion and sediment control plan must be prepared by an **appropriately qualified and experienced person(s)**, in accordance with the Best Practice Erosion and Sediment Control (BPESC) guidelines for Australia (International Erosion Control Association). **Timing: Prior to construction works occurring.** (b) Provide the erosion and sediment control plan to: palm@des.qld.gov.au or mail to: Permit and Licence Management Department of Environment and Science GPO Box 2454 Brisbane QLD 4001 **Timing: Prior to construction works occurring.** (c) Undertake the development generally in accordance with the erosion and sediment control plan. **Timing: For the duration of the construction works.** (d) Provide written evidence from an **appropriately qualified and experienced person(s)** that all elements of this condition have been complied with.

Condition number	Condition
	Timing: Upon completion of the dredging
5	The suitability of **dredged material** for **land** reclamation must be sampled and assessed confirmed no more than five (5) years before **dredging** is undertaken under using a sediment sampling and analysis plan in accordance with the methodologies provided in the latest editions of the: *(a) Water Quality Australia (June 2018) National Acid Sulfate Soils Guidance – Guidelines for the dredging of acid sulfate soils sediments and associated dredge spoil management* *(b) Water Quality Australia (June 2018) National Acid Sulfate Soils Guidance – National acid sulfate soils sampling and identification methods manual* *(c) Queensland Government (2014) Queensland Acid Sulfate Soil Technical Manual. Soil Management Guidelines V4.0* *(d) National Assessment Guidelines for Dredging* *(e) Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines* *(f) National Environment Protection (Assessment of Site Contamination) Measure 1999* *(g) National Assessment Guidelines for Dredging 2009* *(h) **PFAS** National Environmental Management Plan (NEMP).* Note: it is the responsibility of the proponent/operator to determine whether previous characterisation of dredged sediments are suitable for assessing risks to **environmental values** associated with the dredging campaign to which this environmental authority relates.
6	The sediment sampling and analysis plan report on the suitability of the **dredged material** for **land** reclamation must be submitted to the **administering authority** at least forty fifty (540) business days prior to the commencement of the **dredging activity**.
7	An Acid Sulfate Soil Management Plan (ASSMP) must be prepared for all potential acid sulfate soil (PASS) that may be directly or indirectly disturbed by the **dredging activities**. The ASSMP must be prepared in accordance with the latest edition of the *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines.*
8	A copy of the ASSMP must be submitted to the **administering authority** at least forty (40) business days prior to the commencement of the **dredging activity** and, if necessary, amend in accordance with any comments made by the **administering authority.**
9	(a) The ASSMP must be provided to palm@des.qld.gov.au or mailed to: ATTN: Coastal and Marine Assessment Department of Environment and Science Permit and Licence Management Implementation and Support Unit GPO Box 2454 Brisbane Qld 4001 (b) An **appropriately qualified and experienced person(s)** must design and be responsible for the implementation of the ASSMP
10	A copy of the Closure Report (including the results of "handover testing") for the reclamation area in accordance with the Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines for the dredged material must be provided

Condition number	Condition
	to the **administering authority** within twelve (12) months of dredging completion.
11	The volume (in cubic meters) of material disposed of within the reclamation area under this approval must be provided to palm@des.qld.gov.au or mail to: Department of Environment and Science Permit and Licence Management Implementation and Support Unit GPO Box 2454 Brisbane QLD 4001 **Timing: within two weeks of the completion of construction works.**
12	(a) Provide written notice to the Regional Harbour Master (Gladstone) via email to Gladstone.rhm@msq.qld.gov.au when the development authorised under this approval is scheduled to commence. **Timing: at least two (2) weeks prior to the commencement of construction works.** (b) Provide written notice to the Regional Harbour Master (Gladstone) via email to Gladstone.rhm@msq.qld.gov.au, when the development authorised under this approval has been completed. **Timing: within two (2) weeks of the completion of construction works.** Each notice must state this application number, the location and name of registered place and the condition number under which the notice is being given.
13	All vessels, structures, plant and equipment associated with the construction of the approved works must be lit/marked in accordance with the following specifications and requirements such that undertaking the construction works does not cause a risk to the safe navigation of ships: (a) Any associated equipment including anchors and lines deployed must be marked and lit as detailed in the approved Marine Execution Plan (MEP). All vessels must comply with relevant lighting standards; (b) Lighting provided must not obscure, disguise or otherwise interfere with the effectiveness of navigational lighting. **Timing: While the reclamation works are occurring.**
14	(a) Prepare a Marine Execution Plan (MEP), which includes the following: (i) Forecasted start and end dates (ii) Hours of work (iii) General methodology overview (iv) Name of principal marine equipment involved (v) Extreme weather contingency plans (vi) 24/7 point of contact to ensure timely communication with Vessel Traffic Services during extreme weather and other maritime emergencies. (vii) Vessel traffic management plan to allow safe passage of passing traffic (viii) Any other information to support the safe management of the marine works as identified by the applicant. **Timing: prior to the commencement of reclamation works.** (b) Provide a copy of the MEP to the Regional Harbour Master (Gladstone) via email to: Gladstone.rhm@msq.qld.gov.au

Condition number	Condition
	Timing: within two (2) weeks prior to the commencement of reclamation works. (c) The reclamation works must be undertaken in accordance with the MEP required in part (1) of this condition. **Timing: while the reclamation works are occurring.**

Definitions

Administering authority for:

- conditions 1-11 means the Department of Environment and Science or its successors or predecessors
- conditions 12-14 means the Department of Transport and Main Roads or its successors or predecessors

Appropriately qualified and experienced person(s) means a person or persons who has professional qualifications, training, skills and experience relevant to the conditioned requirement and can give authoritative assessment, advice and analysis in relation to the conditioned requirement using the relevant protocols, standards, methods or literature.

Construction means building of the bund wall and barge unloading facility, and ancillary works for the Northern and Southern Western Basin Expansion reclamation areas as per EIS Figure 2.19, version 16, dated 23 November 2018*.

* figures from EIS documents must be updated to meet the following minimum standards:

- Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including:
  - adjacent real property boundaries;
  - adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area;
  - relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs);
  - the location and setting out details for cross-sections; and
  - any other information required to accurately define the area and to allow the site to be readily identified from the plan.
- All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.

Dredged material means mud, sand, coral, shingle, gravel, clay, earth and other material removed by dredging. Dredged material includes dredge spoil and extracted quarry material.

Dredging means the mechanical removal of material from below naturally occurring surface waters. It excludes minor adjustments to the bed surface to level troughs and peaks and where bed material is only redistributed locally (bed levelling).

Dredging activities (activity) means the following:

(a) **Dredging**

(b) Loading of barges or similar vessels with dredged material

(c) Movement of barges or similar vessels from the dredge footprint to a barge unloading facility

(d) Removal of dredged material from barges or similar vessels into trucks or similar infrastructure for transport to the existing Western Basin reclamation area and/or Western Basin Expansion reclamation area

(e) Placement and dewatering of dredged material within the existing Western Basin reclamation area and/or Western Basin Expansion reclamation area.

Land reclamation means any land, whether above or below the ordinary high-water mark at spring tides (i.e. includes tidal land).

Tidal land means land that is submerged at any time by tidal water.

Tidal water means as defined in the *Coastal Protection and Management Act 1995*.

Schedule 6. Preliminary Approval for Operational Work – Tidal Works within a Coastal Management District (Western Basin Expansion reclamation area (northern area))

This schedule includes the Coordinator-General's stated conditions for Preliminary Approval for Tidal Works under the *Planning Act 2016*, stated under Section 39 of the *State Development and Public Works Organisation Act 1971*.

The entity with jurisdiction for conditions 1 to 11 in this schedule is the Department of Environment and Science.

The entity with jurisdiction for conditions 12-14 in this schedule is the Department of Transport and Main Roads.

Condition number	Condition
1	The development must be carried out generally in accordance with the following plans*: (a) Figure 2.18: Property details and tenure for Western Basin Expansion reclamation area, version 11, dated 10 March 2020, in relation to the northern reclamation area; (b) Figure 2.20: Western Basin Expansion typical section of peripheral bund wall – armour, core and geotextile (bund wall type B1), included in *Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project Draft Environmental Impact Statement* Chapter 2, revision 0, dated 26 March 2019; (c) Figure 2.21: Western Basin Expansion typical section of bund wall – core and geotextile (bund wall type B2), included in draft EIS Chapter 2, revision 0, dated 26 March 2019. **Timing: For the duration of the construction works.** <u>Notes:</u> * figures from EIS documents must be updated to meet the following minimum standards: • Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including: – adjacent real property boundaries; – adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area; – relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs); – the location and setting out details for cross-sections; and – any other information required to accurately define the area and to allow the site to be readily identified from the plan. • All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.
2	The development must be carried out generally in accordance with the *Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project Draft Environmental Impact Statement (*Draft EIS), revision 0, dated 26 March 2019 and the *Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project Additional Information to the Environmental Impact Statement* (AEIS), revision 0, dated 25 September 2019, in particular:

Condition number	Condition
	(a) Chapter 2: Project description (Draft EIS), including Sections 2.5, 2.6 and 2.10 where relevant to the Western Basin Expansion reclamation area (northern area); (b) Appendix G: Project Environmental Management Plan (AEIS) where relevant to the Western Basin Expansion reclamation area (northern area); (c) Appendix H: Project Environmental Monitoring Procedure (AEIS) where relevant to the Western Basin Expansion reclamation area (northern area). **Timing: For the duration of the construction works.**
3	Prior to the commencement of works, submit Registered Professional Engineer of Queensland (RPEQ)[1] certified plans prepared by a registered engineer for the following structures to palm@des.qld.gov.au or mail to: Permit and Licence Management Department of Environment and Science GPO Box 2454 Brisbane QLD 4001 The relevant structures are those whose purpose includes: (1) The containment of dredged material and other earth material required to allow development to occur on the reclaimed area. **Timing: Twenty (20) business days prior to the commencement of construction works.** Note: [1]the Department of Environment and Science requires that plans submitted as part of an environmental approval or development application be GPS referenced and approved by a suitably qualified and experienced person who is a Registered Professional Engineer of Queensland (RPEQ).
4	(a) An erosion and sediment control plan must be prepared by an **appropriately qualified and experienced person(s)**, in accordance with the Best Practice Erosion and Sediment Control (BPESC) guidelines for Australia (International Erosion Control Association). **Timing: Prior to construction works occurring.** (b) Provide the erosion and sediment control plan to: palm@des.qld.gov.au or mailed to: Permit and Licence Management Department of Environment and Science GPO Box 2454 Brisbane QLD 4001 **Timing: Prior to construction works occurring.** (c) Undertake the development generally in accordance with the erosion and sediment control plan. **Timing: For the duration of the construction works.** (d) Provide written evidence from an **appropriately qualified and experienced person(s)** that all elements of this condition have been complied with. **Timing: At the completion of the dredging**
5	The suitability of **dredged material** for **land** reclamation must be sampled and assessed confirmed no more than five (5) years before **dredging** is undertaken

Condition number	Condition
	under using a sediment sampling and analysis plan in accordance with the methodologies provided in the latest editions of the: (a) Water Quality Australia (June 2018) National Acid Sulfate Soils Guidance – Guidelines for the dredging of acid sulfate soils sediments and associated dredge spoil management (b) Water Quality Australia (June 2018) National Acid Sulfate Soils Guidance – National acid sulfate soils sampling and identification methods manual (c) Queensland Government (2014) Queensland Acid Sulfate Soil Technical Manual. Soil Management Guidelines V4.0 (d) National Assessment Guidelines for Dredging (e) Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines (f) National Environment Protection (Assessment of Site Contamination) Measure 1999 (g) National Assessment Guidelines for Dredging 2009 (h) **PFAS** National Environmental Management Plan (NEMP). Note: it is the responsibility of the proponent/operator to determine whether previous characterisation of dredged sediments are suitable for assessing risks to **environmental values** associated with the dredging campaign to which this environmental authority relates.
6	The sediment sampling and analysis plan report on the suitability of the **dredged material** for **land** reclamation must be submitted to the **administering authority** at least forty fifty (540) business days prior to the commencement of the **dredging activity**.
7	An Acid Sulfate Soil Management Plan (ASSMP) must be prepared for all potential acid sulfate soil (PASS) that may be directly or indirectly disturbed by the **dredging activities**. The ASSMP must be prepared in accordance with the latest edition of the *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines.*
8	A copy of the ASSMP must be submitted to the **administering authority** at least forty (40) business days prior to the commencement of the **dredging activity** and, if necessary, amend in accordance with any comments made by the **administering authority.**
9	(a) The ASSMP must be provided to palm@des.qld.gov.au or mailed to: ATTN: Coastal and Marine Assessment Department of Environment and Science Permit and Licence Management Implementation and Support Unit GPO Box 2454 Brisbane Qld 4001 (b) An **appropriately qualified and experienced person(s)** must design and be responsible for the implementation of the ASSMP
10	A copy of the Closure Report (including the results of “handover testing”) for the reclamation area in accordance with the Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines for the dredged material must be provided to the **administering authority** within twelve (12) months of dredging completion.

Condition number	Condition
11	The volume (in cubic meters) of material disposed of within the reclamation area under this approval must be provided to palm@des.qld.gov.au or mail to: Department of Environment and Science Permit and Licence Management Implementation and Support Unit GPO Box 2454 Brisbane QLD 4001 **Timing: Within two weeks of the completion of construction works.**
12	(a) Provide written notice to the Regional Harbour Master (Gladstone) via email to Gladstone.rhm@msq.qld.gov.au when the development authorised under this approval is scheduled to commence. **Timing: At least two (2) weeks prior to the commencement of construction works.** (b) Provide written notice to the Regional Harbour Master (Gladstone) via email to Gladstone.rhm@msq.qld.gov.au, when the development authorised under this approval has been completed. **Timing: Within two (2) weeks of the completion of construction works.** Each notice must state this application number, the location and name of registered place and the condition number under which the notice is being given.
13	All vessels, structures, plant and equipment associated with the construction of the approved works must be lit/marked in accordance with the following specifications and requirements such that undertaking the construction works does not cause a risk to the safe navigation of ships: (a) Any associated equipment including anchors and lines deployed must be marked and lit as detailed in the approved Marine Execution Plan (MEP). All vessels must comply with relevant lighting standards; (b) Lighting provided must not obscure, disguise or otherwise interfere with the effectiveness of navigational lighting. **Timing: While the reclamation works are occurring.**
14	(a) Prepare a Marine Execution Plan (MEP), which includes the following: (i) Forecasted start and end dates (ii) Hours of work (iii) General methodology overview (iv) Name of principal marine equipment involved (v) Extreme weather contingency plans (vi) 24/7 point of contact to ensure timely communication with Vessel Traffic Services during extreme weather and other maritime emergencies. (vii) Vessel traffic management plan to allow safe passage of passing traffic (viii) Any other information to support the safe management of the marine works as identified by the applicant. **Timing: Prior to the commencement of reclamation works.** (b) Provide a copy of the MEP to the Regional Harbour Master (Gladstone) via email to: Gladstone.rhm@msq.qld.gov.au **Timing: Within two (2) weeks prior to the commencement of reclamation works.**

Condition number	Condition
	(2) The reclamation works must be undertaken in accordance with the MEP required in part (a) of this condition. **Timing: While the reclamation works are occurring.**

Definitions

Administering authority for:

- conditions 1-11 means the Department of Environment and Science or its successors or predecessors
- conditions 12-14 means the Department of Transport and Main Roads or its successors or predecessors

Appropriately qualified and experienced person(s) means a person or persons who has professional qualifications, training, skills and experience relevant to the conditioned requirement and can give authoritative assessment, advice and analysis in relation to the conditioned requirement using the relevant protocols, standards, methods or literature.

Construction means building of the bund wall and barge unloading facility, and ancillary works for the Northern and Southern Western Basin Expansion reclamation areas as per EIS Figure 2.19, version 16, dated 23 November 2018*.

* figures from EIS documents must be updated to meet the following minimum standards:

- Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including:
  - adjacent real property boundaries;
  - adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area;
  - relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs);
  - the location and setting out details for cross-sections; and
  - any other information required to accurately define the area and to allow the site to be readily identified from the plan.
- All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.

Dredged material means mud, sand, coral, shingle, gravel, clay, earth and other material removed by dredging. Dredged material includes dredge spoil and extracted quarry material.

Dredging means the mechanical removal of material from below naturally occurring surface waters. It excludes minor adjustments to the bed surface to level troughs and peaks and where bed material is only redistributed locally (bed levelling).

Dredging activities (activity) means the following:

(a) **Dredging**

(b) Loading of barges or similar vessels with dredged material

(c) Movement of barges or similar vessels from the dredge footprint to a barge unloading facility

(d) Removal of dredged material from barges or similar vessels into trucks or similar infrastructure for transport to the existing Western Basin reclamation area and/or Western Basin Expansion reclamation area

(e) Placement and dewatering of dredged material within the existing Western Basin reclamation area and/or Western Basin Expansion reclamation area.

Land reclamation means any land, whether above or below the ordinary high-water mark at spring tides (i.e. includes tidal land).

Tidal land means land that is submerged at any time by tidal water.

Tidal water means as defined in the Coastal Protection and Management Act 1995

Schedule 7. Preliminary Approval for Operational Work – Tidal Works within a Coastal Management District (dredging) (Stage 1 dredging works)

This schedule includes the Coordinator-General's stated conditions for Preliminary Approval for Tidal Works under the *Planning Act 2016*, stated under Section 39 of the *State Development and Public Works Organisation Act 1971*.

The entity with jurisdiction for conditions 1 to 3 in this schedule is the Department of Environment and Science.

The entity with jurisdiction for conditions 4 to 8 in this schedule is the Department of Transport and Main Roads.

Condition number	Condition
1	The development must be carried out generally in accordance with the following plans*: (a) Figure 2.9: Gatcombe and Golding Cutting Channel Duplication Area, version 3, dated 18 April 2018 where relevant to Stage 1 dredging works; (b) Figure 2.10: Proposed area to be dredged - Stage 1 (-13.5m LAT), version 4, dated 13 November 2017; (c) Figure 2.17: Proposed area to be dredged for barge access channel and barge unloading facility, version 6, dated 13 December 2018. **Timing: For the duration of the dredging works.** Notes: *figures from EIS documents must be updated to meet the following minimum standards: • Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including: – adjacent real property boundaries; – adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area; – relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs); – the location and setting out details for cross-sections; and – any other information required to accurately define the area and to allow the site to be readily identified from the plan. • All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.
2	The development must be carried out generally in accordance with the *Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project Draft Environmental Impact Statement* (Draft EIS), revision 0, dated 26 March 2019 and the *Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project Additional Information to the Environmental Impact Statement* (AEIS), revision 0, dated 25 September 2019, in particular: (a) Chapter 2: Project description (Draft EIS), including Sections 2.4, 2.6 and 2.10 where relevant to the Stage 1 dredging activity and barge access channel dredging; (b) Appendix F: Dredging Environmental Management Plan (AEIS) where relevant to the Stage 1 dredging activity and barge access channel dredging; (c) Appendix H: Project Environmental Monitoring Procedure (AEIS) where relevant to the Stage 1 dredging activity and barge access channel dredging.

Condition number	Condition
	Timing: For the duration of the dredging works.
3	Prior to the commencement of works, submit Registered Professional Engineer of Queensland (RPEQ)[1] certified plans prepared by a registered engineer for the following structures to palm@des.qld.gov.au or mail to: Permit and Licence Management Department of Environment and Science GPO Box 2454 Brisbane QLD 4001 The relevant structures are those whose purpose includes: (1) Settlement and discharge of tailwater; (2) Management and treatment of acid sulfate soils. **Timing: Twenty (20) business days prior to the commencement of dredging works.** Note: [1]the Department of Environment and Science requires that plans submitted as part of an environmental approval or development application be GPS referenced and approved by a suitably qualified and experienced person who is a Registered Professional Engineer of Queensland (RPEQ).
4	Any navigational aid that is damaged due to the dredging works must be promptly repaired or replaced at the applicant's cost. In the event that any damage is caused to any aid to navigation, the Harbour Master must be immediately contacted on: Ph (07) 4971 5200, or by email to: Gladstone.rhm@msq.qld.gov.au **Timing: For the duration of the dredging works.**
5	(a) Provide written notice to the Regional Harbour Master (Gladstone) via email to Gladstone.rhm@msq.qld.gov.au when the development authorised under this approval is scheduled to commence. **Timing: At least two (2) weeks prior to the commencement of the dredging.** (b) Provide written notice to the Regional Harbour Master (Gladstone) via email to Gladstone.rhm@msq.qld.gov.au, when the development authorised under this approval has been completed. **Timing: Within two (2) weeks of the completion of the dredging.** Each notice must state this application number, the location and name of registered place and the condition number under which the notice is being given.
6	Hydrographic survey(s) of the authorised dredging area must be conducted, and a copy of the resulting plan(s) must be provided to the Regional Harbour Master (Gladstone) via email to: Gladstone.rhm@msq.qld.gov.au **Timing: Within four (4) weeks of the completion of the dredging.**
7	All vessels, structures, plant and equipment associated with the construction of the approved works must be lit/marked in accordance with the following specifications and requirements such that undertaking the construction works does not cause a risk to the safe navigation of ships:

Condition number	Condition
	(a) Any associated dredging equipment including anchors and lines deployed must be marked and lit as detailed in the approved Marine Execution Plan (MEP). All vessels must comply with relevant lighting standards; (b) Lighting provided must not obscure, disguise or otherwise interfere with the effectiveness of navigational lighting. **Timing: While the dredging is occurring.**
8	(a) Prepare a Marine Execution Plan (MEP), which includes the following: (i) Forecasted start and end dates (ii) Hours of work (iii) General methodology overview (iv) Name of principal marine equipment involved (v) Extreme weather contingency plans (vi) 24/7 point of contact to ensure timely communication with Vessel Traffic Services during extreme weather and other maritime emergencies. (vii) Vessel traffic management plan to allow safe passage of passing traffic (viii) Any other information to support the safe management of the marine works as identified by the applicant. **Timing: Prior to the commencement of dredging.** (b) Provide a copy of the MEP to the Regional Harbour Master (Gladstone) via email to: Gladstone.rhm@msq.qld.gov.au **Timing: Within two (2) weeks prior to the commencement of dredging.** (c) The dredging must be undertaken in accordance with the MEP required in part (a) of this condition. **Timing: While the dredging is occurring.**

Definitions

Administering authority for:

- conditions 1-3 means the Department of Environment and Science or its successors or predecessors
- conditions 4-8 means the Department of Transport and Main Roads or its successors or predecessors

Appropriately qualified and experienced person(s) means a person or persons who has professional qualifications, training, skills and experience relevant to the conditioned requirement and can give authoritative assessment, advice and analysis in relation to the conditioned requirement using the relevant protocols, standards, methods or literature.

Construction means building of the bund wall and barge unloading facility, and ancillary works for the Northern and Southern Western Basin Expansion reclamation areas as per EIS Figure 2.19, version 16, dated 23 November 2018*.

* figures from EIS documents must be updated to meet the following minimum standards:

- Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including:
  - adjacent real property boundaries;
  - adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area;
  - relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs);

  - the location and setting out details for cross-sections; and
  - any other information required to accurately define the area and to allow the site to be readily identified from the plan.
- All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.

Dredged material means mud, sand, coral, shingle, gravel, clay, earth and other material removed by dredging. Dredged material includes dredge spoil and extracted quarry material.

Dredging means the mechanical removal of material from below naturally occurring surface waters. It excludes minor adjustments to the bed surface to level troughs and peaks and where bed material is only redistributed locally (bed levelling).

Dredging activities (activity) means the following:

(a) **Dredging**

(b) Loading of barges or similar vessels with dredged material

(c) Movement of barges or similar vessels from the dredge footprint to a barge unloading facility

(d) Removal of dredged material from barges or similar vessels into trucks or similar infrastructure for transport to the existing Western Basin reclamation area and/or Western Basin Expansion reclamation area

(e) Placement and dewatering of dredged material within the existing Western Basin reclamation area and/or Western Basin Expansion reclamation area.

Land reclamation means any land, whether above or below the ordinary high-water mark at spring tides (i.e. includes tidal land).

Tidal land means land that is submerged at any time by tidal water.

Tidal water means as defined in the Coastal Protection and Management Act 1995

Schedule 8. Preliminary Approval for Operational Work – Tidal Works within a Coastal Management District (dredging) (Stage 2 dredging works)

This schedule includes the Coordinator-General's stated conditions for Preliminary Approval for Tidal Works under the *Planning Act 2016*, stated under Section 39 of the *State Development and Public Works Organisation Act 1971*.

The entity with jurisdiction for conditions 1 to 3 in this schedule is the Department of Environment and Science.

The entity with jurisdiction for conditions 4 to 8 in this schedule is the Department of Transport and Main Roads.

Condition number	Condition
1	The development must be carried out generally in accordance with the following plans*: (a) Figure 2.9: Gatcombe and Golding Cutting Channel Duplication Area, version 3, dated 18 April 2018 where relevant to Stage 2 dredging works; (b) Figure 2.11: Proposed area to be dredged - Stage 2 (-16.1m LAT), version 4, dated 13 November 2017. **Timing: For the duration of the dredging works.** Notes: *figures from EIS documents must be updated to meet the following minimum standards: • Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including: – adjacent real property boundaries; – adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area; – relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs); – the location and setting out details for cross-sections; and – any other information required to accurately define the area and to allow the site to be readily identified from the plan. • All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.
2	The development must be carried out generally in accordance with the *Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project Draft Environmental Impact Statement* (Draft EIS), revision 0, dated 26 March 2019 and the *Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project Additional Information to the Environmental Impact Statement* (AEIS), revision 0, dated 25 September 2019, in particular: (a) Chapter 2: Project description (Draft EIS), including Sections 2.4, 2.6 and 2.10 where relevant to the Stage 2 dredging activity; (b) Appendix F: Dredging Environmental Management Plan (AEIS); (c) Appendix H: Project Environmental Monitoring Procedure (AEIS) where relevant to the Stage 2 dredging activity. **Timing: For the duration of the dredging works.**
3	Prior to the commencement of works, submit Registered Professional Engineer of Queensland (RPEQ)[1] certified plans prepared by a registered engineer for the following structures to palm@des.qld.gov.au or mail to:

Condition number	Condition
	Permit and Licence Management Department of Environment and Science GPO Box 2454 Brisbane QLD 4001 The relevant structures are those whose purpose includes: (a) Settlement and discharge of tailwater; (b) Management and treatment of acid sulfate soils. **Timing: Twenty (20) business days prior to the commencement of dredging works.** Note: [1]the Department of Environment and Science requires that plans submitted as part of an environmental approval or development application be GPS referenced and approved by a suitably qualified and experienced person who is a Registered Professional Engineer of Queensland (RPEQ).
4	(a) Any navigational aid that is damaged due to the dredging works must be promptly repaired or replaced at the applicant's cost. (b) In the event that any damage is caused to any aid to navigation, the Harbour Master must be immediately contacted on: Ph (07) 4971 5200, or by email to: Gladstone.rhm@msq.qld.gov.au **Timing: For the duration of the dredging works.**
5	(a) Provide written notice to the Regional Harbour Master (Gladstone) via email to Gladstone.rhm@msq.qld.gov.au when the development authorised under this approval is scheduled to commence. **Timing: At least two (2) weeks prior to the commencement of the dredging.** (b) Provide written notice to the Regional Harbour Master (Gladstone) via email to Gladstone.rhm@msq.qld.gov.au, when the development authorised under this approval has been completed. **Timing: Within two (2) weeks of the completion of the dredging.** Each notice must state this application number, the location and name of registered place and the condition number under which the notice is being given.
6	Hydrographic survey(s) of the authorised dredging area must be conducted, and a copy of the resulting plan(s) must be provided to the Regional Harbour Master (Gladstone) via email to: Gladstone.rhm@msq.qld.gov.au **Timing: Within four (4) weeks of the completion of the dredging.**
7	All vessels, structures, plant and equipment associated with the construction of the approved works must be lit/marked in accordance with the following specifications and requirements such that undertaking the construction works does not cause a risk to the safe navigation of ships: (a) Any associated dredging equipment including anchors and lines deployed must be marked and lit as detailed in the approved Marine Execution Plan (MEP). All vessels must comply with relevant lighting standards; (b) Lighting provided must not obscure, disguise or otherwise interfere with the effectiveness of navigational lighting. **Timing: While the dredging is occurring.**

Condition number	Condition
8	(a) Prepare a Marine Execution Plan (MEP), which includes the following: (i) Forecasted start and end dates (ii) Hours of work (iii) General methodology overview (iv) Name of principal marine equipment involved (v) Extreme weather contingency plans (vi) 24/7 point of contact to ensure timely communication with Vessel Traffic Services during extreme weather and other maritime emergencies. (vii) Vessel traffic management plan to allow safe passage of passing traffic (viii) Any other information to support the safe management of the marine works as identified by the applicant. **Timing: Prior to the commencement of dredging.** (b) Provide a copy of the MEP to the Regional Harbour Master (Gladstone) via email to: Gladstone.rhm@msq.qld.gov.au **Timing: Within two (2) weeks prior to the commencement of dredging.** (c) The dredging must be undertaken in accordance with the MEP required in part (a) of this condition. **Timing: While the dredging is occurring.**

Definitions

Administering authority for:

- conditions 1-3 means the Department of Environment and Science or its successors or predecessors
- conditions 4-8 means the Department of Transport and Main Roads or its successors or predecessors

Appropriately qualified and experienced person(s) means a person or persons who has professional qualifications, training, skills and experience relevant to the conditioned requirement and can give authoritative assessment, advice and analysis in relation to the conditioned requirement using the relevant protocols, standards, methods or literature.

Construction means building of the bund wall and barge unloading facility, and ancillary works for the Northern and Southern Western Basin Expansion reclamation areas as per EIS Figure 2.19, version 16, dated 23 November 2018*.

* figures from EIS documents must be updated to meet the following minimum standards:

- Detailed and appropriately scaled drawings and/or plans which clearly identify the location of proposed development, including:
  - adjacent real property boundaries;
  - adjacent riverbanks, walls, sandbanks, structures, the limit of vegetation, and/or other principal features of the immediate area;
  - relevant tidal planes (e.g. Highest Astronomical Tide, Mean High Water Springs);
  - the location and setting out details for cross-sections; and
  - any other information required to accurately define the area and to allow the site to be readily identified from the plan.
- All plans/drawings should include title, date and numbering suitable to identify the plan and should be mapped to GDA94 projection.

Dredged material means mud, sand, coral, shingle, gravel, clay, earth and other material removed by dredging. Dredged material includes dredge spoil and extracted quarry material.

Dredging means the mechanical removal of material from below naturally occurring surface waters. It excludes minor adjustments to the bed surface to level troughs and peaks and where bed material is only redistributed locally (bed levelling).

Dredging activities (activity) means the following:

(f) **Dredging**

(g) Loading of barges or similar vessels with dredged material

(h) Movement of barges or similar vessels from the dredge footprint to a barge unloading facility

(i) Removal of dredged material from barges or similar vessels into trucks or similar infrastructure for transport to the existing Western Basin reclamation area and/or Western Basin Expansion reclamation area

(j) Placement and dewatering of dredged material within the existing Western Basin reclamation area and/or Western Basin Expansion reclamation area.

Land reclamation means any land, whether above or below the ordinary high-water mark at spring tides (i.e. includes tidal land).

Tidal land means land that is submerged at any time by tidal water.

Tidal water means as defined in the Coastal Protection and Management Act 1995

Schedule 9. Preliminary Approval for matters regulated under the Fisheries Act 1994 - (Western Basin Expansion reclamation area (southern area))

This schedule includes the Coordinator-General's stated conditions for Preliminary Approval for operational works under the *Planning Act 2016*, stated under Section 39 of the *State Development and Public Works Organisation Act 1971*.

The entity with jurisdiction for conditions in this schedule is the Department of Agriculture and Fisheries.

Part A. General conditions

These general conditions apply to approvals required under Part A and B of this schedule.

Condition number	Condition	Timing
1	Provide written notice to notifications@daf.qld.gov.au, when the development authorised under this approval: (1) will start, and	(1) At least five (5) business days but no greater than twenty (20) business days prior to the commencement of the works
	(2) when it has been completed.	(2) Within fifteen (15) business days of the completion of the fisheries development works.
2	This fisheries development (as defined by the *Fisheries Act 1994*) constitutes a place that is required to be open for inspection by an inspector at all times, pursuant to Section 145 of the *Fisheries Act 1994*.	At all times
3	Land profiles that are temporarily disturbed by the development works (other than those within the permanent development footprint and permanent indirect impacts), must be promptly restored to pre-work profiles.	Upon completion of the works the subject of this approval
4	Enter into an agreed delivery arrangement to deliver an environmental offset in accordance with the *Environmental Offsets Act 2014* to counterbalance any significant residual impact on matters of state environmental significance (marine plants) from the establishment of the Western Basin Expansion reclamation area (southern area).	Prior to commencing any works that impact on the prescribed environmental matters (marine plants)
5	The development must not adversely impact on community access to fisheries resources and fish habitats, including recreational and Indigenous fishing access, outside of the permanent development footprint.	At all times
6	The development must not adversely impact on commercial fishing access and linkages between a commercial fishery and infrastructure, services and facilities, outside of the permanent development footprint.	At all times
7	Any impacts to the commercial, recreational and Indigenous fishing sectors are to be addressed in	

Condition number	Condition	Timing
	accordance with the DAF Guideline on Fisheries Adjustment as a Result of Development.	
8	An aquatic fauna salvage plan to avoid or minimise entrapment and to avoid injury, damage and mortalities is to be designed and implemented by a suitably qualified and experienced person(s) to remove and relocate fauna trapped within the Western Basin Expansion Reclamation Area (southern area) bund.	

Part B. Preliminary approval for a development permit for Material Change of Use, Reconfiguration of a Lot, or Operational Works for removal, destruction or damage of a marine plant

This preliminary approval is for removal, destruction or damage of a marine plant associated with the placement of bund wall rock material and dredged material within the Western Basin Expansion reclamation area (southern area).

The entity with jurisdiction for conditions in this schedule is the Department of Agriculture and Fisheries.

Condition number	Condition	Timing
1	Development authorised under this approval is limited as follows: (1) MCU, RAL or Operational works that is the removal, destruction or damage of marine plants being limited to the 'Project direct impact on marine plants (MNES) (seagrass and macroalgae)' and 'Project indirect impact on marine plants (MNES) (seagrass and macroalgae)' associated with the placement of bund wall rock material and dredged material within the Western Basin Expansion reclamation area (southern area) as detailed in the Gatcombe and Golding Cutting Channel Duplication Project, Figure 1: Location of MSES (marine plant) associated with the Western Basin Expansion reclamation area (southern area), version 0, dated 17 October 2019.	At all times
2	Works involving the removal, destruction or damage of marine plants must be undertaken in accordance with the Accepted Development Requirements for operational work that is the removal, destruction or damage of marine plants or under a development approval (assessable development).	At all times
3	Development works must avoid, or where this cannot be reasonably achieved minimise/mitigate impacts to marine plants outside of the permanent development footprint.	For the duration of the works the subject of this approval
4	Bund wall material and dredged material are not to be disposed of on tidal lands or within waterways, other than in the existing Western Basin reclamation area and the Western Basin Expansion reclamation area and are managed to prevent acid soil development.	At all times
5	(1) The entire marine footprint of the works is to be included in the final Significant Residual Impact area to MSES Marine Plants, however if: (2) A comprehensive and accurate marine plant survey is undertaken at appropriate scale within 12 months prior to any development application for marine plant disturbance being applied for, this survey may be considered in review of the Significant Residual Impact area to MSES Marine Plants at the MCU, RAL or	Within 12 months prior to applying for a development approval for operational works that is the removal, destruction or damage of marine plants.

Condition number	Condition	Timing
	operational works application stage. To be considered, the survey must detail: (a) the total area of all marine plant disturbance (b) clear identification of permanent and temporary impacts (c) any marine plants adjacent to the works (d) include surveys over multiple seasons relevant to the species to be impacted.	
6	(1) Marine Plants that are temporarily removed, damaged or destroyed by this development must be restored to pre-disturbance condition, or if this is not likely to be achieved; (2) Implement a monitoring and inspection program for the purposes of ongoing monitoring of the restoration of temporarily disturbed marine plants. The monitoring program is to be designed and implemented by a suitably qualified and experienced person(s) and should detail the health and condition of marine plants pre-disturbance. Monitoring is to take place for 5 years to ensure pre-disturbance condition has been achieved. If it is unlikely that pre-disturbance condition can be achieved, or after 5 years the pre-disturbance condition has not been achieved, then; (3) Enter into an agreed delivery arrangement to deliver an environmental offset in accordance with the *Environmental Offsets Act 2014* to counterbalance any significant residual impact on matters of state environmental significance (marine plants) from the establishment of the Western Basin Expansion reclamation area (southern area).	(1) Within five (5) years of removal, damage or destruction (3) Prior to commencing any works that impact on the prescribed environmental matters (marine plants)
7	(1) The development works must be managed to prevent development works and associated activities (e.g. storage, parking, runoff, access) from indirectly impacting on marine plants and tidal fish habitats. (2) Implement a monitoring and inspection program for the purposes of ongoing monitoring and protection of marine plants adjacent to the development area, including but not limited to the **intertidal area west of the Western Basin Expansion reclamation area (southern area)**. The monitoring program is to be designed and implemented by a **suitably qualified and experienced person(s)** and should detail the health and condition of marine plants prior to works commencing. Monitoring is to take place bi-annually for 5 years post works to ensure no indirect impacts to marine plants as a result of the development has occurred. Include an alert to action component, agreed with the Department of Agriculture and Fisheries, within this program which sets out: (a) A risk matrix for each marine plant type (i.e. mangroves, saltmarsh, seagrass). (b) Trigger criteria for each species. (c) An alert to action procedure to be initiated if trigger criteria are met or exceeded. (d) If it is found that marine plants adjacent to the works have been irreversibly damaged, then; (3) Enter into an agreed delivery arrangement to deliver an environmental offset in accordance with the *Environmental Offsets Act 2014* to counterbalance any significant residual impact on matters of state environmental significance (marine plants) from the	Prior to commencement of the works and maintained until their completion

Condition number	Condition	Timing
	establishment of the Western Basin Expansion reclamation area (southern area).	
8	Marine plants authorised for removal and other material used in the development (e.g. debris, construction material, soil, etc.) are to be promptly removed from the intertidal zone, excluding from within the bunded Western Basin Expansion reclamation area (southern area).	For the duration of the works that are subject of this approval and to be maintained.

Schedule 10. Preliminary Approval for matters regulated under the Fisheries Act 1994 - (Western Basin Expansion reclamation area (northern area))

This schedule includes the Coordinator-General's stated conditions for Preliminary Approval for operational works under the *Planning Act 2016*, stated under Section 39 of the *State Development and Public Works Organisation Act 1971*.

The entity with jurisdiction for conditions in this schedule is the Department of Agriculture and Fisheries.

Part A. General conditions

These general conditions apply to approvals required under Part A and B of this Schedule.

Condition number	Condition	Timing
1	Provide written notice to notifications@daf.qld.gov.au, when the development authorised under this approval: (1) will start, and	(1) At least five (5) business days but no greater than twenty (20) business days prior to the commencement of the works
	(2) when it has been completed.	(2) Within fifteen (15) business days of the completion of the fisheries development works.
2	This fisheries development (as defined by the *Fisheries Act 1994*) constitutes a place that is required to be open for inspection by an inspector at all times, pursuant to Section 145 of the *Fisheries Act 1994*.	At all times
3	Land profiles that are temporarily disturbed by the development works (other than those within the permanent development footprint and permanent indirect impacts), must be promptly restored to pre-work profiles.	Upon completion of the works the subject of this approval
4	Enter into an agreed delivery arrangement to deliver an environmental offset in accordance with the *Environmental Offsets Act 2014* to counterbalance any significant residual impact on matters of state environmental significance (marine plants) from the establishment of the Western Basin Expansion reclamation area (southern area).	Prior to commencing any works that impact on the prescribed environmental matters (marine plants)
5	The development must not adversely impact on community access to fisheries resources and fish habitats, including recreational and Indigenous fishing access, outside of the permanent development footprint.	At all times
6	The development must not adversely impact on commercial fishing access and linkages between a commercial fishery and infrastructure, services and facilities, outside of the permanent development footprint.	At all times
7	Any impacts to the commercial, recreational and Indigenous fishing sectors are to be addressed in accordance with the DAF Guideline on Fisheries Adjustment as a Result of Development.	

Condition number	Condition	Timing
8	An aquatic fauna salvage plan to avoid or minimise entrapment and to avoid injury, damage and mortalities is to be designed and implemented by a suitably qualified and experienced person(s) to remove and relocate fauna trapped within the Western Basin Expansion Reclamation Area (southern area) bund.	

Part B. Preliminary approval for a development permit for Material Change of Use, Reconfiguration of a Lot, or Operational Works for removal, destruction or damage of a marine plant

This preliminary approval is for removal, destruction or damage of a marine plant associated with the placement of bund wall rock material and dredged material within the Western Basin Expansion reclamation area (northern area).

The entity with jurisdiction for conditions in this schedule is the Department of Agriculture and Fisheries.

Condition number	Condition	Timing
1	Development authorised under this approval is limited as follows: (1) MCU, RAL or Operational works that is the removal, destruction or damage of marine plants being limited to the 'Project direct impact on marine plants (MNES) (seagrass and macroalgae)' and 'Project indirect impact on marine plants (MNES) (seagrass and macroalgae)' associated with the placement of bund wall rock material and dredged material within the Western Basin Expansion reclamation area (northern area) as detailed in the Gatcombe and Golding Cutting Channel Duplication Project, Figure 2: Location of MSES (marine plant) associated with the Western Basin Expansion reclamation area (northern area), version 0, dated 17 October 2019.	At all times
2	Works involving the removal, destruction or damage of marine plants must be undertaken in accordance with the Accepted Development Requirements for operational work that is the removal, destruction or damage of marine plants or under a development approval (assessable development).	At all times
3	Development works must avoid, or where this cannot be reasonably achieved minimise/mitigate impacts to marine plants outside of the permanent development footprint.	For the duration of the works the subject of this approval
4	Bund wall material and dredged material are not to be disposed of on tidal lands or within waterways, other than in the existing Western Basin reclamation area and the Western Basin Expansion reclamation area and are managed to prevent acid soil development.	At all times
5	(1) The entire marine footprint of the works is to be included in the final Significant Residual Impact area to MSES Marine Plants, however if: (2) A comprehensive and accurate marine plant survey is undertaken at appropriate scale within 12 months prior to any development application for marine plant disturbance being applied for, this survey may be considered in review of the Significant Residual Impact area to MSES Marine Plants at the MCU, RAL or operational works application stage. To be considered, the survey must detail:	Within 12 months prior to applying for a development approval for operational works that is the removal, destruction or damage of marine plants.

Condition number	Condition	Timing
	(a) the total area of all marine plant disturbance (b) clear identification of permanent and temporary impacts (c) any marine plants adjacent to the works (d) include surveys over multiple seasons relevant to the species to be impacted.	
6	(1) Marine Plants that are temporarily removed, damaged or destroyed by this development must be restored to pre-disturbance condition, or if this is not likely to be achieved; (2) Implement a monitoring and inspection program for the purposes of ongoing monitoring of the restoration of temporarily disturbed marine plants. The monitoring program is to be designed and implemented by a **suitably qualified and experienced person(s)** and should detail the health and condition of marine plants pre-disturbance. Monitoring is to take place for 5 years to ensure pre-disturbance condition has been achieved. If it is unlikely that pre-disturbance condition can be achieved, or after 5 years the pre-disturbance condition has not been achieved, then (3) Enter into an agreed delivery arrangement to deliver an environmental offset in accordance with the *Environmental Offsets Act 2014* to counterbalance any significant residual impact on matters of state environmental significance (marine plants) from the establishment of the Western Basin Expansion reclamation area (northern area).	(1) Within five (5) years of removal, damage or destruction (3) Prior to commencing any works that impact on the prescribed environmental matters (marine plants)
7	(1) The development works must be managed to prevent development works and associated activities (e.g. storage, parking, runoff, access) from indirectly impacting on marine plants and tidal fish habitats. (2) Implement a monitoring and inspection program for the purposes of ongoing monitoring and protection of marine plants adjacent to the development area, including but not limited to the intertidal area west of the Western Basin Expansion reclamation area (southern area). The monitoring program is to be designed and implemented by a suitably qualified and experienced person(s) and should detail the health and condition of marine plants prior to works commencing. Monitoring is to take place bi-annually for 5 years post works to ensure no indirect impacts to marine plants as a result of the development has occurred. Include an alert to action component, agreed with the Department of Agriculture and Fisheries, within this program which sets out: (a) A risk matrix for each marine plant type (i.e. mangroves, saltmarsh, seagrass). (b) Trigger criteria for each species. (c) An alert to action procedure to be initiated if trigger criteria are met or exceeded. (d) If it is found that marine plants adjacent to the works have been irreversibly damaged, then; (3) Enter into an agreed delivery arrangement to deliver an environmental offset in accordance with the *Environmental Offsets Act 2014* to counterbalance any significant residual impact on matters of state environmental significance (marine plants) from the establishment of the Western Basin Expansion reclamation area (northern area).	Prior to commencement of the works and maintained until their completion

Condition number	Condition	Timing
8	Marine plants authorised for removal and other material used in the development (e.g. debris, construction material, soil, etc.) are to be promptly removed from the intertidal zone, excluding from within the bunded Western Basin Expansion reclamation area (northern area).	For the duration of the works that are subject of this approval and to be maintained.

Schedule 11. Preliminary Approval for matters regulated under the Fisheries Act 1994 - (Channel Duplication Stage 1 dredging)

This schedule includes the Coordinator-General's stated conditions for Preliminary Approval for operational works under the *Planning Act 2016*, stated under Section 39 of the *State Development and Public Works Organisation Act 1971.*

The entity with jurisdiction for conditions in this schedule is the Department of Agriculture and Fisheries.

Part A. General conditions

These general conditions apply to approvals required under Part A and B of this schedule.

Condition number	Condition	Timing
1	Provide written notice to notifications@daf.qld.gov.au, when the development authorised under this approval: (1) will start, and (2) when it has been completed.	(1) At least five (5) business days but no greater than twenty (20) business days prior to the commencement of the works (2) Within fifteen (15) business days of the completion of the fisheries development works.
2	This fisheries development (as defined by the *Fisheries Act 1994*) constitutes a place that is required to be open for inspection by an inspector at all times, pursuant to Section 145 of the *Fisheries Act 1994*.	At all times
3	Enter into an agreed delivery arrangement to deliver an environmental offset in accordance with the *Environmental Offsets Act 2014* to counterbalance any significant residual impact on matters of state environmental significance (marine plants) from the Stage 1 dredging works.	Prior to commencing any works that impact on the prescribed environmental matters (marine plants)
4	The development must not adversely impact on community access to fisheries resources and fish habitats, including recreational and Indigenous fishing access.	At all times
5	The development must not adversely impact on commercial fishing access and linkages between a commercial fishery and infrastructure, services and facilities.	At all times

Part B. Preliminary approval for a development permit for Material Change of Use, Reconfiguration of a Lot, or Operational Works for removal, destruction or damage of a marine plant

This preliminary approval is for removal, destruction or damage of a marine plant within the Stage 1 dredge footprint.

The entity with jurisdiction for conditions in this schedule is the Department of Agriculture and Fisheries.

Condition number	Condition	Timing
1	Development authorised under this approval is limited as follows: (1) MCU, RAL or Operational works that is the removal, destruction or damage of marine plants being limited to the 'Project direct impact on marine plants (MNES) (seagrass and macroalgae)' associated with Stage 1 dredging works, Figure 3: Location of MSES (marine plant) associated with the area to be dredged (Stage 1), version 0, dated 17 October 2019.	At all times
2	Works involving the removal, destruction or damage of marine plants must be undertaken in accordance with the Accepted Development Requirements for operational work that is the removal, destruction or damage of marine plants or under a development approval (assessable development).	At all times
3	Development works must avoid, or where this cannot be reasonably achieved minimise/mitigate impacts to marine plants outside of the permanent development footprint.	For the duration of the works the subject of this approval
4	Dredged material is not to be disposed of on tidal lands or within waterways, other than in the existing Western Basin reclamation area and the Western Basin Expansion reclamation area, and are managed to prevent acid soil development.	At all times
5	(1) The entire marine footprint of the works is to be included in the final Significant Residual Impact to MSES Marine Plants, however if: (2) If a comprehensive marine plant survey is undertaken within 12 months prior to any development application for marine plant disturbance is applied for, this may be used to review the Significant Residual Impact area to MSES Marine Plants at the MCU, RAL or operational works stage. The survey must detail: (a) the total area of all marine plant disturbance (b) clear identification of permanent and temporary impacts (c) any marine plants adjacent to the works (d) include surveys over multiple seasons relevant to the species to be impacted.	Within 12 months prior to applying for a development approval for operational works that is the removal, destruction or damage of marine plants.
6	Enter into an agreed delivery arrangement to deliver an environmental offset in accordance with the *Environmental Offsets Act 2014* to counterbalance any significant residual impact on matters of state environmental significance (marine plants) from the Stage 1 dredging works.	Prior to commencing any works that impact on the prescribed environmental matters (marine plants)
7	Implement a monitoring and inspection program for the purposes of ongoing monitoring and protection of marine plants adjacent to the works area and within the turbidity impact zones of Stage 1 dredging. Include an alert to action component, agreed with Department of Agriculture and Fisheries, within this program which sets out: (1) A risk matrix for each species type (i.e. mangroves, saltmarsh, seagrass). (2) Trigger criteria for each species. (3) An alert to action procedure to be initiated if trigger criteria are met or exceeded.	

Schedule 12. Preliminary Approval for matters regulated under the Fisheries Act 1994 - (Channel Duplication Stage 2 dredging)

This schedule includes the Coordinator-General's stated conditions for Preliminary Approval for operational works under the *Planning Act 2016*, stated under Section 39 of the *State Development and Public Works Organisation Act 1971*.

The entity with jurisdiction for conditions in this schedule is the Department of Agriculture and Fisheries.

Part A. General conditions

These general conditions apply to approvals required under Part A and B of this schedule.

Condition number	Condition	Timing
1	Provide written notice to notifications@daf.qld.gov.au, when the development authorised under this approval: (1) will start, and (2) when it has been completed.	(1) At least five (5) business days but no greater than twenty (20) business days prior to the commencement of the works (2) Within fifteen (15) business days of the completion of the fisheries development works.
2	This fisheries development (as defined by the *Fisheries Act 1994*) constitutes a place that is required to be open for inspection by an inspector at all times, pursuant to Section 145 of the *Fisheries Act 1994*.	At all times
3	Enter into an agreed delivery arrangement to deliver an environmental offset in accordance with the *Environmental Offsets Act 2014* to counterbalance any significant residual impact on matters of state environmental significance (marine plants) from the Stage 2 dredging works.	Prior to commencing any works that impact on the prescribed environmental matters (marine plants)
4	The development must not adversely impact on community access to fisheries resources and fish habitats, including recreational and Indigenous fishing access.	At all times
5	The development must not adversely impact on commercial fishing access and linkages between a commercial fishery and infrastructure, services and facilities.	At all times

Part B. Preliminary approval for a development permit for Material Change of Use, Reconfiguration of a Lot, or Operational Works for removal, destruction or damage of a marine plant

This preliminary approval is for removal, destruction or damage of a marine plant within the Stage 2 dredge footprint.

The entity with jurisdiction for conditions in this schedule is the Department of Agriculture and Fisheries.

Condition number	Condition	Timing
1	Development authorised under this approval is limited as follows: (1) Operational works that is the removal, destruction or damage of marine plants being limited to the 'Project direct impact on marine plants (MNES) (seagrass and macroalgae)' associated with Stage 2 dredging works, Figure 4: Location of MSES (marine plant) associated with the area to be dredged (Stage 2), version 0, dated 17 October 2019.	At all times
2	Works involving the removal, destruction or damage of marine plants must be undertaken in accordance with the Accepted Development Requirements for operational work that is the removal, destruction or damage of marine plants or under a development approval (assessable development).	At all times
3	Development works must avoid, or where this cannot be reasonably achieved minimise/mitigate impacts to marine plants outside of the permanent development footprint.	For the duration of the works the subject of this approval
4	Dredged material is not to be disposed of on tidal lands or within waterways, other than in the existing Western Basin reclamation area and the Western Basin Expansion reclamation area, and are managed to prevent acid soil development.	At all times
5	(1) The entire marine footprint of the works is to be included in the final Significant Residual Impact area to MSES Marine Plants, however if: (2) A comprehensive marine plant survey is undertaken within 12 months prior to any development application for marine plant disturbance is applied for this may be used to determine the Significant Residual Impact area to MSES Marine Plants at the MCU, RAL or operational works stage. The survey must detail: (a) the total area of all marine plant disturbance (b) clear identification of permanent and temporary impacts (c) any marine plants adjacent to the works (d) include surveys over multiple seasons relevant to the species to be impacted.	Within 12 months prior to applying for a development approval for operational works that is the removal, destruction or damage of marine plants.
6	Enter into an agreed delivery arrangement to deliver an environmental offset in accordance with the *Environmental Offsets Act 2014* to counterbalance any significant residual impact on matters of state environmental significance (marine plants) from the Stage 1 dredging works.	Prior to commencing any works that impact on the prescribed environmental matters (marine plants)
7	Implement a monitoring and inspection program for the purposes of ongoing monitoring and protection of marine plants adjacent to the works area and within the turbidity impact zones of Stage 2 dredging. Include an alert to action component, agreed with Department of Agriculture and Fisheries, within this program which sets out: (1) A risk matrix for each marine plant type (i.e. mangroves, saltmarsh, seagrass). (2) Trigger criteria for each species. (3) An alert to action procedure to be initiated if trigger criteria are met or exceeded.	

Appendix 3. Recommendations

The following recommendations, under section 52 of the *State Development and Public Works Organisation Act 1971,* are provided to guide assessment managers in assessing the development applications. These recommendations do not limit assessment managers' ability to seek additional information nor power to impose conditions on any development approval required for the project.

Schedule 1. Preliminary Approval for Allocation of Quarry Material (dredging) (Stage 1 dredging works)

This schedule is relevant to applications for which the *Coastal Protection and Management Act 1995* is applicable. These general recommendations are for consideration by the Department of Environment and Science.

Condition number	Condition
General	
G1	All reasonable and practicable **measures** must be taken to prevent or minimise **environmental impacts** caused by the **removal** of the **quarry material** and handling, placement, or **rehandling**, of the **dredged material.**
G2	All **records** must be kept for the duration of the **Allocation Notice** and at least five years from when the current **Allocation Notice** expires and must be provided to the **chief executive** or **nominated delegate** within the required timeframe and in the specified format upon request.
G3	The **chief executive** must be notified in writing as soon as practicable after becoming aware of any **records** that have been stolen, lost, destroyed or damaged.
G4	All **personnel** operating under this **Allocation Notice** must be made aware of the content and conditions of the notice; and at all times must: (a) comply with the content and conditions of the **Allocation Notice**; and (b) have access to a copy of the **Allocation Notice** in either digital or hard copy format.
Site limits and management	
L1	The **dredging operation** must be conducted in accordance with the following limitations: (a) the volume per unit time as set out in Table 4 (to be developed); and (b) the **Allocation Area** as set out in Table 3 (to be developed).
Measuring quarry material	
M1	Commencing one (1) year after the commencement of **quarry material removed**, the **Allocation Holder** must submit to the **chief executive**: (a) an annual **return** of the volume of **quarry material removed** from the **Allocation Area**, even if no material has been extracted during that period. The volume of **quarry material removed** from the **Allocation Area** must be measured in cubic metres (m^3) using an approved verifiable methodology (hydrographic surveys - pre and post dredging); and (b) payment of the **royalty** stated in Table 4 (to be developed) per cubic metre (m^3) of **quarry material removed**. The **return** is due within 20 business days after the end of each annual **return** period and prior to the expiry of this **Allocation Notice**.
M2	A daily record must be kept of when **dredging** is occurring at the **Allocation Area.**

Definitions

Administering authority means the Department of Environment and Science or its successors or predecessors.

Allocation Area means the area where **removal** of **quarry material** by you is permitted, the extent of which is set out in the **Allocation Notice.**

Allocation Holder means the holder(s) of the **Allocation Notice** whose details are set out in the Details tables at the front of the **Allocation Notice.**

Allocation Notice means the Notice issued under Section 76 of the *Coastal Protection and Management Act 1995* by the **chief executive** of the **Department** to provide details of the approved allocation of **quarry material** in **tidal water** and associated conditions.

Chief executive means the **chief executive** administering the *Coastal Protection and Management Act 1995*, at the time of publication being the **chief executive** of the Department of Environment and Science, and their delegates.

Department means the Department of Environment and Science or its successor or predecessors.

Dredged material means mud, sand, coral, shingle, gravel, clay, earth and other material removed by dredging. Dredged material includes dredge spoil and extracted quarry material.

Dredging operation includes all components of the activities necessary for the **removal**, transport, handling, **rehandling** and disposal of **quarry material** and **dredged material.**

Environmental impacts means impacts that the **removal** of the **quarry material**, including the proposed method of extraction, or the handling, placement, or **rehandling** of **dredged material** may have on:

- the physical and ecological integrity of the **Allocation Area** and surrounds;
- the **environmental values** and water quality objectives for the **waters**; and
- the management of fish habitats, marine parks and protected areas in and adjacent to the **Allocation Area.**

Environmental value as defined under Chapter 1 of the *Environmental Protection Act 1994*.

Measures has the broadest interpretation and includes:

- **Procedural measures** such as standard operating procedures for dredging operations, environmental risk assessments, management actions, Departmental directions and relevant guidelines
- **Physical measures** such as plant, equipment, physical objects (such as bunding, containment systems etc.), ecosystem monitoring and bathymetric surveys.

Personnel include plant operators, sub-contractors, staff and any other persons responsible for the implementation of, or operating under, the **Allocation Notice.**

Physical measures see definition of **measures.**

Procedural measures see definition of **measures.**

Quarry material has the same meaning as in the *Coastal Protection and Management Act 1995.*

Records include: documentation of **measures**; reporting on **measures;** survey results required under a condition of this notice; daily extraction logs and periodic extraction returns; **royalty** payment **records**; written procedures; **records** of maintenance actions; **records** of disposal arrangements; outcomes of risk assessments; documentation of the **removal** of plant, equipment and **measures** from the **Allocation Area** upon completion of the operation.

Rehandling means to handle or relocate **dredged material** from a stockpile.

Remove (removed, removal) means to:

- extract and collect **quarry material** from the **Allocation Area**; or
- take plant, equipment and **measures** that are associated with the **dredging operation,** out of the **Allocation Area.**

Remove does not include the **rehandling** of **dredged material** or collection of **quarry material** as part of a geotechnical investigation associated with future tidal works or extraction).

Return means a written **return** completed in the approved form (available at www.qld.gov.au using the publication number ESR/2015/1601 as a search term) that details the quantity of **quarry material removed** by you for that period.

Royalty means the rate prescribed under a regulation or the price set for the sale that is payable for **quarry material removed** under an **Allocation Notice.**

Tidal water has the same meaning as in the *Coastal Protection and Management Act 1995*.

Waters means all Queensland waters and includes rivers, streams, lakes, lagoons, ponds, swamps, wetlands, surface waters, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), any groundwater and any part thereof.

Schedule 2. Preliminary Approval for Allocation of Quarry Material (dredging) (Stage 2 dredging works)

This schedule is relevant to applications for which the *Coastal Protection and Management Act 1995* is applicable. These general recommendations are for consideration by the Department of Environment and Science.

Condition number	Condition
General	
G1	All reasonable and practicable **measures** must be taken to prevent or minimise **environmental impacts** caused by the **removal** of the **quarry material** and handling, placement, or **rehandling**, of the **dredged material.**
G2	All **records** must be kept for the duration of the **Allocation Notice** and at least five years from when the current **Allocation Notice** expires and must be provided to the **chief executive** or **nominated delegate** within the required timeframe and in the specified format upon request.
G3	The **chief executive** must be notified in writing as soon as practicable after becoming aware of any **records** that have been stolen, lost, destroyed or damaged.
G4	All **personnel** operating under this **Allocation Notice** must be made aware of the content and conditions of the notice; and at all times must: (a) comply with the content and conditions of the **Allocation Notice**; and (b) have access to a copy of the **Allocation Notice** in either digital or hard copy format.
Site limits and management	
L1	The **dredging operation** must be conducted in accordance with the following limitations: (a) the volume per unit time as set out in Table 4 (to be developed); and (b) the **Allocation Area** as set out in Table 3 (to be developed).
Measuring quarry material	
M1	Commencing one (1) year after the commencement of **quarry material removed**, the **Allocation Holder** must submit to the **chief executive**: (a) an annual **return** of the volume of **quarry material removed** from the **Allocation Area**, even if no material has been extracted during that period. The volume of **quarry material removed** from the **Allocation Area** must be measured in cubic metres (m^3) using an approved verifiable methodology (hydrographic surveys - pre and post dredging); and (b) payment of the **royalty** stated in Table 4 (to be developed) per cubic metre (m^3) of **quarry material removed**. The **return** is due within 20 business days after the end of each annual **return** period and prior to the expiry of this **Allocation Notice**.
M2	A daily record must be kept of when **dredging** is occurring at the **Allocation Area.**

Definitions

Administering authority means the Department of Environment and Science or its successors or predecessors.

Allocation Area means the area where **removal** of **quarry material** by you is permitted, the extent of which is set out in the **Allocation Notice.**

Allocation Holder means the holder(s) of the **Allocation Notice** whose details are set out in the Details tables at the front of the **Allocation Notice.**

Allocation Notice means the Notice issued under Section 76 of the *Coastal Protection and Management Act 1995* by the **chief executive** of the **Department** to provide details of the approved allocation of **quarry material** in **tidal water** and associated conditions.

Chief executive means the **chief executive** administering the *Coastal Protection and Management Act 1995*, at the time of publication being the **chief executive** of the Department of Environment and Science, and their delegates.

Department means the Department of Environment and Science or its successor or predecessors.

Dredged material means mud, sand, coral, shingle, gravel, clay, earth and other material removed by dredging. Dredged material includes dredge spoil and extracted quarry material.

Dredging operation includes all components of the activities necessary for the **removal**, transport, handling, **rehandling** and disposal of **quarry material** and **dredged material.**

Environmental impacts means impacts that the **removal** of the **quarry material**, including the proposed method of extraction, or the handling, placement, or **rehandling** of **dredged material** may have on:

- the physical and ecological integrity of the **Allocation Area** and surrounds;
- the **environmental values** and water quality objectives for the **waters**; and
- the management of fish habitats, marine parks and protected areas in and adjacent to the **Allocation Area.**

Environmental value as defined under Chapter 1 of the *Environmental Protection Act 1994*.

Measures has the broadest interpretation and includes:

- **Procedural measures** such as standard operating procedures for dredging operations, environmental risk assessments, management actions, Departmental directions and relevant guidelines
- **Physical measures** such as plant, equipment, physical objects (such as bunding, containment systems etc.), ecosystem monitoring and bathymetric surveys.

Personnel include plant operators, sub-contractors, staff and any other persons responsible for the implementation of, or operating under, the **Allocation Notice.**

Physical measures see definition of **measures.**

Procedural measures see definition of **measures.**

Quarry material has the same meaning as in the *Coastal Protection and Management Act 1995.*

Records include: documentation of **measures**; reporting on **measures;** survey results required under a condition of this notice; daily extraction logs and periodic extraction returns; **royalty** payment **records**; written procedures; **records** of maintenance actions; **records** of disposal arrangements; outcomes of risk assessments; documentation of the **removal** of plant, equipment and **measures** from the **Allocation Area** upon completion of the operation.

Rehandling means to handle or relocate **dredged material** from a stockpile.

Remove (removed, removal) means to:

- extract and collect **quarry material** from the **Allocation Area**; or
- take plant, equipment and **measures** that are associated with the **dredging operation,** out of the **Allocation Area.**

Remove does not include the **rehandling** of **dredged material** or collection of **quarry material** as part of a geotechnical investigation associated with future tidal works or extraction).

Return means a written **return** completed in the approved form (available at www.qld.gov.au using the publication number ESR/2015/1601 as a search term) that details the quantity of **quarry material removed** by you for that period.

Royalty means the rate prescribed under a regulation or the price set for the sale that is payable for **quarry material removed** under an **Allocation Notice.**

Tidal water has the same meaning as in the *Coastal Protection and Management Act 1995*.

Waters means all Queensland waters and includes rivers, streams, lakes, lagoons, ponds, swamps, wetlands, surface waters, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), any groundwater and any part thereof.

Schedule 3. Transport Infrastructure Act 1994

This schedule proposes recommended conditions for applications for which the *Transport Infrastructure Act 1994* stated under Section 52 of the *State Development and Public Works Organisation Act 1971*.

This general recommendation is for consideration by the Department of Transport and Main Roads (TMR).

Outcome to be achieved: At all times and for each stage of the project, the proponent must maintain state-controlled and local roads.

Road impact assessment and road-use management plan

Recommendation 1.

(a) To demonstrate compliance with the above outcome, the proponent, in consultation with TMR, must update the **road impact assessment** (RIA) which covers each stage of the project, analysing and mitigating impacts on the safety, efficiency and condition of state-controlled and local roads. The RIA must:

(i) be developed in accordance with the TMR Guide to Traffic Impact Assessment (GTIA)[20]

(ii) demonstrate adequate community consultation has been conducted, especially for the proposed heavy vehicle haulage routes

(iii) be based on a TMR-endorsed road impact assessment scope and development profile

(iv) clearly indicate where detailed estimates are not available and document the assumptions and methodologies that have been previously agreed in writing with TMR, prior to RIA finalisation

(v) assess the impacts to rail open level crossings using the Australian Level Crossing Assessment Model (ALCAM), where relevant

(vi) include a completed TMR 'Transport Generation proforma'[21] consolidating project-related traffic generation information or as otherwise agreed in writing with TMR

(vii) detail the final impact mitigation proposals, whether these are works, contributions to road works/maintenance or road-use management strategies

(viii) include concept design drawings for all intersections and/or links that require upgrading

(ix) provide confirmation that all proposed mitigation works have been designed and will be undertaken in accordance with all relevant TMR standards, manuals and practices[22].

(x) be approved in writing by TMR Fitzroy District office no later than six (6) months prior to the commencement of significant construction works, or as otherwise agreed between the proponent, TMR.

Recommendation 2.

(a) To demonstrate compliance with the above outcome requirement, the proponent, in consultation with TMR, must prepare a road-use management plan (RMP) that covers all stages of the project. The RMP must:

(i) be developed in accordance with TMR's Guide to Preparing a Road-use Management Plan , with a view to also optimising project logistics and minimising road-based trips on all state-controlled and local roads

(ii) detail the non-infrastructure impact mitigation strategies proposed, such as designated heavy vehicle haulage routes to minimise road safety and pavement impacts

[20] Available at http://www.tmr.qld.gov.au/business-industry/Technical -standards-publications.aspx
[21] Available from Transport System Management Section, Brisbane. (email: MDP@tmr.qld.gov.au)
[22] Available at: http://www.tmr.qld.gov.au/business-industry/Technical-standards-publications.aspx

(iii) include a table of RMP mitigation commitments, detailing responsibilities for actions along with protocols to ensure the mitigation commitments are complied with

(iv) be finalised and approved in writing by TMR no later than six (6) months prior to the commencement of significant construction works, or as otherwise agreed between the proponent, TMR.

Recommendation 3.

(a) The proponent must, prior to the commencement of any significant project-related construction traffic on State-controlled roads undertake any required works and other impact mitigation strategies as required by the RIA. These must be in accordance with latest relevant TMR and standards at the time of approval or agreement, prior to commencement of significant construction works unless otherwise agree to in writing by TMR. Works may include the upgrade of any necessary intersection/ accesses/ links in State-controlled and/or LGA road reserves, in accordance with the current TMR road planning and design policies, principles and manuals, unless otherwise agreed in writing with the TMR Fitzroy District Office.

Recommendation 4.

(a) Prior to the commencement of significant project-related construction, the proponent must complete any required works/ make contributions towards works as required, unless otherwise agreed in writing by the TMR District.

Advice only: Permits, approvals and traffic management plans

(a) To ensure efficient processing of the project's required transport-related permits and approvals, the proponent should, no later than three (3) months, or such other period agreed in writing with TMR, prior to the commencement of significant construction works or project-related traffic:

(i) submit detailed drawings of any works required to mitigate the impacts of project-related traffic for TMR to review and approve, ensuring sufficient time is allowed to construct required works prior to the commencement of project traffic

(ii) obtain all relevant licenses and permits required under the Transport Infrastructure Act 1994 for works within the state-controlled road corridor (s33 for road works approval, s62 for approval of location of vehicular accesses to state roads and s50 for any structures or activities to be located or carried out in a state-controlled road corridor)

(iii) prepare a Heavy Vehicle Haulage Management Plan for any excess mass or over-dimensional loads for all phases of the project in consultation with TMR's Heavy Vehicles Road Operation Program Office, the Queensland Police Service

(iv) prepare Traffic Management Plan/s (TMP) as required by the TMR District Office if required. The TMP must be prepared and implemented during the construction and commissioning of each site where road works are to be undertaken, including site access points, road intersections or other works undertaken in the state-controlled road corridor.

Definitions

Significant project traffic means an increase in project traffic on State-controlled roads equal to or greater than 5 per cent in either traffic numbers (AADT) or axle loadings (SARs), as outlined in the GTIA and/or traffic that has the potential to impact on community amenity. In particular, heavy vehicles associated with construction and/or operational haulage

Schedule 4. Other recommendations

The following recommendations are provided to guide assessment managers in assessing the development applications. These recommendations do not limit assessment managers' ability to seek additional information nor power to impose conditions on any development approval required for the project.

Recommendation 1. Emergency service plan

(a) I recommend that the proponent develop the emergency service plan in cooperation with the Queensland Police Service, Queensland Ambulance Service, Queensland Fire and Emergency Services and Maritime Safety Queensland prior to construction commencing.

Recommendation 2. Waterway barrier works

(a) I recommend that the proponent consult with the DAF following detailed design to determine whether the WBE reclamation area constitutes waterway barrier works.

(b) If determined to be a waterway barrier, sufficient detail must be provided to DAF on how barriers to fish passage will be addressed and, if required, detail on any offsets measures if the barrier is predicted to result in an SRI on fish passage.

Appendix 4. Proponent commitments

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
2. Project description	
2.1 (Section 2.4.4.2)	The final dredging methodology adopted for the Project will be subject to MSQ Regional Harbour Master acceptance of the successful dredging contractor's detailed execution plan. The dredging contractor will also need to comply with MSQ's *Standard for Commercial Marine Activities – Gladstone Region* (DTMR 2017a).
2.2 (Section 2.5.7.3)	Monitoring of line and level during construction of the reclamation area bund wall will identify any areas of settlement. Additional rock can then be easily added to maintain the required coverage.
2.3 (Section 2.5.7.3)	A stockpile of armour material will be held by the quarry, sufficient to cover any exposed core material on the outer face if a cyclone were to approach Gladstone. The construction contractor will prepare an emergency plan which will include procedures to address severe climatic events such as cyclones and minimise where practicable, the potential environmental impacts from the reclamation works.
2.4 (Section 2.5.7.4)	Additional rock protection will be required on the inner face of the bund on top of the geotextile to provide additional protection from wave action generated by standing water within the sediment ponds or placement of dredged material during operation.
2.5 (Section 2.5.8)	Geotextile material will be placed against the inner face of all of the outer bund walls. The purpose of the geotextile material is to minimise the migration of dredged material fines through the bund wall to the marine waters of Port Curtis.
2.6 (Section 2.5.8)	• The geotextile material will be non-woven and will generally comply with the specification or acceptable equivalent below. • Weight > 542g/m^2 • Tensile strength > 1,690N • Trapezoidal tear > 644N • Puncture resistance > 1,070N • Permittivity < 0.7sec^{-1} • Apparent opening size < 0.150mm.
2.7 (Section 2.5.8)	The placement and restraint of the geotextile liner will be specified in the detailed design phase of the reclamation bund wall and will meet industry best practice, recognised industry standards and the relevant findings of the *Gladstone Bund Wall Independent Review*, including: • Be placed on the inner bund wall material and then be overlaid and secured by core material (up to 300mm thick layer)

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	• Be laid on the bund wall such that no wrinkles, gaps, folds or deformations occur in the material, with all joints sewn in the horizontal direction to create seams and to conform to the requirements of AS3706: (Geotextiles – Methods of Test). Overlaps in the fabric will be directed vertically down the slope of the bund surface. • The geotextile will be secured in place and protected with a 300mm thick layer of core material.
2.8 (Section 2.5.10)	The internal dewatering cells in the reclamation areas will be designed to ensure the surface area and volume is large enough, and the detention time is sufficient to meet the required decant water quality licenced discharge limit (i.e. less than or equal to 100mg/L).
2.9 (Section 2.5.11)	All floating plant and associated moorings will be kept clear of navigational channels when working or moored. The moorings will be marked in accordance with the requirements of the Regional Harbour Master or representative. Navigational lights, buoys, marks and any warning signs which the Regional Harbour Master considers necessary, will be supplied, installed and maintained. All navigational aids will be constructed and operated in accordance with the requirements of the Regional Harbour Master or representative. All marine plant and equipment used during the dredging and dredged material placement activities will: • Comply with the TOMSA and the *Transport Operations (Maritime Safety) Regulation 2004* • Comply with all the requirements of 'Standards of Marine Construction Activity within Gladstone Harbour' • Be maintained to minimise the discharge of noxious fumes and pollutants.
2.10 (Section 2.6.2)	Sewage generated by the dredger activities is to be disposed of in a controlled manner, in authorised and designated areas or through approved service as per the *Port Procedures and Information for Shipping – Gladstone* (DTMR 2018).
2.11 (Section 2.6.5.1)	No explosives, toxic and infectious substances, and radioactive material will be transported, stored and/or used within the Project site.
2.12 (Section 2.6.5.2)	The collection of tank washing slops, oily bilge water and oily mixtures containing chemicals, oil sludge and sewage will be provided by an appropriately qualified and experienced supplier, while garbage sterilisation and disposal will be provided by GPC as per the *Port Procedures and Information for Shipping – Gladstone* (DTMR 2018). Management of waste from dredging vessels will comply with the relevant waste management legislation and guidelines.
2.13 (Section 2.6.5.2)	Solid waste will be temporarily stored onsite, in accordance with the relevant legislation and guidelines, and regularly collected by a licenced waste disposal contractor and, where recycling is not feasible, transferred to a licenced waste facility within the GRC area.
2.14 (Section 2.6.5.2)	All sewage and greywater will be temporarily stored onsite in accordance with the relevant waste management legislation and guidelines and removed and transported to a licenced sewage treatment plant by a licenced waste management contractor.

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2.15 (Section 2.6.5.2)	All vessels arriving at the Port of Gladstone are required to follow the DTMR's *Port Procedures and Information for Shipping – Gladstone* (DTMR 2018), which details quarantine requirements.
2.16 (Section 2.6.5.2)	Upon arrival within the Port of Gladstone, all wastes, including quarantine waste, from the dredging vessels will be arranged for collection and disposal. Quarantine waste will be kept in sealed plastic bags on board until collection by a licenced contractor (e.g. liquid waste, oil containing waste and sewage) or GPC (general garbage) (DTMR 2018). Quarantined waste will be sterilised prior to disposal at a licenced facility.
2.17 (Section 2.7)	The navigational aid relocation and installation methodology will be confirmed and approved by MSQ prior to work commencing.
2.18 (Section 2.7)	Outer BUF and bund wall warning lights will be installed every 100m along the outer BUF and WBE seaward reclamation area bund wall in accordance with MSQ requirements.
2.19 (Section 2.7)	Following the completion of the filling operations within the WB and WBE reclamation areas, GPC will undertake surface stabilisation works for the portion of the reclamation area that has achieved the final design surface level. These works are likely to include capping the final surface with material of an appropriate grade or vegetating with appropriate species.
2.20 (Section 2.8)	Maintenance activities within the reclaimed area will be undertaken to minimise dust and erosion as required.
2.21 (Section 2.10)	The seaward bund walls to be designed to 100 year average recurrence interval (ARI) immunity and the detailed design will include allowances for storm surge, sea level rise, wave climate, and flood levels within this part of Port Curtis
2.22 (Section 2.10)	Use of internal cells and adjustable weir boxes within the WB and WBE reclamation areas to allow retention of dredged tailwaters and settling of suspended solids
2.23 (Section 2.10)	Implementation of adaptive design measures during the detailed design phase for the Project to minimise the potential impacts on the ecological values of Port Curtis
2.24 (Section 2.10)	Dredger equipment and dredging methodology will be selected on the basis of dredger availability, the nature of the material to be dredged, consideration of environmental impacts, and minimisation of dredging timeframes
2.25 (Section 2.10)	Dredging operations will be undertaken during suitable conditions (i.e. within the operational parameters of the dredger, for example not during high energy situations such as storm surges). If the Bureau of Meteorology (BoM) issues a severe weather warning for the Port of Gladstone, dredging works within the affected area to cease.
2.26 (Section 2.10)	The barges will be fitted with 'green valves' in the overflow pipe to control the amount of air contained in the excess water in order to reduce turbidity. Overflow discharge will be managed using a computer-based management system to prevent excessive overflow discharge.
2.27 (Section 2.10)	Fitting 'green valves' to the TSHD and barge overflow pipes to minimise turbidity. The use of 'green' (anti-turbidity) valves creates conditions which results in a larger part of the fine sediments in the dredge material mixture to settle more rapidly, resulting in

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	sediment plumes being smaller, shorter in duration and mostly confined to the lower parts of the water column. The valve would be controlled automatically by an on- board computer-based management system.
2.28 (Section 2.10)	TSHD dredger heads will be fitted with fauna exclusion devices, including but not limited to, turtle deflector/exclusion device.
2.29 (Section 2.10)	Vessels will have on-board systems for determining the density of dredged material (or solid to water ratio).
2.30 (Section 2.10)	Vessel will have electronic positioning system for defining the location and depth of dredging activities.
2.31 (Section 2.10)	When the drag head is not in contact with the seabed, and pumps are in operation, pump speed will be reduced and the drag head water jets activated to minimise the risk of turtle capture.
2.32 (Section 2.10)	Stormwater management system will form part of detailed design of the WBE reclamation area which will include drainage systems and stormwater treatment measures to manage runoff and minimise discharge of sediment laden and turbid waters into Port Curtis.
2.33 (Section 2.10)	At the completion of filling of the reclamation area, the retention of an appropriately sized stormwater pond will be provided to manage internal stormwater quality runoff from the final reclamation area surface.
2.34 (Section 2.13)	All Project wharf users will meet the First Point of Entry Biosecurity Standards which describe the requirements for landing. In addition, all Project wharf users operating at GPC's multiuser wharves/berths will comply with GPC's biosecurity procedure, guide, training and reporting.
2.35 (Section 2.13)	Dredging equipment will conform to Australian Quarantine and Inspection Services (AQIS) Guidelines to minimise the risk of the introduction of any introduced marine species.
2.36 (Section 2.13)	In the event that marine pests are introduced into the local environment by the Project, the dredging contractors' Ballast Water Management Plan will be implemented in accordance with the Australian Ballast Water Management Requirements (Version 7) (Commonwealth Government 2017) and under the Project and Dredging EMPs. The management plans will include contingency measures that include, but are not limited to, the following: • Immediate notification to DAF (Biosecurity Queensland), Department of Agriculture and Water Resources, DES and MSQ • Follow any directions or notices given by a regulator in relation to marine pests • Corrective actions (i.e. immediate investigation strategies, holding the balance of ballast on board, transferring the balance between tanks, examining ship to shore transfer options, etc.) • Consequential reporting/liaison requirements.
2.37 (Section 2.14)	There are a number of security requirements potentially relevant to the Project, including: • The Maritime Security Identification Card, which is a nationally recognised identity card which identifies the holder as a person who has met the necessary background requirements to work in a maritime security zone. It shows that the holder has met the

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	minimum security requirements to work unescorted or unmonitored in a maritime security zone and is not considered a threat to maritime security. • Security access requirements (i.e. maritime security levels, landside restricted zones and security restricted zones) • Port inductions for contractors, Port users, consultants and essential services.
2.38 (AEIS Appendix F)	All dredging equipment will be operated and maintained in a safe and efficient manner to ensure that water quality impacts and noise levels generated comply with manufacturer specifications.
2.39 (AEIS Appendix F)	Prior to dredging, equipment will be inspected to ensure that all required measures are being adopted to reduce potential impact to marine fauna and associated habitats.
2.40 (AEIS Appendix F)	Dredging activities will be restricted to the Project's approved areas and depths.
2.41 (AEIS Appendix F)	No waste (including sewage) will be released to the environment, stored, transferred or disposed contrary to any conditions of Project approvals.
2.42 (AEIS Appendix F)	Waste generated during dredging will be managed in accordance with the waste hierarchy, and must be stored, handled and transferred in a proper and efficient manner to prevent environmental harm.
2.43 (AEIS Appendix F)	TSHD vessels will be fitted with electronic logging, and the logs must be available to GPC and DES on request.
2.44 (AEIS Appendix F)	The minimum technical design standards and conditions of the TSHD stated under EIS commitment numbers 2.27, 2.28, 2.43, 2.52 and 13.2 will be supported by appropriate certification, including photographs, provided to DES prior to the commencement of use.
2.45 (AEIS Appendix F)	No blasting will be undertaken under this Dredging EMP. If blasting is needed, the Dredging EMP will need to be amended to include or reference a detailed blasting management plan approved by DES.
2.46 (AEIS Appendix F)	All equipment will be turned off when not in use.
2.47 (AEIS Appendix F)	All equipment on the dredge will be operated and maintained in a safe and efficient manner to ensure that generated noise complies with manufacturer specifications.
2.48 (AEIS Appendix F)	Navigational lights, buoys, marks and any warning signs, which the RHM considers necessary, will be supplied, installed and maintained. All navigational aids must be constructed and operated in accordance with the requirements of the RHM or representative.
2.49 (AEIS Appendix F)	All flood lighting or other lighting, except navigational lighting, installed on the structure or surrounds will be constructed in accordance with the requirements of the RHM or representative.

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2.50 (AEIS Appendix F)	All marine plant and equipment used by the construction contractor will comply with all the requirements of 'Standards of Marine Construction Activity within Gladstone Harbour' as published on the MSQ website (www.msq.qld.gov.au).
2.51 (AEIS Appendix F)	All marine plant and equipment used by the construction contractor will be maintained to minimise the discharge of noxious fumes and pollutants.
2.52 (AEIS Appendix F)	The dredging contractor will comply with the relevant requirements within the following documents: • Transport Operation (Marine Safety) Act 1994 and the Transport Operations (Marine Safety) Regulation 2016 • Standard for Commercial Marine Activities – Gladstone Region and preparation and implementation of the approved Project Marine Execution Plan • Port Procedures and Information for Shipping – Gladstone.
2.53 (AEIS Appendix F)	Any material which is deposited outside the alignment of the works shown in Figures 7.1 to 7.4, or any debris which falls or is deposited into tidal waters during the dredging will be removed by the construction contractor at its cost and expense prior to the practical completion of the works.
2.54 (AEIS Section 2.2)	Once the dredging contractor has been appointed, a waste water licenced operator will be consulted to confirm the dredging activity waste water volume and collection requirements.
2.55 (AEIS Section 2.3)	Dredging program and construction program of the bund wall and reclamation area will consider sensitive environmental windows where practical.
2.56 (AEIS Section 2.4)	All waste generated in carrying out the activity must be lawfully reused, recycled or removed to a facility that can lawfully accept the waste.
2.57 (AEIS Section 2.4)	Incompatible wastes must not be mixed in the same container or waste storage area.
2.58 (AEIS submission ID 12.109)	During the Project detailed design phase of the WBE reclamation area the following will be undertaken to address the independent review of the Western Basin reclamation area bund wall findings and recommendations: • Additional geotechnical investigation for the WBE reclamation area and BUF • Additional coastal processes and hydrodynamic modelling to be undertaken if the size and/or shape of the reclamation area changes from the Project EIS and AEIS, and mitigation measures adopted to minimise the potential changes to environmental impacts • Groundwater modelling and piping investigation, and incorporate the findings into the design and construction methodology • Detail design to adopt industry best practice and incorporate the findings of the Project EIS geotechnical investigation and additional geotechnical investigation into the design and construction methodology.

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2.59 (AEIS Appendix G)	An additional geotechnical investigation will be undertaken during the detailed design phase of the WBE reclamation area, and if paleo channels are found to occur in the WBE reclamation area, appropriate design and construction methodologies will be implemented to minimise the potential for piping under the bund walls and mud wave erosion on the outside of the wall.
3. Land use and tenure	
3.1 (Section 3.4.2.3)	Any changes required to the tenure arrangements will be progressed by GPC following completion of the Project EIS process and will be finalised prior to the lodgement of development applications associated with the BUF and WBE reclamation area.
3.2 (Section 3.6.1)	Native Title will be required to be addressed as part of any future process to have the tenure of the USL within the BUF and WBE reclamation area converted from USL to leasehold in accordance with the provisions of the Land Act. Regard to the existing ILUA will be necessary should GPC seek freehold title over the land.
3.3 (Section 3.6.1)	GPC will comply with existing lease conditions associated with Lot 508 on SP239687 (associated with the placement of dredged material within the WB reclamation area and the portion of the WBE reclamation area (southern area)), together with any future lease conditions issued by the State for the WBE reclamation area. Existing lease conditions for Lot 508 on SP239687 will continue to apply once the land has been reclaimed for SPL purposes until such time as it is amended or surrendered and a new lease is granted from the State or the tenure is converted to freehold land.
3.4 (Section 3.6.1)	GPC will apply to have tenure granted over the WBE reclamation area to support the land being gazetted as SPL under TIA.
4. Visual amenity	
4.1 (Section 4.7)	Control measures will be implemented during construction to ensure construction activities do not disturb the existing vegetation along the shoreline adjacent to the WB and WBE reclamation areas
4.2 (Section 4.7)	The Project site will be kept tidy at all times. Materials and machinery will be stored tidily during works and will be removed in a timely manner when no longer required. Roads providing access to the site and work areas will be maintained free of dust and mud as far as is reasonably practicable.
4.3 (Section 4.7)	Dredging vessels will have minimal and low-glare lighting, consistent with maritime safety standards.
5. Topography, geology and soils	
Acid sulfate soils	
5.1 (Section 5.6.1.1)	An ASS Management Plan will be prepared at least three months prior to the commencement of construction to detail site-specific management measures for all stages of construction on the Project (i.e. bund wall and BUF construction, dredging activities and placement of dredged material). The ASS Management Plan will be developed in accordance with the Queensland Acid Sulfate Soils Technical Manual (Dear et al. 2014).

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Bund wall and barge unloading facility construction	
5.2 (Section 5.6.1.3)	During detailed design, the WB and WBE reclamation areas groundwater will be modelled to determine the predicted permanent groundwater table in order to include PASS below this level (i.e. the safe PASS reinternment level (SPRL))
5.3 (Section 5.6.1.3)	Design specifications will avoid disturbance of marine and terrestrial surface and subsurface soils, where practical. Where disturbance is unavoidable, the design specification will endeavour to minimise the disturbance footprint.
5.4 (Section 5.6.1.3)	Key construction personnel will be provided mandatory training in the identification and control procedures for ASS. A register of construction personnel who have completed the relevant ASS training will be maintained.
5.5 (Section 5.6.1.3)	To prevent the oxidation of PASS material through the potential creation of a 'mud wave' during bund wall construction: • Unconsolidated materials (i.e. the mud wave, if generated) above the mean high water neap will be excavated and contained separately in a designated treatment area • Excavated materials will be tested by a National Association of Testing Authorities accredited laboratory for SPOCAS and treated with the required amount of aglime • Sediments will be validated at a rate of 1 sample/1,000m^3, prior to re-instatement into the reclamation area. Validation shall confirm, using SPOCAS analysis, that the sediment has no potential acidity. The laboratory calculated liming rate is < 1kg $CaCO_3$/tonne.
5.6 (Section 5.6.1.3) AEIS Appendix F AEIS Appendix G	• Material within the bund walls will be re-distributed as required so that it remains permanently under water where practicable, or if exposed to the atmosphere for a significant length of time, it is treated appropriately in compliance with the ASS Management Plan. Significant length of time is defined will comply with the Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines (version 4), including: – Coarse texture (sands to loamy sands and peats): Overnight (18 hours) – Medium texture (sandy loams to light clays): 2 nights (42 hours) – Fine texture (medium to heavy clays and silty clays): 3 nights, e.g. a weekend (66 hours).
5.7 (Section 5.6.1.3)	Daily inspection of the base of the bund wall for potential impacts of mud wave, resulting in soil being excavated above the natural level and exposed to oxygen. Should daily inspections observe excavated soil above the natural level, this material will be collected and transported to a containment area for treatment.
5.8 (Section 5.6.1.3)	Removal of intertidal vegetation will be restricted to the minimum required, to enable the safe construction and operation of the WBE reclamation area, including minimising disturbance to ecologically sensitive areas, such as adjacent seagrass and mangrove communities.

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5.9 (Section 5.6.1.3)	Any mangroves will be removed at ground level, with roots left in-situ (where practical), to maintain soil stability and reduce sediment disturbance.
5.10 (Section 5.6.1.3)	Regular auditing will be undertaken to confirm that bund wall construction is carried out in accordance with the defined requirements set out in the ASS Management Plan and associated management documentation.
5.11 (Section 5.6.1.3)	The design specification will not be approved where it does not demonstrate an attempt to avoid, or minimise, the disturbance to ASS material.
5.12 (Section 5.6.1.3)	Bund wall construction will not commence until an ASS Management Plan has been prepared and approved for implementation during all phases of the Project.
5.13 (AEIS Appendix G)	Groundwater monitoring for acidity will occur on a regular basis, with samples analysed for: • Field measurements: water level, pH, electrical conductivity, redox potential and total alkalinity • Laboratory analysis: pH, electrical conductivity, total titratable acidity, total alkalinity, dissolved iron and aluminium and dissolved ions (chloride and sulphate)
5.14 (Section 5.6.1.3)	In the event of an incident relating to the release of acid leachate, runoff or sediment occurring: • The GPC Project Manager will be notified as soon as practicable, as per the Dredging EMP (refer AEIS Appendix F) • The area will be identified and hydraulically isolated using suitable mitigation measures • The runoff/sediment will be treated with an adequate quantity of fine aglime and samples analysed for pH. Runoff/sediment to have a pH between 6.5 and 8.5 prior to release. • An investigation into the cause of the incident will be conducted, and a review of the mitigation measures initiated.
5.15 (Section 5.6.1.3)	All records and associated permits will be provided to the relevant authority as required, upon request and/or at the completion of construction activities.
Dredging activities and placement of dredged material	
5.16 (Section 5.6.1.4)	The dredged material will remain in a saturated state in the barges to minimise the potential for oxidation of PASS. Dredged material will not be stored in the barges or trucks for more than 24 hours and will be kept saturated.
5.17 (Section 5.6.1.4)	Dredging of identified PASS 'hot spot' areas will occur within the early stages, where practicable, to allow strategic placement of sediments containing PASS (refer Figure 5.5 and Figure 5.7 in the EIS), within the safe PASS reinternment level (SPRL) in the WBE reclamation area.
5.18 (Section 5.6.1.4)	Dewatering and lowering of the water table within the WB and WBE reclamation areas will be avoided to maximise the volume of sediment that remains saturated

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5.19 (Section 5.6.1.4)	Any runoff from the WB and WBE internal settlement ponds within the reclamation areas (sediment above water level) will be directed towards a series of internal ponds and tested (for pH, metals, etc.) prior to discharge into Port Curtis via the licenced discharge point. Decant water to be discharged into Port Curtis is to have a pH between 6.5 and 8.5 and adjustments will be made to the pH prior to licenced releases, should the water within the WBE reclamation area be too acidic or alkaline. Other decant water release limits are provided in the Project Environmental Monitoring Procedure (refer AEIS Appendix H).
5.20 (Section 5.6.1.4)	Ongoing validation sampling of Project sediments containing PASS above SPRL (determined by a suitably qualified expert during detailed design phase) within the WB and WBE reclamation areas (at a rate of 1 sample/1,000m^3), and treatment of PASS materials if required. Validation will confirm, using SPOCAS analysis, that the sediment has no potential acidity. The laboratory calculated liming rate is < 1kg $CaCO_3$/tonne.
5.21 (Section 5.6.1.4)	If Project PASS sediment samples fail the validation testing, then additional sampling will be conducted to determine extent and location of the ASS material. Management options will be assessed on a case by case basis but will include containment, treatment and validation as per the ASS Management Plan.
5.22 (Section 5.6.1.4)	Daily monitoring of water quality (e.g. pH, dissolved oxygen, etc.) within internal ponds.
5.23 (Section 5.6.1.4)	Daily inspection of surface waters, and stormwater drainage, in the vicinity of the site, for evidence of impacts, resulting from disturbance of ASS (e.g. fish kill, aquatic/riparian flora mortality and/or iron staining)
5.24 (Section 5.6.1.4)	The visual monitoring plan and checklist provided in the ASS Management Plan will be used to identify signs of ASS oxidisation, including: • Unexplained scalding, degradation, or death of vegetation • Unexplained death, or disease, in aquatic organisms • Formation of the mineral jarosite, and other acidic salts, in exposed or excavated soils • Areas of blue-green water, or extremely clear water, indicating high concentrations of aluminium • A transition to, or establishment of, a community dominated by acid tolerant species • Rust coloured deposits on plants, or on the banks of drains, water bodies, and watercourses, indicating iron precipitates • Black, to very coloured waters, indicating de-oxygenation • Sulfurous (rotten egg gas) smells • Corrosion of concrete, and/or steel structures, in contact with soil or water • Invasion of a community, or area, by acid tolerant species.
5.25 (Section 5.6.1.4)	Weekly reports will be completed onsite for the duration of construction activity and will incorporate any identification of ASS

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
5.26 (Section 5.6.1.4)	In the event of an incident relating to the release of acid leachate, runoff or sediment occurring: • The GPC Project Manager will be notified as soon as practicable, as per the Dredging EMP (refer AEIS Appendix F) • The area will be identified and hydraulically isolated using suitable mitigation measures • The runoff/sediment will be treated with an adequate quantity of fine aglime and samples analysed for pH. Runoff/sediment to have a pH between 6.5 and 8.5 prior to release. • An investigation into to the cause of the incident will be conducted, and a review of the mitigation measures be initiated.
Stabilisation and maintenance activities on the reclamation areas	
5.27 (Section 5.6.1.5)	Establishment of a groundwater monitoring network and monitoring plan for the WB and WBE reclamation areas once dredged material placement and earthworks have been completed and the WB and WBE reclamation areas are stable. Groundwater monitoring piezometer installation will not be undertaken during the construction of the WBE reclamation area as piezometers are likely to be broken/demolished if installed prior to finalisation of earthworks. Subject to the above requirements, groundwater monitoring for the WB and WBE reclamation areas will continue for 12 months after each Project dredging stage. Groundwater monitoring will cease if 12 months of consistent groundwater monitoring results show that there is no risk of environmental nuisance or environmental harm being caused by dredged material within the WB and WBE reclamation areas. If groundwater monitoring for the WB and WBE reclamation areas has ceased due to the above, groundwater monitoring will commence 3 months prior to a Project dredging stage commencing.
5.28 (Section 5.6.1.5)	The groundwater monitoring plan for the WB and WBE reclamation areas will contain information on the following (but not limited to): • Location and frequency of sampling • Field measurements: water level, pH, electrical conductivity, redox potential and total alkalinity • Laboratory analysis: pH, electrical conductivity, total titratable acidity, total alkalinity, dissolved iron and aluminium and dissolved ions (chloride and sulphate).
5.29 (Section 5.6.1.5)	Monitoring parameters and provisional limits for groundwater will be based on established ‘baseline’ values and set at: • pH – outside 6.5 to 8.5 • Acidity – < 40mg/L • Alkalinity – > 60mg/L.
5.30 (Section 5.6.1.5)	If the pH of groundwater falls outside the ‘baseline values’, the following steps will be undertaken:

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	• Initially increase monitoring frequency at affected location(s) to fortnightly until corrective measures are implemented or parameters return to within performance criteria • If the performance criterion in groundwater wells is not being met after two months, and the non-compliance cannot be attributed to short term heavy rainfall or external influences, consideration will be given to the installation of lime cut off trench or other additional treatment measures in consultation with the GPC Project Manager.
Erosion, sediment control and contamination management	
5.31 (Section 5.6.2)	Preparation of an erosion and sediment control plan by a suitably qualified and experienced professional in accordance with the requirements of the International Erosion Control Association Guidelines (2008)
5.32 (Section 5.6.2)	Vegetation of the final reclamation area with suitable vegetation to prevent wind erosion of the surface.
5.33 (Section 5.6.2)	No major maintenance, servicing and re-fuelling of vehicles and equipment will be undertaken on the WB and WBE reclamation areas outer bund walls
5.34 (Section 5.6.2)	Daily inspections of all plant and machinery will be conducted
5.35 (Section 5.6.2)	Spill kits will be provided at the site, near where equipment is being used, and staff will be trained in the use of spill kits
5.36 (Section 5.6.2)	If a spill occurs, this will be cleaned up immediately with appropriately absorbent materials with the area remediated if required
5.37 (Section 5.6.2)	Oils, fuels, chemicals and hazardous materials will be stored in clearly designated and appropriating bunded storage areas, located as far as practicable from marine waters. The storage areas will be covered to prevent stormwater infiltration.
Sediment quality	
6.1 (AEIS Section 6.2)	Where Project capital dredging is to be undertaken past the Project sample validity period of 5 years, additional confirmation sampling in the material to be dredged will be undertaken prior to Project dredging to the depth where there is potential for anthropogenic influence (0.28m).
6.2 (AEIS Section 6.2)	Risk from dredged material will be re-assessed with implementation of commitment 6.1 (AEIS Section 6.2). This risk will require re-assessment of sediment samples as per Project EIS Section 6.4.3 (sediment investigation methodology).
7. Coastal processes and hydrodynamics	
7.1 (AEIS Section 7.3)	In the vicinity of the WBE reclamation area modelling will be undertaken during the detailed design phase of the Project to optimise the design to minimise potential erosion within the channels between the proposed reclamation areas and the mainland, and between the northern and southern WBE reclamation areas.
7.2 (AEIS Section 7.3)	A monitoring program will be developed and implemented to manage any observed impacts in the channels and along the shoreline adjacent to the new reclamation area, including changes to:

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	• Land forms, including coastal and dune vegetation • Existing navigable channels • Intertidal areas, including feeding area for migratory birds • Wetlands, including groundwater regimes • Existing approved tidal works structures • MNES and MSES values.
7.3 (AEIS Section 7.3)	A monitoring program will be developed and implemented to monitor sedimentation in the Facing Island harbour before, during and after the Project and implement mitigation measures to address any significant increase in sedimentation resulting from the Project.
7.4 (AEIS Chapter 7)	Bathymetric data for the areas to be dredged will be updated prior to the Project dredging.
7.5 (AEIS Chapter 7.3)	The current sedimentation monitoring program will be updated to include appropriate sedimentation monitoring at locations to be derived from plume modelling and sensitive receptor locations. Following implementation and assessment of sedimentation monitoring of the Facing Island Harbour (Commitment 7.3), a revision of data will be applied (alongside complementary data from other monitoring programs). This assessment will be used to identify the requirement of implementation of further sediment monitoring.
7.6 (AEIS Chapter 7.3)	Develop and implement a monitoring regime to manage any observed impacts in the channels and along the shoreline adjacent to the new WBE reclamation area, including MNES and MSES values.
7.7	During detailed design of the WBE reclamation area bund-toe assess and address in the design process any increases in water velocities adjacent to the WBE reclamation area.
7.8	A suitably qualified and experienced person will undertake monitoring of the WBE reclamation area and existing WB outer bund walls from the commencement of dredged material placement to monitor structural integrity/the function of the bund wall to prevent sediment plumes.
8. Water quality	
8.1 (Section 8.7)	No WBE reclamation area construction activities will be initiated prior to obtaining DAWE and DES approval of the Project EMP and Project Environmental Monitoring Procedure. No Project dredging activities will be initiated prior to obtaining DAWE and DES approval of the Dredging EMP and Project Environmental Monitoring Procedure.
8.2 (Section 8.7)	All activities will comply with the approved Project EMP, Dredging EMP and Project Environmental Monitoring Procedure to minimise impacts on water quality, associated with the health of marine flora and fauna values.

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8.3 (Section 8.7)	Project activities to result in no exceedance of the seagrass time to impact light threshold levels as specified in the Project Environmental Monitoring Procedure.
8.4 (Section 8.7)	Compliance with all Commonwealth and State Government approval conditions and Project management plans relevant to the Project works.
8.5 (Section 8.7)	Achieve the performance criteria outlined in the Project EMP and Dredging EMP
8.6 (Section 8.7)	An appropriate response will be implemented where monitoring determines that the water quality trigger levels have been exceeded or seagrass light thresholds are found to be compromised by Project activities
8.7 (Section 8.7)	All Project water within the WB and WBE reclamation areas will be adequately contained and managed before being licenced discharges occur into the receiving waters, including gross pollutant and sediment removal. All reasonable and practicable measures will be implemented to prevent pollution resulting from silt runoff, oil and grease spills from machinery, concrete truck washout and the like.
Establishment of the Western Basin Expansion reclamation area and barge unloading facility	
8.8 (Section 8.7)	The detailed design phase of the WBE reclamation area bund wall and BUF will adopt the following into the design and construction methodology process and construction specification: • Industry best practice • Lining of the inner face of the bund wall of the WBE reclamation area and BUF bund walls with geotextile fabric to reduce the migration of fines through the bund walls • Geotextile materials designed to filter sediment will be: – Placed on the inner bund wall material and then be overlaid and secured by core material – Keyed into the rock armour material to prevent slippage and deformation from occurring prior to placement of the core material – Laid on the bund wall such that no wrinkles, gaps, folds or deformations occur in the material, with all joints sewn in the horizontal direction to create seams and to conform to the requirements of Australian Standards 3706: Geotextiles – Methods of Test. Overlaps in the fabric should be directed vertically down the slope of the armour material. • Use of internal cells and adjustable weir boxes within the WBE reclamation area will allow retention of dredged tailwaters and settling of suspended solids • Incorporate the findings and recommendations of the independent review of the WBDDP bund water performance (refer draft EIS Appendix D) • Incorporate the findings of the Project EIS geotechnical investigations and additional geotechnical investigations that will be undertaken for the WBE reclamation area and BUF during the detailed design phase of the Project

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	• Stormwater management system will form part of the detailed design of WBE reclamation area and BUF, which will include drainage systems and stormwater treatment measures to manage runoff and minimise discharge of sediment laden and turbid waters into Port Curtis • Groundwater modelling and piping investigation will be undertaken during the detailed design phase of the Project. The findings of the modelling and investigation will be incorporated into the design and construction methodology and specification.
8.9 (Section 8.7)	Core material (up to 300mm) and dredged material to be used against the outer bund wall geotextile material.
8.10 (Section 8.7)	Maximum unarmoured length of 50m will be maintained during construction to minimise potential erosion and water quality impacts from tidal flows and wave movements against the unarmoured outer bund walls.
8.11 (Section 8.7)	Sufficient armoured material will be held in reserve for placement in the event of a storm or approaching cyclone.
8.12 (Section 8.7)	Implement the Project Environmental Monitoring Procedure to manage potential impacts on water quality.
8.13 (Section 8.7)	Appropriate design and construction of bund, including: • All reasonable and practicable measures will be implemented to prevent pollution resulting from silt runoff, oil and grease spills from machinery, concrete truck washout and the like • No major maintenance, servicing and re-fuelling of vehicles and equipment will be undertaken on the WB and WBE reclamation areas outer bund walls, nor will vehicles and equipment be parked on the WB and WBE reclamation areas outer bund walls for a significant time, reducing the potential for significant spills of oils and fuels to occur • No waste, other than reclamation decant water, will be released into the marine environment or adjacent vegetation communities • Spill kits for land and water based spills (including hydrocarbon absorbent booms) will be kept at the site and personnel trained in their use. Emergency response procedures will be established. • Adherence to waste management controls identified in the Project EMP • Monitoring and management of any material that is displaced above LAT will be undertaken in accordance with the ASSMP • All construction equipment will undergo regular maintenance and pre-start inspections. Equipment and vehicles will not be parked at the Project site for a significant time, when not in use. • Powered Mobile Equipment (PME) will be suitable and rated for the task and kept in good working order • A PME preventative maintenance regime will be implemented.
8.14 (Section 8.7)	The reclamation construction contractor will prepare an emergency plan which will include procedures to address severe climatic events such as cyclones and minimise where practicable the potential environmental impacts from the reclamation works. The

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	emergency plan will also include procedures to address breaks in the construction of the reclamation area bund walls to minimise the risks of a bund wall failure and minimise impacts on marine waters.
Dredging activities	
8.15 (Section 8.7)	Implement the approved Dredging EMP and Project Environmental Monitoring Procedure during all dredging works
8.16 (Section 8.7)	Where practical scheduling the timing of dredging to reduce the potential likelihood for turbid plumes to impact on sensitive receptors such as avoiding the late spring and early summer periods (together with other less extreme summer periods), which represent key periods for seagrass growth and resilience building
8.17 (Section 8.7)	Dredging operations will be undertaken during suitable conditions (i.e. within the operational parameters of the dredger, for example not during high energy situations such as storm surges). If the BoM issues a severe weather warning for the Port of Gladstone, Project dredging works within the affected area will cease.
8.18 (Section 8.7)	Dredger and work boats sailing routes to be optimised to reduce the generation of propeller wash
8.19 (Section 8.7)	The dredger will operate within the approved dredging footprint at all times
8.20 (Section 8.7)	The TSHD and barges will carry out adaptive management measures depending on results of water quality monitoring (i.e. reduce overflow, move location, etc.)
8.21 (Section 8.7)	Decant water will be treated in decanting ponds constructed at the WBE and WB reclamation areas. All decant water will be treated to meet the water quality limits outlined in the ERA 16 approval and Project Environmental Monitoring Procedure prior to being released at the licensed discharge points.
8.22 (Section 8.7)	No decant water will be discharged prior to water monitoring in accordance with the Project Environmental Monitoring Procedure and the ASSMP. If required, lime dosing of decant water within the WB and WBE reclamation areas in accordance with the ASSMP.
8.23 (Section 8.7)	Overflow levels to be raised to the highest allowable point during sailing from the channel duplication area to be dredged to the BUF to ensure spillage of sediment is reduced
8.24 (Section 8.7)	The barges to be fitted with ‘green valves’ in the overflow pipe to control the amount of air contained in the excess water in order to reduce turbidity. Overflow discharge to be managed using a computer-based management system to prevent excessive overflow discharge.
8.25 (Section 8.7)	Turbidity minimising equipment will be serviced and inspected appropriately by the dredging contractor. Vessel log books will be maintained by the dredging contractor and are available for viewing by GPC.

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8.26 (Section 8.7)	A dredging contractors' Ballast Water Management Plan will be prepared in accordance with the Australian Ballast Water Management Requirements (Version 6) (Commonwealth Government 2016). The management plan will include contingency measures that include, but are not limited to: • Immediate notification to DAF (Biosecurity Queensland), DAWR, DES and MSQ • Follow any directions or notices given by a regulator in relation to marine pests • Corrective actions (i.e. immediate investigation strategies, holding the balance of ballast on board, transferring the balance between tanks, examining ship to shore transfer options, etc.) • Consequential reporting/liaison requirements.
8.27 (Section 8.7)	In the instance that an additional capital dredging campaign occurs during the Project dredging period, the Dredging EMP will be updated to manage potential risk occurring from concurrent capital dredging.
8.28 (AEIS Section 7)	Licenced discharges from the two existing Western Basin reclamation area discharge points will not occur at the same time as at the proposed WBE reclamation area discharge point. However licenced discharges can occur at the same time from one existing Western Basin reclamation area discharge point and the proposed WBE reclamation area discharge point.
Stabilisation and maintenance activities in the reclamation areas	
8.29 (Section 8.7)	No contaminants will be released from site to any waters, beds, or banks of any waters (including groundwater) unless authorised
8.30 (Section 8.7)	Progressive installation of stormwater management measures on the final Project reclamation surface as it is completed
8.31 (Section 8.7)	At the completion of filling of the reclamation area, a stormwater pond will be retained to manage stormwater quality runoff from the final surface of the WBE reclamation area
8.32 (Section 8.7)	Progressive capping and revegetation of the reclamation surface to manage stormwater quality
8.33 (Section 8.7)	No refuelling or maintenance of equipment will occur outside the Project construction compound, nor will equipment be parked at the Project site for a significant time, reducing the potential for significant spills of oils and fuels to occur
8.34 (Section 8.7)	No waste is to be released into the marine environment or adjacent vegetation communities
8.35 (Section 8.7)	Spill kits for land and water based spills will be kept at the site and personnel trained in their use. Emergency response procedures will be implemented
8.36 (Section 8.7)	Best practice management will be implemented throughout the maintenance phase, by implementing the Project EMP, GPC maintenance procedures and guidelines, and complying with all relevant Commonwealth and State legislation and approval conditions.
Established duplicated shipping channels	

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8.37 (Section 8.7)	Vessels will comply with the *Quarantine Act 1906* for management of introduced pests in ballast waters, managed by the AQIS
8.38 (Section 8.7)	Vessels will comply with the International Convention on the Control of Harmful Antifouling systems on Ships, managed by MSQ
8.39 (Section 8.7)	Waste management during operation will be implemented in accordance with the relevant legislative approval conditions and best practice management
8.40 (Section 8.7)	Loading and unloading of materials at facilities will be undertaken in accordance with individual operational licences and permits.
Maintenance dredging	
8.41 (Section 8.7)	GPC will obtain all required permits for maintenance dredging and will implement mitigation measures
8.42 (Section 8.7)	Maintenance dredging operations will occur in compliance with applicable Commonwealth and State legislative requirements, as well as the most current version of the Port of Gladstone Maintenance Dredging EMP and the Long Term Monitoring and Management Plan for Sea Disposal (LTMMP)
8.43 (Section 8.7)	A water quality monitoring program will be undertaken throughout maintenance dredging activities, to ensure that WQOs are achieved
8.44 (Section 8.7)	Preparation and implementation of a sediment SAP to determine suitability of maintenance dredged material for marine placement
8.45 (Section 8.7)	Any contaminated material detected in future testing will be assessed and investigated to determine suitability and management options under the NAGD (2009) and the sea dumping permit process.
Monitoring, reporting and corrective actions	
8.46 (Section 8.7)	Undertake water quality monitoring, reporting and implement corrective action in accordance with the Project Environmental Monitoring Procedure
8.47 (Section 8.7)	GPC will report monitoring results to DAWE and DES as per permit requirements
8.48 (Section 8.7)	Regular internal and external third party audits will be conducted for the duration of the Project works, to ensure that: • Mitigation measures are being implemented effectively • Relevant performance criteria is being achieved • Activities are compliant with regulatory and Project-specific requirements • Any non-conformances are recorded and appropriate corrective actions are implemented.
8.49 (Section 8.7)	All records and associated permits will be provided to the relevant government regulator upon request and/or at the completion of Project activities

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8.50 (Section 8.7)	Complaints and incidents will be monitored throughout the Project activities, and corrective actions will be determined by the incident or complaint investigation
8.51 (Section 8.7)	Maintenance and/or corrective actions will be scheduled as required for equipment issues
8.52 (Section 8.7)	Records/logs of dredging and dredged material placement activities will be maintained in accordance with relevant permit and legislative requirements
8.53 (Section 8.7)	Regular auditing will be undertaken to confirm that Project activities are carried out in accordance with the defined requirements set out in the Dredging EMP, Project Environmental Monitoring Procedure and the Project EMP.
8.54 (Section 8.7)	Regular visual monitoring of turbid plumes during rock placement as part of the WBE reclamation area bund wall construction
8.55 (Section 8.7)	Weekly reports (as appropriate) will be completed for the duration of the Project activities
8.56 (Section 8.7)	Pre-start inspections on construction equipment to identify potential leaks
8.57 (Section 8.7)	Emergency response procedure will be prepared prior to the commencement of construction as part of the environmental management plans and the GPC EMS
8.58 (Section 8.7)	A non-compliance report will be filled out if any non-conformances are found
8.59 (Section 8.7)	In the event of an environmental incident, effective emergency response measures will be quickly implemented to ensure environmental harm for the event is minimised and feedback is issued to all parties involved in the works.
8.60	Establish a Dredge Technical Reference Panel (DTRP) for the Project dredging activities. The DTRP would comprise of scientific experts on water quality, seagrass and benthic habitat; regulators and dredging technical advisors, and would: Provide recommendations and scientific advice for water quality management Oversee the water quality monitoring program to ensure is adequate for managing water quality impacts
8.61	Develop a terms of reference for the DTRP in consultation with relevant state and Commonwealth agencies, including DES, DAF and DAWE.
9. Nature conservation	
Pest and weed management plan	
9.1 (Section 9.27)	Further baseline marine plant surveys (seagrass and macroalgae) will be undertaken at least 12 months prior to dredging works, within the proposed direct impact area and the predicted zone of high impact (indirect impact area). Surveys will be undertaken within total predicted marine plant disturbance area (both permanent and temporary impact). The surveys will be conducted over

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	the relevant seasons for each of species that are likely to be impacted. The results of these surveys will inform the Project's offset obligation in the final offset strategy for the Project.
9.2 (Section 9.27)	Further baseline marine plant surveys (seagrass and macroalgae) will be undertaken at least 12 months prior to commencing construction of the WBE reclamation area and BUF, within the proposed direct impact area and the predicted indirect impact area. Surveys will be undertaken within total predicted marine plant disturbance area (both permanent and temporary impacts). The surveys will be conducted over the relevant seasons for each of species that are likely to be impacted. The results of these surveys will inform the Project's offset obligation in the final offset strategy for the Project.
9.3 (Section 9.27)	A pre-construction baseline pest and weed survey will be undertaken to identify high risk species (location and abundance) within the Project direct impact areas. This survey will be used as a baseline to enable assessment against performance indicators during the construction phase. The survey will be conducted within the intertidal and terrestrial environments associated with the: • WB and WBE reclamation areas and construction compounds (terrestrial and intertidal areas) • BUF • Quarry and haul route. This survey will target both flora and fauna pest species.
9.4 (Section 9.27)	The Pest and Weed Management Plan will be updated using site specific detail obtained during the baseline pest and weed survey.
9.5 (Section 9.27)	Prior to construction high risk areas will be identified (i.e. areas containing prohibited or restricted matters as defined by the Biosecurity Act) within the Project direct impact areas. Vehicle wash/blow-down facilities and procedures will be established for these areas to reduce the risk of the transport and potential spread of weed species and/or their propagules.
9.6 (Section 9.27)	The Dredging Contractor will prepare a Ballast Water Management Plan (BWMP) in accordance with the *Australian Ballast Water Management Requirements* (Version 7) (Commonwealth Government 2017) (or the most recent revision). This management plan will include contingency measures that include: • Information on instances where immediate notification to DAWR/DES/MSQ is required • Ballast water management measures • Corrective actions (i.e. immediate investigation strategies, holding the balance of ballast on board, transferring the balance between tanks, examining ship to shore transfer options, etc.) • Reporting/liaison requirements.
9.7 (Section 9.27)	All dredging plant will be required to conform with the BWMP and DAWR Guidelines to minimise the risk of the introduction of any introduced marine species.
9.8 (Section 9.27)	All vehicles and machinery will be visually inspected by an appropriately skilled person, prior to entering the Project impact areas.

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9.9 (Section 9.27)	All vehicles entering areas known to contain pest or weed species (high risk areas) will be washed down prior to entering a low risk area (i.e. areas free of pest or weed species).
9.10 (Section 9.27)	Signs will be erected at entrance points, prompting the wash-down of all vehicles prior to entering low risk areas.
9.11 (Section 9.27)	All high-risk materials (e.g. imported soil) will be certified as 'free of weeds and pests' prior to acceptance into Project impact areas.
9.12 (Section 9.27)	Regular inspections will occur within the terrestrial Project impact areas to identify and record any sightings of pest fauna species. Appropriate mitigation measures will be developed and implemented for pest fauna species to avoid and/or minimise potential impacts on native fauna species and their habitats (e.g. migratory shorebirds and roosting/foraging habitat).
9.13 (Section 9.27)	Any sightings of any terrestrial pest fauna species will be maintained in a log and reported back to the Contractor's Environmental Manager
9.14 (Section 9.27)	Soil and fill material from high risk areas will not be transported to low risk areas.
9.15 (Section 9.27)	All declared prohibited or restricted plant matter (as defined by the Biosecurity Act) detected within Project impact areas will be controlled in accordance with the specific herbicide application procedure/s, outlined in the PWMP.
9.16 (Section 9.27)	Vehicle movement will be restricted to designated roads and temporary tracks, wherever practicable.
9.17 (Section 9.27)	Food scraps will be removed from the Project impact areas every day so as to limit the potential for pest fauna species to enter Project impact areas.
9.18 (Section 9.27)	The use of herbicides and pesticides within and adjacent to intertidal/marine areas and drainage lines will be avoided and/or minimised. Products that are specifically formulated for use in environmentally sensitive areas will be used in these locations where required.
9.19 (Section 9.27)	Major incidents resulting in a significant spread of weeds and/or pests will be reported to GPC, and the appropriate regulatory agency (e.g. DAWR, DES, MSQ)
9.20 (Section 9.27)	In the event that marine pests are introduced/spread as a result of Project activities, the BWMP contingency measures will be implemented in accordance with the Australian Ballast Water Management Requirements.
Vegetation management plan	
9.21 (Section 9.27)	If terrestrial vegetation clearing is required within areas mapped as a 'high risk' area on the flora survey trigger map, a vegetation survey will be undertaken by a suitably qualified person in accordance with the *Flora Survey Guidelines – Protected Plants* guideline (version 2.0, 2016) (or the most recent revision). This survey is required to determine if there are protected plant species within the Project impact areas that have the potential to be impacted by Project activities. In the event that protected flora species are located, and are likely to be impacted as a result of Project activities, an Impact Management Plan (IMP) will be

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	developed which will include species-specific mitigation measures. All relevant permits will be obtained prior to clearing in accordance with the *Flora Survey Guidelines – Protected Plants* guideline (version 2.0, 2016) (or the most recent revision).
9.22 (Section 9.27)	A pre-construction baseline mangrove and seagrass meadow survey will be undertaken in the Project indirect impact area (where there is the potential for impacts as a result of Project activities), in accordance with the DES *Monitoring and Sampling Manual 2018: Environment Protection (Water) Policy 2009, Version February 2018 – Biological assessment: Monitoring mangrove forest health* (or the most recent revision).
9.23 (Section 9.27)	A Bushfire Management Plan (BMP) will be developed and implemented and will include measures to minimise the risk of fire on areas of native vegetation.
9.24 (Section 9.27)	The BMP will identify measures to minimise potential ignition sources associated with Project activities, including all earth-moving equipment to be fitted with flame arrestors.
9.25 (Section 9.27)	Where practical the construction compound and other laydown areas will be located within existing cleared and/or disturbed areas that are considered to be of low ecological value.
9.26 (Section 9.27)	The design of the Project works will aim to reduce impacts on adjacent intertidal vegetation and marine plants (e.g. seagrass meadows and mangroves), where practical, and will reduce potential fragmentation impacts as a result of Project activities.
9.27 (Section 9.27)	All necessary permits and approvals will be obtained prior to undertaking relevant works. Any vegetation clearing or removal of marine plants will be carried out in accordance with all relevant approval conditions.
9.28 (Section 9.27)	The clearing or removal of terrestrial, intertidal or marine vegetation (where unavoidable) will be restricted to the minimum required to enable the safe construction and maintenance of the Project, including minimising disturbance to ecologically sensitive areas.
9.29 (Section 9.27)	The clearing of vegetation and grubbing works (if required) will employ techniques that leave the root ball intact and minimise the disturbance of soil/sediments, where practical (e.g. cut the tree at the base and leave the root structure *in situ*).
9.30 (Section 9.27)	Cleared vegetation will be stockpiled and mulched for use within the reclamation works area. Stockpiles will be placed in areas of low ecological value (i.e. existing cleared and/or disturbed areas), where practical.
9.31 (Section 9.27)	Parking of vehicles, stockpiling, or storage of plant/equipment will not be permitted within areas of native vegetation. Tree protection zones will be established where Project impact areas are within/adjacent to remnant vegetated areas, as identified by a suitably qualified person (e.g. arborist, ecologist, environmental officer/manager).
9.32 (Section 9.27)	The condition of mangrove habitats will be monitored every 6 months within areas that have the potential to be impacted by Project reclamation area establishment activities, in accordance with the DES *Monitoring and Sampling Manual 2018: Environment Protection (water) Policy 2009, Version February 2018 – Biological assessment: Monitoring mangrove forest health* (or future versions). This will be undertaken for the duration of the WBE reclamation area (southern area) and WBE reclamation

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	area (northern area) establishment activities, and for a 2 year period following the completion of relevant WBE reclamation area activities.
9.33 (Section 9.27)	The health and extent of seagrass meadows, benthic macroalgae and the condition of coral reefs will be monitored within areas potentially impacted by Project activities as detailed within the Environmental Monitoring Procedure (refer AEIS Appendix H). This will include surveys during dredging and post dredging to assess the extent of these communities at multiple sites located within the low and moderate impact zones, and the zone of influence established for water quality parameters (outlined in the Environmental Monitoring Procedure).
9.34 (Section 9.27)	Dredging and dredged material placement works will be restricted to the extent necessary to enable the safe construction and maintenance of the Project, including minimising the disturbance to ecologically sensitive areas (i.e. adjacent habitats and seagrass communities).
9.35 (Section 9.27)	Turbidity and Benthic Photosynthetically Active Radiation (BPAR) will be monitored during dredging activities, and adaptive management measures will be implemented where there is an exceedance of trigger values outlined in the Environmental Monitoring Procedure for sensitive ecological values (e.g. seagrasses and coral reefs).
9.36 (Section 9.27)	The hydrodynamic model for the reclamation area will be validated following completion of construction to determine actual sedimentation and erosion impacts. Management measures will be revised, if required, to reduce the potential for impacts on sensitive ecological receptors (e.g. seagrass meadows, water quality).
Fauna management plan	
9.37 (Section 9.27)	The detailed design of the Project works will take into account fauna impacts, with residual adverse impacts offset through the provision of suitable offsets in accordance with legislative requirements.
9.38 (Section 9.27)	A pre-construction fauna habitat survey will be conducted by a suitably qualified and experienced person, to detect and record details of animal breeding places (as defined under Schedule 5, Section (1) of the NC Reg) within the Project WBE reclamation area direct impact area and adjoining foreshore area, and obtain additional site-specific information to supplement existing fauna data. The survey extent will include the Project direct impact areas associated with the WB and WBE reclamation areas, BUF and construction compounds, including a 100m buffer (note: where additional impact areas are required, this mitigation measure will apply). Where required, a Species Management Plan (SMP) will be developed in accordance with the requirements of the *Nature Conservation (Wildlife Management) Regulation 2006*, and approvals to operate under the SMP will be obtained as required, and in accordance with Section 88 of the NC Act, and pursuant to Section 332 of the NC Reg, to authorise any unavoidable interference with animal breeding places (as defined under the NC Reg). Where breeding habitats, such as hollow-bearing trees or nests, are located within the Project impact areas, or where they have the potential to be impacted, measures to protect or appropriately manage these habitats will be developed in accordance with the *Nature Conservation (Wildlife Management) Regulation 2006.*

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	These measures will be included in the Fauna Management Plan (FMP) prior to the WBE reclamation area construction or WBE reclamation area impacting activities being undertaken, and will address the following: • Potential impacts to native terrestrial and intertidal animal breeding places, resulting from WBE reclamation area activities • Site-specific and practical management actions to avoid or minimise both the potential immediate and long-term impact/s of removing an animal breeding place • Monitoring and reporting requirements that demonstrate how management actions will be effectively implemented and will produce the intended results.
9.39 (Section 9.27)	The FMP will be finalised prior to construction using site-specific detail obtained during pre-construction fauna habitat surveys. The FMP will incorporate the mitigation measures to avoid or minimise potential impacts to native terrestrial and intertidal fauna, within areas that have the potential to be impacted by WBE reclamation area activities.
9.40 (Section 9.27)	The survey for and management of wildlife will be undertaken by suitably qualified personnel with the appropriate permits and licences (e.g. fauna spotter catchers to have appropriated damage mitigation permits)
9.41 (Section 9.27)	Wildlife load reduction measures will be included in the FMP if required, and implemented and conducted by a suitably qualified ecologist
9.42 (Section 9.27)	Where practicable, the construction of the WBE reclamation area (northern area) outer bund walls that are nearest to the coastline will be scheduled to occur from March to September (i.e. outside of the critical migratory bird visitation periods for the majority of species visiting Port Curtis) (as presented in Appendix 3 (Timing of Migration) of the *Gladstone Ports Corporation Report for Migratory Shorebird Monitoring Port Curtis and the Curtis Coast Annual Summer Survey 2016*). Migratory birds are still likely to be present in the area outside of the March to September period, therefore measures relating to migratory shorebirds and their habitat will be implemented as required during the construction period (i.e. not restricted to these months).
9.43 (Section 9.27)	During pre-construction activities, all personnel operating vehicles will be made aware of the potential to encounter native fauna, including conservation significant species, and be trained in the implementation of the relevant mitigation measures including all requirements for reporting injured/trapped fauna.
9.44 (Section 9.27)	Appropriate signage will be installed, to promote driver awareness and provide safety for fauna crossing or inhabiting the area. Reduced speed zones will be established within proximity to sensitive areas, to be determined prior to construction by a suitably qualified person (e.g. ecologist, fauna spotter catcher).
9.45 (Section 9.27)	If required, tree clearing activities will be undertaken in the presence of a suitably qualified and experienced fauna spotter catcher, in accordance with the FMP and other approvals and legislative requirements.
9.46 (Section 9.27)	WBE reclamation area outer bund wall construction occurring adjacent to sensitive habitats (e.g. shorebird habitat) will be conducted in the presence of a suitably trained WBE reclamation area construction employee (e.g. fauna spotter catcher).

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9.47 (Section 9.27)	The suitably trained WBE reclamation area construction employee (e.g. fauna spotter catcher) will have the authority to initiate a 'stop-work' order within the buffer zone of an active breeding place (i.e. 50m for all raptor, owl, and conservation significant species; 30m for all other species). In this event, the spotter catcher will determine the appropriate management of the breeding place in accordance with the management measures included in the FMP (as developed following the pre-construction survey) and in accordance with all relevant permits and approvals.
9.48 (Section 9.27)	The suitably trained WBE reclamation area construction employee (e.g. fauna spotter catcher) will relocate any displaced fauna to a suitable recipient site, in the event that the animal is not injured. All injured animals (native or introduced) will be taken to receive immediate veterinary attention.
9.49 (Section 9.27)	If an animal is injured during construction activities, works in the immediate area of the animal will cease immediately and will not recommence until rescue actions have been taken. A review of construction activities will be undertaken following the event, to minimise the risk of the event reoccurring. The results of the review will be communicated to the relevant personnel, including the requirement to adapt alternative construction methods and/or additional mitigation measures.
9.50 (Section 9.27)	Speed limits will be enforced for all Project activities to prevent injuries to native fauna.
9.51 (Section 9.27)	Where night lighting is required (i.e. cannot be avoided), the lights will be directed to avoid light spill into adjacent marine, intertidal and terrestrial areas, and appropriate bulbs will be selected and used to reduce potential impacts on marine fauna (e.g. to avoid impacts on marine turtle orientation).
9.52 (Section 9.27)	If fauna exclusion fencing is determined to be required as a result of the pre-construction fauna surveys, a detailed summary of exclusion fencing requirements will be prepared and included in the FMP.
9.53 (Section 9.27)	A marine species emergency response/notification plan will be developed to allow for the rapid and effective handling (e.g. capture and release) of marine fauna in the event that an incident occurs within Project impact areas.
9.54 (Section 9.27)	Where practicable, all vessels will be fitted with propeller guards to reduce potential impacts on marine fauna as a result of propeller strike.
9.55 (Section 9.27)	TSHD dredger heads will be fitted with fauna exclusion devices, including turtle deflectors. This equipment will be appropriately serviced and inspected prior to commencement of dredging activities to ensure it is in good working order.
9.56 (Section 9.27)	All vessel operators will be made aware of the potential for native fauna species, including conservation significant species, to occur within the Project impact areas, prior to construction
9.57 (Section 9.27)	During construction of the WBE reclamation area and BUF, migratory shorebirds utilising the adjoining Friend Point roost site will be monitored by a suitably trained WBE reclamation area construction employee (e.g. fauna spotter catcher) to determine if adaptive management of Project activities is required. This will include monitoring impacts in response to a range of construction-related activities, including potential noise and dust impacts; vehicle movements; and the potential introduction and/or spread of

<table>
<tr><th>EIS commitment number (Project EIS or AEIS section reference)</th><th>EIS commitment</th></tr>
<tr><td></td><td>pest species (e.g. foxes, wild dogs). Works will cease and mitigation measures developed where the suitably trained WBE reclamation area construction employee identifies that the Project activities are resulting in frequent alarm or flight responses, or avoidance of the adjoining Friend Point roost site and foraging habitat.
The results of the monitoring will be reported and will include the identification of adaptive management measures to be implemented to avoid or reduce impacts on these species.</td></tr>
<tr><td>9.58 (Section 9.27)</td><td>Noise spot checks will be conducted at nearby shorebird roosts during construction (i.e. Friend Point shorebird roost) and compared to the following guidelines for migratory shorebirds. Works will cease and mitigation measures developed as appropriate where noise spot checks determine that ‘moderate impacts on habitat use’, or ‘avoidance of area’ disturbance has or is likely to occur.
<table>
<tr><th>Disturbance effect</th><th>Steady or continuous noise sources LA_{eq}(15min)(dBA)</th><th>Episodic (single event or short-term) noise sources LA_{max}(dBA)</th><th>Typical bird activities potentially impacted</th></tr>
<tr><td>Occasional (Alert) – minor impacts on habitat use for most species</td><td>50 to 65</td><td>45 to 60</td><td>Nesting</td></tr>
<tr><td>Frequent (Alarm or Flight) – moderate impacts on habitat use</td><td>68 to 85</td><td>60 to 80</td><td>Nesting
Roosting</td></tr>
<tr><td>Avoidance of area – by most of the population of some species</td><td>≥85</td><td>≥80</td><td>Nesting
Roosting
Foraging</td></tr>
</table>
Note:
• Masking impacts, particularly on smaller songbirds, may occur at noise levels of approximately the alert threshold right up until the point of avoidance
• LA_{max} limits have been specifically set below the LA_{eq} limits in recognition of considerations related to startle response.</td></tr>
<tr><td>9.59 (Section 9.27)</td><td>Appropriate signage will be erected in prominent positions to promote awareness of marine fauna present within the Project impact areas.</td></tr>
<tr><td>9.60 (Section 9.27)</td><td>A suitably trained marine fauna spotter crew member will be present on all moving vessels larger than 7m in length, at all times and will conduct a pre-start search for marine fauna prior to the commencement of dredging, and will to continue to spot for</td></tr>
</table>

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
	marine fauna throughout dredging activities (i.e. continual observations during dredging). All fauna observations will be recorded and reported, as per the relevant approval requirements.
9.61 (Section 9.27)	Immediately prior to the commencement of dredging activities, a search for marine megafauna will be conducted by a suitably trained crew member, in accordance with the relevant management plans and permits, approvals, and legislative requirements.
9.62 (Section 9.27)	Dredging works will be stopped in the event that the suitably trained marine fauna spotter (or operator) observes a marine turtle or marine mammal (e.g. dolphin, dugong or whale) within 50m of the operation. Dredging will not recommence until the animal(s) have moved beyond 50m or until 15 minutes has passed and the animal(s) have not been observed within 50m of the operations during that time. The vessel may move to another area and recommence work provided that the 50m separation distance is maintained.
9.63 (Section 9.27)	For Project vessels speed limits will be enforced within the Project impact areas to reduce the potential for injury to marine fauna. For Project vessels go slow zones will be established in shallow areas, less than 5m in depth.
9.64 (Section 9.27)	A bund wall closure plan will be prepared to manage potential impacts on marine and intertidal fauna species. This plan will include the following measures: • When construction of the WBE reclamation area and BUF reaches the stage where the bund/sheet piling wall is to be closed, a suitably trained marine fauna spotter (or operator) will be present to minimise the risk of marine fauna being stranded within the WBE reclamation area and BUF • If there are any instances of overflow from marine waters into the reclamation area or BUF once they have been closed, the area within the reclamation area or BUF bund will be immediately inspected for any stranded fauna • Fish capture/salvage techniques will be implemented, as provided in the Fish Salvage Guidelines (DPIF 2004), if required • All personnel involved in the capture and salvage of fauna will be appropriately inducted and trained Fauna exclusion measures will be installed on the seaward facing side of all discharge points to prevent fauna entering into the reclamation area via the discharge points. Exclusion measures will allow fauna within the reclamation area to leave and re-enter the marine environment (e.g.one-way gates, regular checking to avoid being left open and marine fauna entering).
9.65 (Section 9.27)	The bund wall/sheet piling wall closure plan will contain details on the following: • Qualifications and training of personnel undertaking the capture and salvage and the methods to be used • Details of the relevant permits under which the bund wall closure activities will be undertaken • Overview of the bund/sheet piling wall closure schedule, including pre-closure meetings and checks • Monitoring and reporting requirements.
9.66 (Section 9.27)	Hazardous substances with the potential to impact fauna and associated habitat will be stored within suitably contained and bunded areas within construction compounds, and located an appropriate distance from waterbodies and/or sensitive habitats.

<table>
<tr><th>EIS commitment number (Project EIS or AEIS section reference)</th><th>EIS commitment</th></tr>
<tr><td>9.67 (Section 9.27)</td><td>An exclusion/safety zone will be created around the perimeter of the navigational aid impact piling. During the works, a suitably trained marine fauna spotter (or operator) will be present to ensure that navigational aid impact piling will not be carried out while:
Dugongs, marine turtles, dolphins or whales are within 150m of piling activities
Migratory birds are within 25m of piling activities
Activities will be placed on hold for the period of time it takes the animal to leave the exclusion/safety zone of its own accord.
The following fauna safety shut-down zones will also be implemented for continuous impact piling durations using the suitably trained marine fauna spotter (or operator):
<table>
<tr><th>Noise exposure threshold based on cumulative SEL (within a 24-hour period)</th><th></th><th>Observation zone</th><th>Shut-down zone</th></tr>
<tr><td>Duration with continuous piling @ 100 strikes / min</td><td>Cumulative SEL < 198bD re 1µPa^2 S</td><td></td><td></td></tr>
<tr><td>≤ 1 min</td><td>≤ 50 m</td><td>1.0 km</td><td>50 m</td></tr>
<tr><td>10 min</td><td>310 m</td><td>1.0 km</td><td>310 m</td></tr>
<tr><td>60 min</td><td>1.4 km</td><td>2.0 km</td><td>1.4 km</td></tr>
</table></td></tr>
<tr><td>9.68 (Section 9.27)</td><td>Impact piling activities will be avoided during the following times where practical:
When marine mammals are likely/observed to be breeding, calving, feeding or resting in nearby biologically important habitats (i.e. times may vary depending on species)
Humpback whale migration season from June to August (ie June to August for northward migration to breeding grounds, and around September for the southward migration)
During marine turtle (Loggerhead turtle and Flatback turtle) peak nesting activity period from November to December, and February.</td></tr>
<tr><td>9.69 (Section 9.27)</td><td>Standard operating procedures will be required to be undertaken by contractors during all impact piling activities, and will include pre-start, soft start, normal operation, stand-by operation, and shut-down procedures, as follows:
– Pre-start monitoring – the presence of marine turtles and marine mammals will be visually monitored by a suitably trained crew member for at least 30 minutes before piling commences using a soft start procedure
Soft start – is to always be used prior to works commencing even if marine turtles and marine mammals have not been observed inside the shut-down zone during the pre-start observations. soft start may commence with piling impact energy gradually increased over a 10-minute time period. A soft start will also be used after long breaks of more than 30 minutes in piling activity.</td></tr>
</table>

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
	– Normal piling – if marine turtles and marine mammals have not been observed inside the shut-down or observation zones during the soft start, piling at full impact energy will commence. Visual observations will continue throughout piling activities – Stand-by – if a marine turtle or marine mammal is sighted within the observation zone during the soft start or normal operation piling, the operator of the piling rig will be placed on stand-by to shut down the piling rig, while visual monitoring of the animal continues. – Shut-down – if a marine turtle or marine mammal is sighted within or are about to enter the shut-down zone, piling activity will be stopped immediately. If the animal is observed to move outside the zone again, or 30 minutes have elapsed with no further sightings, piling activities will recommence with the soft start procedure. If a marine turtle or marine mammal is detected in the shut-down zone during a period of poor visibility, operations will stop until visibility improves.
9.70 (Section 9.27)	• Where noise-related incidents occur while implementing standard operating procedures, validation of the effectiveness of the following noise mitigation measures will be undertaken (via site acoustic testing): – Lower impact piling duration/piling strike number per day – Use of additional impact piling noise attenuation measures: ○ Air bubble curtains. Air bubble curtains are designed to infuse the water column surrounding the pile with air bubbles, generating a bubble screen that attenuates the sound propagation from the piling. For the mid-sized steel pile proposed for the Project (with a dimension greater than 24 but less than 48 inches), an air bubble curtain is expected to provide about 10 dB of noise reduction. ○ Isolation casings. Isolation casings are hollow casing slightly larger in diameter than the pile to be driven. The casing is inserted into the water column and bottom substrate, and then dewatered so that the work area is isolated from the surrounding water column in order to attenuate the sound propagation. Dewatered isolation casings are expected to provide attenuation that is at least as great as the attenuation provided by air bubble curtains. ○ Cushion blocks. Cushion blocks consist of blocks of material atop a pile during piling to minimise the noise generated during impact hammering. Materials typically used for cushion blocks include wood, nylon and micarta blocks. The noise reduction is expected to be from a few dB to over 20 dB. This measure can be used in conjunction with air bubble curtains or isolated casings as described above.
9.71 (AEIS Section 9.14)	WBE reclamation area bund wall establishment and dredging program to minimise impacts on ecological values by considering sensitive environmental windows.
9.72 (AEIS Appendix G)	Where practicable, marine turtle friendly lighting should be implemented for Project activities to ensure that only amber LED aeroscreen lighting is used outside of buildings on the reclamation areas, and using shading, no light source within the area is directly visible from outside the perimeter of the area (excluding lighting required for navigation and safety).
9.73 (AEIS Appendix F)	Where practicable, marine turtle friendly lighting should be implemented for Project activities to ensure that only amber LED aeroscreen lighting is used for lighting outside of Project vessel cabins, cabin portholes on all Project vessels to be blacked out at

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
	night to prevent light spill, and the use of shading, no light source within the area is directly visible from outside the Project vessel perimeter
9.74 (AEIS Section 9.14)	In the event that two or more of any endangered or vulnerable species of marine megafauna are fatally injured on any two out of three consecutive days, the dredging operation must stop and not re-commence until consultation with DES has occurred and direction has been given by DES to allow re-commencement.
9.75 (AEIS Section 9.14)	Retrieved turtle carcasses (and parts of) shall be immediately notified on the RSPCA Hotline 1300 264 625 (1300 ANIMAL), to allow prompt collection by DES for analysis.
9.76 (AEIS Sections 9.6.3, 9.10.6, 9.11.4.2 and 9.11.4.3)	Update the Project EMP to further outline 'stop work' procedures to occur with serve extreme events to limit active dredging sediment suspension.
9.77 (AEIS Section 9.15)	The Project will consider the following when undertaking Project activities within the relevant Port of Gladstone spatial and temporal environmental windows: • Minimising Project activities within close proximity to the Friend Point migratory shorebird roost site • Minimising Project activities within key environmental windows, including: – Seagrass growing season – Migratory shorebird foraging and roosting prior to migration for breeding – Coral spawning periods – Flatback turtle internesting.
9.78 (AEIS Section 9.10.9)	Development of monitoring program to identify use of the completed Channel Duplication shipping channels by internesting Flatback and Loggerhead turtles.
9.79 (AEIS Sections 9.6.3, 9.10.6, 9.11.4.2, 9.11.4.3)	Update the EMP to provide mitigation/management measures to be undertaken during serve extreme events to limit active dredging sediment suspension
10. Water resources	
10.1 (Section 10.6.1)	Installation of piezometers on the perimeter of the WBE reclamation area once earthworks are completed. The piezometers will be installed in the dredged material and not the bund wall to ensure the accuracy of results.
10.2 (Section 10.6.1)	Development of a WB and WBE reclamation areas groundwater monitoring program (i.e. groundwater levels and water quality, specifically pH) to be implemented once dredging and earthworks have been completed and the WB and WBE reclamation areas

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
	are stable. Monitoring to include sites within the coastal strip of land adjacent to the WBE reclamation area to be installed prior to construction commencing. Groundwater monitoring piezometer installation will not be undertaken during the construction of the WBE reclamation area as piezometers are likely to be broken/demolished prior to finalisation of earthworks. Groundwater monitoring will occur during Project dredging. If potential effects are observed, as part of the groundwater monitoring, corrective actions would include: • Further investigation to qualify, quantity and delineate impacts • Identify and implement appropriate management and/or remediation measures. Groundwater monitoring will cease 6 months after dredging and licenced discharges from the WB and WBE reclamation areas. Discontinuing the groundwater monitoring will be subject to the stabilisation of the groundwater level and groundwater quality results showing no potential impacts to the receiving environment over a continuous 6 month period. If Project dredging recommences, the groundwater monitoring program will be implemented during and post dredging as defined above.
11. Climate and climate change assessment	
11.1 (Section 11.7)	Detailed design of the BUF and WBE reclamation area to consider potential changed surface water volumes in extreme rainfall events.
11.2 (Section 11.7)	Detailed design to consider the effects of increasing temperature on material selection for the BUF and WBE reclamation area bund walls.
11.3 (Section 11.7)	Detailed design for the BUF and WBE reclamation area to include a ground stability assessment considering potential changes to temperature and rainfall profiles.
11.4 (Section 11.7)	Site management plan will be prepared for the BUF and WBE reclamation area for the ongoing monitoring and management of ground stability.
11.5 (Section 11.7)	Detailed design for the BUF and WBE reclamation area to consider extreme events. A detailed analysis of storm surge and climate change allowances will be undertaken during detailed design of the BUF and reclamation area bund walls. The EIS preliminary design for the BUF and bund walls has allowed for a combined storm tide and sea level change up to +7m LAT. This is a 0.55m allowance above the predicted 500 year ARI storm tide, including a climate change estimate of 6.45m LAT.
11.6 (Section 11.7)	Prepare and implement a cyclone management plan during Project activities.
11.7 (Section 11.7)	Implement the findings and recommendations of the *Independent Review of the Bund Wall at the Port of Gladstone* (April 2014) (refer Appendix D of the draft EIS).
12. Air quality and greenhouse gas (GHG)	

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
12.1 (Section 12.6.1)	Watering of haul roads or routes used for the haulage of material will be undertaken during construction and dredged material placement.
12.2 (Section 12.6.1)	Watering of exposed areas to reduce wind-blown dust will be undertaken during construction and dredged material placement.
12.3 (Section 12.6.1)	Watering to ensure material being dozed or graded is damp or applying suppressants to further reduce emissions from material haulage over completed sections of bund wall or other transport routes will be undertaken during construction and dredged material placement.
12.4 (Section 12.6.1)	To allow appropriate mixing of exhaust emissions from generators, the exhaust emission release points will be at a point that is 2.5 times higher than buildings or structures within 10 stack heights of the exhaust emission release points
12.5 (Section 12.6.1)	During selection of dredging vessels, the total emissions and characteristics will be reviewed against the assumptions made in the air quality assessment to ensure consistency.
12.6 (Section 12.6.2.1)	Reducing fuel consumption and the generation of emissions during the construction of the bund wall, including BUF construction by implementing the following measures: • Selection of fuel efficient machinery and vehicles, where possible, matched to the delivery requirements of quarry materials to the reclamation site • Appropriate equipment maintenance • Optimisation of transport of materials through load optimisation and delivery scheduling.
12.7 (Section 12.6.2.2)	To minimise the fuel usage associated with dredging operations the management of dredging operations will include the development of key performance indicators for fuel usage, delegation of responsibilities for monitoring, measurement and reporting
12.8 (Section 12.6.2.2)	Fuel efficiency for dredging operations can be achieved by maximising payload while minimising fuel consumption. Moving non-payload weight can unnecessarily increase fuel consumption. Measures to maximise payload include (De Cuyper et al. 2015): • Match vessel capacity to application • Minimise water and sediment trapped in the barges • Minimise non-payload weight, including spare parts and bunker fuel volumes • Minimise idle time.
12.9 (Section 12.6.2.2)	During Project development consider a singular campaign, including benefits of reduced GHG emissions.
12.10 (Section 12.6.2.3)	Ongoing minimisation of diesel consumption during the earthworks on the reclamation site through equipment selection, maintenance and operational procedures.

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
12.11 (Section 12.6.2.4)	Ongoing consideration and evaluation of the potential to supplement fuel volumes with bio-diesel to reduce Project GHG emissions. This is to be undertaken by GPC during the detailed design phase of the Project.
12.12 (Section 12.6.2.4)	Reduction of heavy fuel consumption in dredging vessels by connecting them to mains power while docked. This option will be utilised where available and practical.
12.13 (Section 12.6.3)	Odour inspections of the downwind boundary of the WBE reclamation area during placement of dredged material will be undertaken to ensure there is no discernible impact from odour.
12.14 (AEIS Appendix G)	Wheel wash stations and/or vibration grids will be used at both ends of haul route from the quarry to the WBE reclamation area to reduce dust/mud deposition on public roads.
12.15 (AEIS Appendix G)	All marine plant and equipment will be maintained to minimise the discharge of noxious fumes and pollutants.
12.16 (AEIS Appendix G)	Vessels will be registered and in survey as required by Australian law and to the International Maritime Organisation (IMO) guidelines.
12.17 (AEIS Appendix G)	Key personnel will be provided mandatory training in the potential Project air quality impacts, sensitive receptors and mitigation measures to be implemented.
12.18 (AEIS Section 12.8)	An Air Quality Management Plan will be prepared, and will include all mitigation measures for greenhouse gas emissions.
12.19 (AEIS Section 12.8)	Dust deposition monitoring will be conducted at locations of sensitive receptors.
12.20 (AEIS Section 12.8)	The Project EMP will include triggers for actions to protect against impacts of dust deposition at locations of sensitive receptors, and actions to avoid dust deposition impacts.
12.21 (AEIS Section 12.8)	The Project EMP will include specific measures to reduce GHG emissions and their associated impacts.
13. Noise and vibration	
Navigational aid installation	
13.1 (Section 13.7.1.2)	When the impact piling rig is used within 1km of nearby sensitive receptors on Facing Island and Boyne Island, the following measures will be implemented: • Undertake impact piling trials to determine the minimum required drop height to install the piles as small drop heights can reduce/control noise • Installation of piling ‘cushions’ at the point of impact to reduce the energy (sound emission) during each impact event.
Night-time channel duplication dredging with the TSHD and pushbusters	

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
13.2 (Section 13.7.1.2)	Include noise attenuation measures for the TSHD pumps, power generation plant and motors that would be on-deck sources of noise. Such measures could include: • Installing plant with the lowest available noise emission • Utilise on-deck structures to screen noise emissions from neighbouring plant • Install plant with acoustic enclosures, acoustic exhaust mufflers, acoustic louvers to limit noise emission levels
13.3 (Section 13.7.1.2)	Where practical, plan and manage the dredging program to utilise the less sensitive daytime and evening periods when dredging adjacent to residences on Facing Island. This will limit the requirement to operate the TSHD during the night-time at the closest distance to residences
13.4 (Section 13.7.1.2)	Where practical, pushbusters will not be run at full speed when passing by, and within 2.4km of, noise sensitive receptors on Facing Island
General noise management for Project	
13.5 (Section 13.7.1.2)	General noise management controls are to be adopted and adhered to for the duration of the construction phase, particularly for all works outside the standard day time hours of construction (6.30am to 6.30pm Monday to Saturday). These include: • Brief the Project work team to raise awareness of migratory shorebirds and the importance of minimising noise emissions • Use mobile plant with efficient acoustic mufflers on the exhausts • Where practical, adjust reversing alarms on plant to limit the acoustic range to the immediate operational area • Selection of the quietest plant and equipment that can economically undertake the work • Regular maintenance of equipment to ensure that it remains in good working order • Where practical, avoid the coincidence of plant and equipment working simultaneously close together near sensitive receivers • Mobile plant such as excavators, front end loader and other diesel-powered equipment will be fitted with residential class mufflers • Where work is proposed within at least 1km of residences, the community will be notified at least 2 weeks prior to the commencement of start up. Notifications will describe the potential noise and vibration levels and the proposed management measures to control environmental impacts. • Broadband reversing alarms will be used instead of tonal reversing alarms where the Friend Point roost site is within 1km of proposed construction works. This will be a requirement when outside standard working hours and included as a contractual requirement for contractors. • Equipment which is used intermittently will be shut down when not in use and all engine covers will be kept closed while equipment is operating

<table>
<tr><th>EIS commitment number (Project EIS or AEIS section reference)</th><th>EIS commitment</th></tr>
<tr><td></td><td>• During site inductions and toolbox talks, all site workers (including subcontractors and temporary workforce) will be made aware of the hours of construction and how to apply practical, feasible and reasonable measures to minimise noise and vibration when undertaking construction activities
• The site manager (as appropriate) will provide a community liaison phone number and permanent site contact so that noise and/or vibration- related complaints, if any, can be received and addressed in a timely manner. Consultation and cooperation between the site(s) and neighbours to the site(s) will assist in limiting uncertainty, misconceptions and adverse reactions to noise and vibration.</td></tr>
<tr><td>13.6 (Section 13.7.1.3)</td><td>All noise generated during the Project will be monitored, documented and managed in accordance with the Noise and Vibration Management Plan (NVMP) that has been prepared as part of the Project EMP. The NVMP requires the following actions:
• Monitor construction noise levels at the commencement of the construction phase to verify the outcomes of the noise assessment and confirm the noise from the Project activities will not cause unacceptable impacts at sensitive receptors
• Implement a rolling spot check regime of noise intensive plants and equipment
• Undertaken all monitoring in accordance with relevant Australian Standards and regulatory guidelines for the measurement of environmental noise
• Conduct supplementary noise and/or vibration monitoring, as warranted, to identify issues of concern in response to any noise complaints.</td></tr>
<tr><td colspan="2">Underwater noise mitigation</td></tr>
<tr><td>13.7 (Section 13.7.2.2)</td><td>All proposed Project safety zones will be implemented to mitigate impact pilling.

Proposed safety zones for continuous impact piling durations
<table>
<tr><th colspan="2">Noise exposure threshold based on cumulative SEL (within a 24 hour period)</th><th rowspan="2">Observation zone</th><th rowspan="2">Shut-down zone</th></tr>
<tr><th>Duration with continuous piling @ 100 strikes/min</th><th>Cumulative SEL (< 198dB re 1µPa^2 S)</th></tr>
<tr><td>≤ 1 min</td><td>≤ 50 m</td><td>1.0 km</td><td>50 m</td></tr>
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</table></td></tr>
<tr><td>13.8 (Section 13.7.2.2)</td><td>Implementation of the following management measures to reduce impact pilling noise and vibration:</td></tr>
</table>

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
	• Contract documentation – include these requirements for impact piling noise management and mitigation measures in the contract documentation • Timing and duration – avoid conducting impact piling during times when marine mammals are likely to be breeding, calving, feeding or resting in biologically important habitats nearby. Where practical, avoid piling during whale migration season. • Trained crew – ensure a suitably trained crew member is available during piling to conduct the recommended standard operational procedures to manage noise impacts • Standard operational procedures – standard operating procedures to be undertaken by contractors during piling activities include pre-start, soft start, normal operation, stand-by operation, and shut-down procedures, including: – Pre-start monitoring – the presence of marine turtles and marine mammals will be visually monitored by a suitably trained crew member for at least 30 minutes before piling commences using a soft start procedure – Soft start – if marine turtles and marine mammals have not been observed inside the shut-down zone during the pre-start observations, soft start may commence with piling impact energy gradually increased over a 10 minute time period. A soft start will also be used after long breaks of more than 30 minutes in piling activity – Normal piling – if marine turtles and marine mammals have not been observed inside the shut-down or observation zones during the soft start, piling at full impact energy may commence. Visual observations will continue throughout the piling activities – Stand-by – if marine turtles or marine mammals are sighted within the observation zone during the soft start or normal operation piling, the operator of the piling rig will be placed on stand-by to shut down the piling rig, while visual monitoring of the animal continues – Shut-down – if marine turtle or marine mammals are sighted within or are about to enter the shut-down zone, piling activity should be stopped immediately. If the animal is observed to move outside the zone again, or 30 minutes have elapsed with no further sightings, piling activities will recommence following the soft start procedure. If a marine turtle or marine mammal is detected in the shut-down zone during a period of poor visibility, operations will stop until visibility improves.
13.9 (Section 13.7.2.2)	Compliance and sighting report – the contractor will maintain a record of procedures employed during piling, including information on any marine mammals or marine turtles sighted, and their reaction to the piling activity. The report will include • Location, date, start and completion time of piling • Information on the piling rig (hammer weight and drop height), pile size, number of piles, number of impacts per pile • Details of the trained crew members conducting the visual observations • Times when observations were hampered by poor visibility or high winds, times when start-up delays or shut-down procedures occurred, and the time and distance of any marine mammal or marine turtle sightings.
Additional mitigation measures for fish, dugong and marine turtles	

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
13.10 (Section 13.7.2.2)	Use of piling noise attenuation measures, where practical. Various attenuation measures have been developed to attenuate underwater piling noise to minimise exposure of marine fauna species during piling activities (ICF Jones & Stokes and Illingworth & Rodkin 2009). These measures include but not limited to: • Air bubble curtains. Air bubble curtains are designed to infuse the water column surrounding the pile with air bubbles, generating a bubble screen that attenuate the sound propagation from the pile. For a mid-sized steel pile as used in this Project (with a dimension greater than 24 inches but less than 48 inches), the previous experiment data indicates that an air bubble curtain will provide about 10 dB of noise reduction (ICF Jones & Stokes and Illingworth & Rodkin 2009) • Isolation casings. Isolation casings are hollow casing slightly larger in diameter than the pile to be driven. The casing is inserted into the water column and bottom substrate, and then dewatered so that the work area could be isolated from the surrounding water column in order to attenuate the sound propagation. Dewatered isolation casings generally can be expected to provide attenuation that is at least as great as the attenuation provided by air bubble curtains. • Cushion blocks. Cushion blocks consist of blocks of material atop a pile during piling to minimise the noise generated during impact hammering. Materials typically used for cushion blocks include wood, nylon and micarta blocks. The resulted noise reduction could be from a few dB to over 20 dB. This measure can be used in conjunction with air bubble curtains or isolated casings as above.
14. Waste	
14.1 (Section 14.6.1)	Waste produced by dredging and other vessels will be managed via contractual arrangements with GPC, and will meet requirements of the GPC EMS as well as the relevant waste management legislation and guidelines.
14.2 (Section 14.6.1)	Any waste fuel, oils and lubricants (including oily bilge water) generated by vessels during dredging works will be collected and managed by Nationwide Oil Pty Ltd as per DTMR's Port Procedures.
14.3 (Section 14.6.2)	Green waste generated during construction and operational management of the WB and WBE reclamation areas (i.e. vegetation cleared for construction and operational management, including grass clippings and other green waste) will be used for landscaping and site stabilisation within the WB and WBE reclamation areas.
14.4 (Section 14.6.3)	The solid waste generated from the reclamation construction site office will be managed by GPC and collected by a waste contractor and disposed of in accordance with the applicable legislation and policies.
14.5 (Section 14.6.3)	All waste areas will be kept tidy and all municipal waste will be placed in the appropriate receptacle. Sealed bins will be used to prevent wind, animals and rain from spreading litter.
14.6 (Section 14.6.3)	Solid waste will be temporarily stored onsite, in accordance with the relevant legislation and guidelines, and regularly collected by a licenced waste disposal contractor and, where recycling is not feasible, transferred to a licenced waste facility within the GRC area (e.g. Benaraby Landfill).

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
14.7 (Section 14.6.4)	Waste water generated by the dredger activities will be stored on the dredger, transferred to Auckland Point Wharf area for collection and then transported to GRC sewage treatment plant. Dredgers with on-board tertiary waste water treatment facilities will treat generated waste water within these facilities.
14.8 (Section 14.6.4)	All sewage and greywater, generated as a result of the operation of the reclamation area construction compound and site office, will be temporarily stored onsite in accordance with the relevant waste management legislation and guidelines, and removed and transported to the GRC sewage treatment plant.
14.9 (Section 14.6.4)	In the event of an oil or fuel spill into marine and/or terrestrial environments, vessels will adhere to the requirements of the spill-clean procedure included in the DTMR *Guide for the prevention of ship-sourced pollution and for the safe transfer of bunkers in Queensland waters, 2016.* An Environmental Incident Report and Corrective Action Report will be completed within 24 hours of the incident occurring as per the requirements set out in the Project EMP.
14.10 (Section 14.6.5)	All vessels arriving at the Port of Gladstone are required to follow the DTMR's *Port Procedures and Information for Shipping, Port of Gladstone, 2017,* which details quarantine requirements.
14.11 (Section 14.6.5)	Upon arrival within the Port of Gladstone, all wastes, including quarantine waste, from the dredging vessels will be assembled for collection and disposal. Quarantine waste will be kept in sealed plastic bags on board until collection by a licenced contractor (DTMR 2018). Quarantined waste will be sterilised prior to disposal at a licenced facility.
14.12 (Section 14.6.6)	Where feasible the waste management hierarchy, as per the *Waste Reduction and Recycling Act 2011* will be implemented during the Project.
14.13 (Section 14.6.6)	**Hydrocarbons, oils and other lubricants (including oily bilge)** • Removal of solid and liquid waste to a licenced facility • Waste bulk oils will be stored on dredgers and directly transferred to existing Port wharves or via work boats • Powered Mobile Equipment (PME) will be suitable and rated for the task and kept in good working order • A PME preventative maintenance regime will be implemented • Temporary storage of hydrocarbons will occur in bunded areas that are appropriately sized for the application and capacity maintained (i.e. kept free of rain water) • Wash bilges with biodegradable degreasers or detergents and dispose of cleaning residue ashore • Use absorbents to mop up excess oil or fuel • Undertake checks and preventative maintenance of plant and equipment to minimise leaks and spills • Spill response procedures implemented and staff are suitably trained • Spill equipment (including hydrocarbon absorbent booms) is available and staff are familiar with its use

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
	• Regular maintenance of work areas, storage areas, transfer equipment and spill equipment • Call emergency services to assist with hazardous material spills • Appropriate handling of absorbent material (including absorbent booms) where these have been used to clean up spills.
14.14 (Section 14.6.6)	**Hazardous and potentially hazardous waste** • Maintain inventory and safety data sheets for hazardous substances • Tracking records to be kept when regulated waste is removed from the dredger or a GPC wharf facility. All regulated waste transported by licenced contractors and disposed at a licenced place. • Bring only the minimum quantity of substance required into the work areas • Store full and empty drums and/or containers in bunded areas • Collect empty drums for re-use or recycling • Waste not disposed of by burning • Hazardous substances handled and stored in a manner that prevents environmental harm • Any spills to be cleaned up as soon as practicable • Call emergency services to assist with hazardous material spills • Complaints or incidents to be reported to GPC.
14.15 (Section 14.6.6)	**Sewage/grey water** • Waste water from dredger and ablution facilities to be collected then transported to GRC sewage treatment plant • With the help of a licenced contractor determine the number of ablution facilities required at the site offices for the duration of the Project • Dredgers with tertiary treatment facilities will treat generated waste water on board.
14.16 (Section 14.6.6)	**Municipal and office waste (food waste, plastics and paper)** • Provide facilities for the appropriate separation and storage of waste. Adequate storage capacity to be maintained and no waste to remain at the completion of works • Ensure that waste is removed and disposed of by a licenced contractor on a regular basis to a licenced waste facility • Educate staff to recycle waste • All waste areas will be kept tidy and all municipal waste is to be placed in the appropriate receptacle • Use sealed bins to prevent wind, animals and rain from spreading litter • Waste is not to be disposed of in the marine environment or incinerated in vessels at sea

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
	• Ensure that bins/bags used on the dredgers to store waste are secure • Retrieve litter that does enter the water.
14.17 (Section 14.6.6)	**General building material** • Store waste separately to avoid contamination with other waste • Where possible reuse excess materials on site alternatively remove to recycling facility.
14.18 (Section 14.6.6)	**Dunnage and quarantine waste** • Waste not to be disposed of in the marine environment or incinerated in vessels at sea • Waste to be kept in sealed plastic bags on board until collection by a licensed contractor • Waste to be sterilised prior to disposal • Record the movement and quantities of regulated and quarantine wastes.
14.19 (Section 14.6.6)	**Green waste (grass clippings and landscaping)** • Green waste to be chipped and used onsite for landscaping.
14.20 (AEIS Chapter 14)	All waste generated in carrying out the activity will be lawfully reused, recycled or removed to a facility that can lawfully accept the waste. Incompatible wastes will not be mixed in the same container or waste storage area.
15. Transport	
15.1 (Section 15.4.6.8)	No over-dimensional vehicles that will affect the road network will be used as part of Project activities.
15.2 (Section 15.4.7)	General transport safety will be improved through implementing the following non-infrastructure mitigation measures: • Temporary reduction in the speed limit to improve gap acceptance for trucks entering and exiting the traffic stream to and from Landing Road • Variable message signage placed in advance of the intersection on the northern and southern approaches to the Landing Road/Guerassimoff Road to provide further warning of the temporary speed limit reduction and trucks turning.
15.3 (Section 15.4.7)	Further traffic counts will be undertaken closer to the commencement year, and the measures above will be reassessed to confirm suitability at that time.
15.4 (Section 15.4.7)	If the location of the Project bund wall material source/quarry changes during the detailed design phase (i.e. not all the bund wall material is sourced from the Targinnie/Yarwun quarry area), a reassessment of the Project potential impacts on the SCRs and local roads, including consultation with DTMR and GRC, will be undertaken.
15.5 (Section 15.6.5)	The dredging contractor will comply with the relevant requirements within the following documents:

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
	• *Standard for Commercial Marine Activities – Gladstone Region* (DTMR 2017a) and preparation and implementation of the approved Project Marine Execution Plan • *Port Procedures and Information for Shipping – Gladstone* (DTMR 2018) • *Transport Operations (Marine Safety) Regulation 2016* • Dredging EMP (refer AEIS Appendix F).
15.6 (AEIS Section 15.2)	A road safety, pavement condition and intersection performance assessment will be undertaken during the detailed design phase of the Project, and a mitigation proposal will be prepared prior to the commencement of significant Project traffic.
15.7 (AEIS Section 15.2)	A final road management plan will be prepared and provided to the Department of Transport and Main Roads for approval 6 months prior to the commencement of significant Project traffic only if State-controlled roads are used for haulage of outer bund wall material.
15.8 (AEIS Section 15.2)	A traffic impact assessment of the Project impacts on State-controlled roads and Council road network will be undertaken during the detailed design phase of the Project.
15.9 (AEIS Section 15.3)	If the WBE reclamation area bund walls are constructed at a rate greater than the existing approved GPC Ticor Quarry extraction rates, GPC in consultation with the Gladstone Regional Council will determine the maintenance and repair requirements during and post the Project construction period.
16. Aboriginal cultural heritage	
16.1 (Section 16.8.1)	Avoidance of cultural heritage sites will be a primary consideration in finalising the design of the WBE reclamation area, inclusive of the location and nature of related activities and infrastructure.
16.2 (Section 16.8.2)	Project activities will be designed to minimise the impact on recorded and potential cultural heritage sites. Wherever practicable, construction impacts will be minimised such that important cultural activities (e.g. fishing, knowledge transfer) can continue unabated within the Port Curtis area. To assist in achieving these objectives, consultation will continue between GPC and the PCCC in order to ensure that cultural considerations are incorporated into the Project detailed design. Ongoing consultation regarding Project activities that involve disturbance, modification or cumulative impacts to either the land surface or the marine areas will enable appropriate levels of input and ensure that appropriate mitigation programs (inclusive of monitoring programs incorporating Traditional Owner groups) are subsequently developed and implemented.
16.3 (Section 16.8.3)	Given the importance and cultural significance of the marine portions of the WBE reclamation area, GPC will utilise Traditional Owner groups to monitor the potential impacts of Project marine activities as part of implementing the Project EMP and Dredging EMP.

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
16.4 (Section 16.8.4)	During the design and construction of the WBE reclamation area, the footprint will not impinge on the coastal fringe and the existing buffer between the shoreline and proposed development area will be maintained. However, if the WBE reclamation area does result in direct and/or indirect impacts on the natural foreshore, a terrestrial cultural heritage assessment will be undertaken. The assessment will place a particular emphasis on mangrove stands, creeks and ephemeral creek lines, areas in proximity to creeks and ephemeral creek lines with associated riparian vegetation, and foreshore areas within the direct and/or indirect impact areas from the WBE reclamation area. Within the marine context, the initial seagrass meadows disturbance will be monitored by Traditional Owner groups as part of implementing the Project EMP and Dredging EMP.
16.5 (Section 16.8.4)	As there remains potential for further, as yet undocumented Aboriginal cultural material to be present (most likely stone artefacts) within the Project areas, GPC will implement the New Discoveries provision for incidental finds of Aboriginal cultural heritage found during Project activities provided in Section 10.2 of the Cultural Heritage Protocol (refer draft EIS Appendix M).
16.6 (Section 16.8.4)	Before works begin, GPC will use all reasonable endeavours to arrange for all persons (staff and/or contractors) who will be engaged in works and who are likely to have contact with Aboriginal cultural heritage to participate in a cultural heritage induction session. Among other things, these inductions will inform workers what archaeological material may look like and give them clear instructions on what to do if they find anything that could be cultural heritage material. These inductions will be jointly presented by GPC, a suitably qualified cultural heritage practitioner and/or a representative(s) from the PCCC.
17. Non-Aboriginal cultural heritage	
17.1 (Section 17.7)	Known shipwreck locations to be avoided by Project activities
17.2 (Section 17.7)	Prior to dredging activities commencing, undertake a thorough survey (e.g. remote sensing survey using multi-beam or side beam scanning sonar with magnetometer) of the areas to be dredged and engage a suitably qualified and experienced maritime archaeologist to interpret the resultant data to identify any potential shipwrecks for further investigation and management
17.3 (Section 17.7)	Ensure that all employees are suitably trained to identify cultural heritage sites or objects and report the finds to the Contractor's Environment Officer (CEnvO) and maintain a log of all employees who have undergone cultural heritage training
17.4 (Section 17.7)	Inform all employees of their obligations to notify the CEnvO of any cultural finds
17.5 (Section 17.7)	Develop an accidental cultural heritage discovery reporting process and form that includes a clear chain of custody in the report (e.g. details of the person/s who made the discovery, date of discovery, description of discovery, location of discovery, etc). The reporting process is to include roles and responsibility regarding the handling and reporting of cultural heritage discoveries.
17.6 (Section 17.7)	Engage an independent archaeologist for advice upon making a cultural heritage discovery
17.7 (Section 17.7)	Should an item or object of historical non-Aboriginal cultural heritage significance be found during Project activities the following measures will be adopted:

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
	• All work at the location of the potential find must cease and the CEnvO will be notified • The CEnvO will notify GPC's Environment Manager, who will undertake appropriate actions and provide management recommendations to the CEnvO • GPC's Environment Manager will notify the DES of any relevant finds in accordance with Section 89 of the Heritage Act.
18. Social impact assessment	
18.1 (Section 18.9.1)	A Project Liaison Person will be appointed for the duration of the Project activities to be the main and readily accessible single point of contact for affected parties, stakeholders and the wider community. The contact details will be made available through a Project website and prominently advertised.
18.2 (Section 18.9.1)	A Social Impact Management Plan will be prepared for the Project (refer AEIS Appendix J) and will include as a minimum: • A summary of the social impacts and affected stakeholders as identified through the SIA process • Describe GPC's impact management activities and commitments (mitigation strategies) to minimise negative social impacts and to enhance benefits for the community and other stakeholders • Describe the mechanisms to monitor the impacts to adjust mitigation strategies and Action Plans • Identify stakeholders to be included in the development and implementation of mitigation strategies throughout the life of the Project • Determine a timeframe for the development and implementation of the identified management strategies • Provide guidance to GPC's social performance activities.
18.3 (Section 18.9.1)	Prior to the commencement of the Project's construction works (or individual stages), a Communications Plan will be prepared and implemented. The purpose of the Communications Plan is to set out procedures detailing how communication with affected parties, stakeholders and the wider community, will occur throughout the pre-construction and construction phases of the Project. As a minimum, the Communications Plan will include: • Communication about the timing, duration and likely impacts of construction works (or stages) ensuring activities and engagement with the following sensitive receptors: – Facing Island residents' potentially affected by noise and vibration associated with Project activities – Commercial fisher groups and recreational fisher groups (including tourism operators) – Maritime users (such as small vessel operators, commercial fishing fleet, recreational fishers and tourist operators). Communication will include signage and advertising advising of restrictions and their period of applicability, including safety information for recreational boating around dredging vessels. – Users of the rock haulage routes (Targinnie/Yarwun community and local businesses) – Residents' potentially affected by significant landscape character changes associated with Project activities

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
	• A complaints and response process.
18.4 (Section 18.9.1)	Continue the SRG (and other groups where necessary) to minimise potential impacts during the Project's construction through awareness of Project activities and provide input into more detailed design and feedback on Project mitigation measures
18.5 (Section 18.9.1)	Continue ongoing engagement with Traditional Owners about their values and traditional fishing grounds. Engagement will be undertaken in accordance with the Cultural Heritage Protocol (refer draft EIS Appendix M). If an unknown item of tangible cultural heritage is uncovered during construction, work will cease until Traditional Owners are consulted as per the procedures set out in the Cultural Heritage Protocol.
18.6 (Section 18.9.1)	A Workforce Management Plan will be implemented as part of the SIMP to mitigate workforce influx and cumulative workforce influx impacts. This will be in place prior to Project construction works commencing and will be reviewed annually over the duration of the Project's construction activities.
18.7 (Section 18.9.1)	Adherence to mitigation measures identified in chapters for water quality, nature conservation and noise and vibration.
18.8 (Section 18.9.1)	Mitigation effectiveness will be monitored through complaints received, by maintaining a grievance register and reviewing on a monthly basis.
18.9 (AEIS Section 18.9.1)	A copy of the Social Impact Management Plan will be provided to the Department of Housing and Public Works.
18.10 (AEIS submission ID 3.04)	GPC will undertake further consultation with peak fishing bodies regarding potential impacts from the Project.
Workforce Management Plan	
18.11 (Section 18.9.2)	The Project construction workforce will be managed by adopting the following principles: **Workforce behaviour** • Adhere to relevant legislation for construction workers, including the *Work Health and Safety Act 2011*. • Develop a workforce code-of-conduct which outlines acceptable behaviour, standards for work performance and appropriate ways of interacting with the residents of Gladstone. • Implement the code-of-conduct by ensuring that this is included in all contract documentation as well as in training and induction programs before workers commence their employment. Ensure that abiding by the code-of-conduct is a condition of employment and a breach of the code could result in automatic dismissal. Proactive 'refresher' training will be undertaken at regular periods throughout the construction period to minimise the risk of breaches. **Workforce recruitment** • GPC will work with the appointed dredging contractor and the bund wall construction contractor to develop appropriate recruitment and training programs as relevant and in accordance with the appointed contractor's labour procurement policies. This will include identifying roles that can be filled by local workers, with a focus on recruitment and training opportunities for

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
	apprentices, trainees, Aboriginal and/or Torres Strait Islander peoples, women, unemployed or under employed people, secondary school students and graduates. • Utilise local and regional recruitment and training providers where possible and practical to meet vacant position requirements. **Accommodation planning** • GPC will work with local real estate agents, and residential dwelling and unit providers in the Gladstone area to secure long term accommodation for non-local Project employees • During the low and shoulder season, utilise the holiday accommodation market where possible and practical to meet any short term accommodation need for Project employees. **The local community** • Wherever possible and practical, procure personnel, goods and services locally to enhance benefits to the local economy. Prepare and implement a Local Industry Procurement and Participation Plan if not already developed. • Promote contribution to and connection with the local community. For example, developing a workforce sporting team and playing in local competitions can be a way of facilitating connections with the community.
19. Economics	
19.1 (Section 19.7)	In the lead-up to, and during dredging activities, GPC will continue to consult with its customers to inform them of upcoming activities and discuss any potential Project impacts on their operations
19.2 (Section 19.7)	In the lead-up to, and during dredging activities, GPC will continue to consult with local commercial fishing groups so that any issues associated with the dredging program and its interaction with commercial fishing can be identified and addressed early
19.3 (Section 19.7)	While GPC employees will be involved in the construction management of the Project, and potentially components of the establishment of the WBE reclamation area outer bund wall and BUF construction, other Project activities will not be GPC employed positions. GPC recognises it has a role to play in developing employment, training and supply opportunities for local people. As relevant, GPC will work with its contractors to develop local employment and training opportunities during construction, focusing on skills development for school leavers, women, Aboriginal people and unemployed/underemployed. During construction and maintenance, where relevant, GPC will also encourage the organisation and its contractors to develop strategies to assess capacity and cost-effectiveness of sourcing goods and services from the local, regional and wider State economy.
20. Hazard and risk	
20.1 (Section 20.5.1)	The Project activities will comply with regional Cyclone Warning procedures and the Cyclone Contingency Plan for vessels within the Port. A stockpile of armour material will be held at the Targinnie/Yarwun quarry, sufficient to cover any exposed core material at the WBE reclamation area if a cyclone were to approach Gladstone.

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
20.2 (Section 20.5.2.1)	Any storage of dangerous goods and substances within the WB and WBE reclamation areas compound will be within a designated secure area contained by a leachate bund as per best practice arrangements.
20.3 (Section 20.5.2.4)	The WB and WBE reclamation areas will be fully enclosed with appropriate fencing to restrict unauthorised access to the site. Site access will be through a principal secured entry point which will only be accessible by authorised site personnel. Any visitors to the site will be subject to strict admittance procedures.
20.4 (Section 20.6.1)	Designers must test and analyse the risk associated with their designs and provide sufficient information to end users. The designer may also be requested to provide current information about the design and relevant risks associated with its use.
20.5 (Section 20.6.2)	The Project will prepare a Cyclone Management Plan which will formulate procedures for cyclone preparedness for both landside and water based activities as well as response measures.
20.6 (Section 20.6.3)	The relevant contractor will prepare an EMP for the Project activities (i.e. construction of the WBE reclamation area bund walls, BUF, installation of navigational aids and maintenance activities on the reclamation areas) based on the plan provided in the Project EMP (refer AEIS Appendix G).
20.7 (Section 20.6.4)	The dredging contractor will prepare a DMP for the Project based on the plan provided in AEIS Appendix F. The DMP will contain management and mitigation measures to minimise the impact of the Project dredging activities on the environment and to achieve worker and public safety.
20.8 (Section 20.6.5)	An Emergency Response Plan for the Project will be developed as part of the Project's health and safety management system and the environmental management of the Project prior to commencement of the construction activities. The systems will be updated as works transition through the Project activity cycle or in response to legalisation or guidance change.
20.9 (Section 20.6.5)	Project safety inductions will be required to specify emergency response procedures for all Project activities with rescue and response procedures defined in addition to onsite first aid and infrastructure and processes.
20.10 (Section 20.6.5)	The WBE reclamation area construction contractor will prepare an emergency plan which will include procedures to address severe climatic events such as cyclones and minimise where practicable the potential environmental impacts from the reclamation works.
20.11 (Section 20.6.6)	A Health and Safety Management Plan will be prepared for the Project based on the GPC Health and Safety Policy. Work procedures will be implemented by GPC and contractors during all phases of the Project to enable safe and efficient work practices. Each work procedure will cover a different activity (e.g. stabilisation, refuelling, passenger transfer boat to vessel). These procedures will be reviewed regularly and updated to reflect any Project activity specific requirements which may arise. The procedures with align with the appropriate Australian Standards as per the Guide to Standards for Occupational Health and Safety (SAI Global 2014). All Project contractors will be required to meet the requirements of the Plan as minimum.

EIS commitment number (Project EIS or AEIS section reference)	EIS commitment
20.12 (AEIS Section 20.3)	Queensland Ambulance Service (QAS) Gladstone, Maritime Safety Queensland, Australian Maritime Safety Authority, Queensland Fire and Rescue Service and Queensland Police Service will be provided with a copy of the Emergency Response Plan. Additionally, QAS Gladstone will be notified ahead of any Emergency Response Plan testing or exercises to facilitate possible attendance.
Channel Duplication Draft Offset Strategy	
E4.1 (AEIS Appendix E4)	The Draft Offset Strategy will be finalised in consultation with relevant Commonwealth and Queensland Government agencies. The final Offset Strategy will include further detail pertaining to the quantity of offsets to be provided by the Project and include additional detail on how the offsets will be implemented and managed. The final Offset Strategy will include further detail pertaining to the previously provided WBDDP offsets, including their qualification of advance offset and their application to this Project, if relevant.
E4.2 (AEIS Appendix E4, Section 6)	Feasibility studies will occur to determine if the following proposed areas are suitable for the provision of direct offsets for Project impacts to shorebirds: • In conjunction with the outcomes of GPC's Sustainable Sediment Management Project, investigate the possibility to create additional shorebird habitat within Port Curtis through using maintenance dredged material through engineering design (i.e. using pre-dredged material (already dried material) and/or expand existing mud islands) • Investigate the opportunities for any potential direct offset habitat/land and undertake feasibility studies to determine if proposed areas are suitable • Investigate during the WBE reclamation area detail design the optimum habitat for shorebirds (i.e. required sediment and water depth) to enable the design to include a dedicated shorebird habitat within the WBE reclamation area • Investigate during the design of bund walls between the northern and southern WBE reclamation areas the opportunity to include intertidal mangroves (e.g. working with nature).

Acronyms and abbreviations

Acronym	Definition
µS/cm	microsiemens per centimetre
AASS	Actual acid sulfate soils
ABARE	Australian Bureau of Agricultural and Resource Economics
ACH Act	*Aboriginal Cultural Heritage Act 2003* (Qld)
AEIS	Additional information to the environmental impact statement
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment Conservation Council
AS/NZS	Australian Standard/New Zealand Standard
ASS	Acid sulfate soils
ASSMP	Acid sulfate soils management plan
ASX	Australian Stock Exchange
AWQG	Australian Water Quality Guideline
BOE	Barrels of oil equivalent
BOM	Board of management
BPAR	Benthic photosynthetic active radiation
BUF	barge unloading facility
BS	British Standard
CAMBA	China–Australia Migratory Bird Agreement
CASA	Civil Aviation Safety Authority
CDMP	coal dust management plan
CEMP	construction environment management plan
CHMP	cultural heritage management plan
CIS	community investment strategy
CLMP	the coal loss management program for coal transport and coal dust emissions
CLR	Contaminated Land Register
CO_2-e	carbon dioxide equivalent
CQRP	Central Queensland Regional Plan
CSD	Cutter suction dredge
CSEP	community stakeholder engagement plan
CSG	coal seam gas
CVIP	Clinton Vessel Interaction Project
dB(A)	decibels measured at the 'A' frequency weighting network
DAF	Department of Agriculture and Fisheries
DAWE	Australian Government Department of Agriculture Water and the Environment
DCS	Department of Community Safety
DEE	Australian Government Department of Environment and Energy

Acronym	Definition
DES	Department of Environment and Science
DIWA	Directory on Nationally Important Wetlands
DMP	Dredge Management Plan
DMPA	Dredge Material Placement Area
DMPOI	Dredge Management Plan Options Investigation
DOC	Department of Communities (Qld)
DOTE	Australian Government Department of the Environment
DSQ	Disability Services Queensland
DTMR	Department of Transport and Main Roads (Qld)
DTRP	Dredge Technical Reference Panel
EIS	Environmental impact statement
EMP	Environmental management plan
EMR	Environmental Management Register
EP	Equivalent persons
EP Act	*Environmental Protection Act 1994* (Qld)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EPC	exploration permit for coal
EPP	Environmental Protection Policy (water, air, waste, noise)
EPP (Air)	Environmental Protection (Air) Policy 2008
EPP (Noise)	Environmental Protection (Noise) Policy 2008
EPP (Water)	Environmental Protection (Water) Policy 2009
ERA	environmentally relevant activity
ERMP	Ecosystem Research and Monitoring Program
ESA	environmentally sensitive area
ESD	Ecologically sustainable development
FHA	Fish habitat area
FID	financial investment decision
FIFO	fly-in fly-out
FLPE	Fisherman's Landing Port Expansion project
FSL	full supply level
FTE	full-time equivalent
GBR Coast MP	Great Barrier Reef Coast Marine Park
GBRMP	Great Barrier Reef Marine Park
GBRWHA	Great Barrier Reef World Heritage Area
GHG	greenhouse gas
GPC	Gladstone Ports Corporation
GQAL	Good quality agricultural land
GRC	Gladstone Regional Council
GRP	Gross regional product
GSP	Gross state product
GTIA	Guide to Traffic Impact Assessment

Acronym	Definition
HES	High ecological significance
HEV	High ecological value
IAS	initial advice statement
ICLR	independent community liaison representative
JAG	Queensland Department of Justice and Attorney-General
JAMBA	Japan–Australia Migratory Bird Agreement
kPa	kilopascal
L_{A1}	those noise levels that are exceeded for one per cent of each one-hour sample period
L_{Aeq}	the average A-weighted sound pressure level of a continuous steady sound that has the same mean square sound pressure as a sound level that varies with time
L_{Amax}	the maximum average A-weighted sound pressure measured over a specified period of time
LAN,T	statistical descriptor for the variation of noise
max $L_{PZ,15\ min}$	the maximum value of the Z-weighted sound pressure level measured over 15 minutes
LAT	Lowest astronomical tide
LED	Light-emitting diode
LGA	local government authority
LIPP	local industry participation plan
LNG	liquified natural gas
LUP	Gladstone Ports Corporation Land Use Plan 2012
MCA	multi-criteria analysis
MCU	material change of use
mg/L	milligrams per litre of liquid/gaseous liquid
ML	megalitres
MLWM	mean low water mark
MNES	matters of national environmental significance
MOU	memorandum of understanding
MP Act	*Marine Parks Act 2004 (Qld)*
MRA	*Mineral Resources Act 1989* (Qld)
MSES	Matters of state environmental significance
MSQ	Maritime Safety Queensland
Mtpa	million tonnes per annum
NAGD	National Assessment Guide for Dredging 2009
NC Act	*Nature Conservation Act 1992* (Qld)
NEPC	National Environmental Protection Council
NEPM	national environment protection measure
NGA	National Greenhouse Accounts
NGAF	National Greenhouse Accounts Factors
NGOs	non-government organisations

Acronym	Definition
NT agreement	native title agreement
NVMP	Noise and vibration management plan
OUV	Outstanding Universal Value
PAR	Photosynthetic active radiation
PASS	Potential acid sulfate soils
PCCC	Port Curtis and Coral Coast Traditional Owners
P&G Act	*Petroleum and Gas Act 2004* (Qld)
PM_{10}	particulate matter with equivalent aerodynamic diameter less than 10μm
$PM_{2.5}$	particulate matter with equivalent aerodynamic diameter less than 2.5μm
PMMs	Priority management measures
Ports Act	*Sustainable Ports Development Act 2015*
PPV	peak particle velocity, which is a measure of ground vibration magnitude and is the maximum instantaneous particle velocity at a point during a given time interval in mms^{-1}
QASSIT	Queensland Acid Sulfate Soils Investigation Team
QASSMAC	Queensland Acid Sulfate Soils Management Advisory Committee
QGEOP	Queensland Government Environmental Offsets Policy
QH	Queensland Health
QWC	Queensland Water Commission
QWQG	*Queensland Water Quality Guidelines*
RE	regional ecosystem
REDD	Regional Ecosystem Description Database
Reef 2050	Reef 2050 Long-term Sustainability Plan
REMP	Receiving environmental management plan
RHM	Regional harbour master
RIA	road impact assessment
RMP	road-use management plan
ROKAMBA	Republic of Korea–Australia Migratory Bird Agreement
SCL	strategic cropping land
SDA	state development area
SDAP	State Development Assessment Provision
SDPWO Act	*State Development and Public Works Organisation Act 1971* (Qld)
SDWPO Regulation	State Development and Public Works Organisation Regulation (Qld)
SEIS	Supplementary information to the environmental impact statement
SMCA	Standards of Marine Construction with Gladstone Harbour
SIA	social impact assessment
SIAU	Social Impact Assessment Unit
SIMP	social impact management plan
SLA	statistical local area
SPA	*Sustainable Planning Act 2009* (Qld)
SPL	Strategic Port Land

Acronym	Definition
SPP	state planning policy
SRI	significant residual impact
TDS	total dissolved solids
TIA	Traffic impact assessment
TI Act	*Transport Infrastructure Act 1994*
TMP	traffic management plan
TOMSA	*Transport Operations (Maritime Safety) Act 1994*
TOR	terms of reference
TSP	total suspended particles
TSS	total suspended solids
USL	unallocated state land
WBDD	Western Basin Dredging and Disposal
WPA	Wetland Protection Area
WQO	water quality objectives
VM Act	*Vegetation Management Act 1999* (Qld)
VTS	vessel traffic service
WB	Western Basin
WBE	Western Basin Expansion
WMP	waste management plan
WRP	water resource plan

Glossary

Term	Definition
assessment manager	For an application for a development approval, means the assessment manager under the *Planning Act 2016* (Qld).
barge unloading facility	a 'U' shaped barge dock filledl required for unloading dredged material from the channel duplication works
bilateral agreement	The agreement between the Australian and Queensland governments that accredits the State of Queensland's EIS process. It allows the Commonwealth Minister for the Environment to rely on specified environmental impact assessment processes of the state of Queensland in assessing actions under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).
bund wall	A constructed retaining wall around the WBE reclamation areas and BUF to prevent inundation or breaches from a known source
Capesize vessels	Large-sized bulk carriers and tankers typically above 100,000 deadweight tonnage
capital dredging	A one-off removal of sediment to expand the shipping channel
construction areas	The construction worksites, construction car parks, and any areas licensed for construction or on which construction works are carried out.
controlled action	A proposed action that is likely to have a significant impact on a matter of national environmental significance; the environment of Commonwealth land (even if taken outside Commonwealth land); or the environment anywhere in the world (if the action is undertaken by the Commonwealth). Controlled actions must be approved under the controlling provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).
controlling provision	The matters of national environmental significance, under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth), that the proposed action may have a significant impact on.
coordinated project	A project declared as a ' coordinated project' under section 26 of the SDPWO Act. Formerly referred to as a 'significant project'.
Coordinator-General	The corporation sole constituted under section 8A of the *State Development and Public Works Organisation Act 1938* and preserved, continued in existence and constituted under section 8 of the SDPWO Act.
EIS	Refers to the draft EIS and revised draft EIS documents collectively. However, this term is not used when necessary to compare draft EIS and revised draft EIS information
environment	As defined in Schedule 2 of the SDPWO Act, includes: a) ecosystems and their constituent parts, including people and communities b) all natural and physical resources c) the qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned in paragraphs (a) to (c).
environmentally relevant activity (ERA)	An activity that has the potential to release contaminants into the environment. Environmentally relevant activities are defined in Part 3, section 18 of the *Environmental Protection Act 1994* (Qld).

imposed condition	A condition imposed by the Queensland Coordinator-General under section 54B of the SDPWO Act. The Coordinator-General may nominate an entity that is to have jurisdiction for the condition.
initial advice statement (IAS)	A scoping document, prepared by a proponent, that the Coordinator-General considers in declaring a coordinated project under Part 4 of the SDPWO Act. An IAS provides information about: • the proposed development • the current environment in the vicinity of the proposed project location • the anticipated effects of the proposed development on the existing environment • possible measures to mitigate adverse effects.
matters of national environmental significance	The matters of national environmental significance protected under the *Environment Protection and Biodiversity Conservation Act 1999*. The eight matters are: a) world heritage properties b) national heritage places c) wetlands of international importance (listed under the Ramsar Convention) d) listed threatened species and ecological communities e) migratory species protected under international agreements f) Commonwealth marine areas g) the Great Barrier Reef Marine Park h) nuclear actions (including uranium mines).
mining activity	As defined in section 110 of the EP Act
nominated entity (for an imposed condition for undertaking a project)	An entity nominated for the condition, under section 54B(3) of the SDPWO Act.
Port of Gladstone	The area defined by the Port of Gladstone Port Limits together with adjoining islands and landside areas, including reclamation areas, that support existing or consented industrial developments or are proposed to cater for future port-related industrial activities and supporting infrastructure
properly made submission (for an EIS or a proposed change to a project)	Defined under Schedule 2 of the SDPWO Act as a submission that: a) is made to the Coordinator-General in writing b) is received on or before the last day of the submission period c) is signed by each person who made the submission d) states the name and address of each person who made the submission e) states the grounds of the submission and the facts and circumstances relied on in support of the grounds.
proponent	The entity or person who proposes a coordinated project. It includes a person who, under an agreement or other arrangement with the person who is the existing proponent of the project, later proposes the project.
reclamation area	The reclamation of land under tidal water means the raising of land above the high-water mark by carrying out works, including dredging and dredged material placement
Significant project	A project declared (prior to 21 December 2012) as a 'significant project' under section 26 of the SDPWO Act. Projects declared after 21 December 2012 are referred to as ‘coordinated projects’.
stated condition	Conditions stated (but not enforced by) the Coordinator-General under sections 39, 45, 47C, 49, 49B and 49E of the SDPWO Act. The Coordinator-General may state conditions that must be attached to a: • development approval under the Sustainable Planning Act 2009

	• proposed mining lease under the Mineral Resources Act 1989 • draft environmental authority (mining lease) under Chapter 5 of the Environmental Protection Act 1994 (EPA) • proposed petroleum lease, pipeline licence or petroleum facility licence under the Petroleum and Gas (Production and Safety) Act 2004 • non-code compliant environmental authority (petroleum activities) under Chapter 4A of the EPA.
the project	Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project
the proponent	Gladstone Ports Corporation Limited
WBE reclamation areas	Two new reclamation areas to contain the dredged material from the channel duplication works
works	Defined under the SDPWO Act as the whole and every part of any work, project, service, utility, undertaking or function that: a) the Crown, the Coordinator-General or other person or body who represents the Crown, or any local body is or may be authorised under any Act to undertake, or b) is or has been (before or after the date of commencement of this Act) undertaken by the Crown, the Coordinator-General or other person or body who represents the Crown, or any local body under any Act, or c) is included or is proposed to be included by the Coordinator-General as works in a program of works, or that is classified by the holder of the office of Coordinator-General as works.

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