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6 Sediment quality

6.1 Chapter content

The Project impact assessment for sediment quality was provided in Chapter 6 of the Project EIS.

This chapter provides additional information to address the submissions received during the statutory public display period of the Project EIS. The key issues raised from the Project EIS submission process relevant to the sediment quality assessment are summarised Table 6.1.

Table 6.1 Summary of submission issues received in relation to the Project EIS sediment quality chapter

Submitter ID number (refer Appendix A)	Summary of submission issue raised	Project EIS section (public notification version)	AEIS section containing information to address submission comments	Complete replacement section for Project EIS	Supplements the Project EIS information
12.13	Requirement to undertake additional sediment sampling and analysis prior to Project dredging	Section 6.5.2	Section 6.2		✓
12.14	Describe the concentration of contaminants in material to be dredged in accordance with the procedures outlined in the NAGD	Section 6.5.2	Section 6.3		✓
12.15	Ensure the inclusion of manganese monitoring in monitoring plans for tailwater and tailwater receiving waters	Section 6.5.2.1	Appendix H	✓	
12.04	Potential impacts and risk assessment rating tables in each draft EIS chapter should be amended to include effective mitigation measures to assist with their interpretation	Section 6.8.2	Section 6.4	✓	

6.2 Additional sediment sampling and analysis

This section supplements the Project EIS Section 6.4.3 (sediment investigation methodology).

Sample validity periods for dredging activities is defined in the National Assessment Guidelines for Dredging 2009 (NAGD) as a period of 5 years (Commonwealth of Australia 2009). NAGD requires materials to be dredged to be sampled to the depth where there is potential for anthropogenic influence, which in the case of the Port of Gladstone is 0.28m below the seabed (refer Vicente-Beckett et al. (2006)).

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 (i.e. 0.28m). This commitment has been included in AEIS Appendix I.

6.3 Concentration of contaminants in material to be dredged

This section supplements the Project EIS Section 6.5.2 (sediment).

NAGD requires sampling (and analysis of the samples for potential contaminants of concern) of materials to a depth where there is potential for anthropogenic influence (refer NAGD, page 58, paragraph 1 below):

Contaminants may extend throughout the seabed layer of recent marine silts or sands, although they rarely penetrate far into the underlying, undisturbed geological materials, especially if these are clay or rock (except in rare cases, such as where contamination has been carried there via groundwater from an adjacent contaminated land site). The sampling program must, therefore, aim to sample the full thickness of potentially contaminated sediment to be dredged. (Commonwealth of Australia 2009).

Vicente-Beckett et al. (2006) demonstrated that anthropogenic influenced sediments are likely to only occur in the top 0.28m in the Port of Gladstone (refer Project EIS Section 6.4.2). This is due to the relatively short period of industrial activity in Gladstone (in relation to other ports), the high velocity of currents in the water within the harbour and the low occurrence of industrial releases into the harbour.

Sampling to a depth of 0.28m has been achieved by the Project investigations at all locations (refer Project EIS Section 6.4.3.3 (sample collection) and Project EIS Appendix E4 (sampling and analysis plan implementation report (area to be dredged))).

Data to the full depth of dredging activities is only required for physical properties to assess potential impacts associated with turbidity (refer NAGD, page 60, final paragraph):

Data will also be required on the physical properties of the full depth of sediment, including the natural geological materials, in order to assess turbidity impacts and the behaviour of the dredged material, post-disposal. This data could generally be obtained from the geotechnical samples taken for dredging planning. (Commonwealth of Australia 2009).

Physical property data of the Project material to be dredged has been obtained from geotechnical sampling (as per NAGD recommendations) (refer Project EIS Section 5.4.2.3 (geotechnical investigation)) and Project EIS Appendix E1 (Gatcombe and Golding Cutting Channel Duplication Project final geotechnical report) and Project EIS Appendix E3 (geotechnical investigation factual report (dredger access channel and transfer location)).

The sediments to dredged in the Project sampling locations are natural material which may contain naturally occurring elevated metal concentrations (e.g. Mn, Ni). However, these metals are present in the natural material as a result of natural composition of the sediment parent rock material. Adopting the *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (NEPM) 'added risk approach', any concentrations of metals/metalloids identified in the sediment (below the potentially anthropogenically influenced layer of 0.28m) will not have an adverse effect on the surrounding ecosystems.

Project risks to environmental values from anthropogenic organic and inorganic chemicals in the Port during Project dredging and from the licenced tailwater discharges have been assessed and will be managed, through the following:

- Geochemical sampling and assessment of contaminants undertaken in the top 0.28m at every sampling location

- Geochemical results compared against NAGD guidance for offshore disposal in a marine environment, as well as onshore beneficial reuse in a terrestrial environment through comparison against NEPM screening criteria. Sediment is suitable for both offshore disposal and onshore terrestrial beneficial reuse.
- The sediments to dredged under the Project sampling locations (i.e. below the borehole refusal depth) are natural material which may contain naturally occurring elevated metal concentrations (e.g. Mn, Ni). However, these metals are present in the natural material as a result of the sediment parent rock material (e.g. the average abundance of manganese in Australian soils is 850mg/kg (AusIMM 2011)). Adopting the NEPM 'added risk approach', any concentrations of metals/metalloids identified in the sediment (below the potentially anthropogenically influenced layer of 0.28m) will not have an adverse effect on the surrounding ecosystems.
- Water quality monitoring data from both DES and GPC as part of the Western Basin Dredging and Disposal Project (WBDDP) indicates metals/metalloids are predominantly associated with sediments (on average 62% are either adhered to sediment or form part of the matrix) and are stable (i.e. unlikely to be made available within the water column)
- Water quality monitoring undertaken within the Western Basin reclamation area during the WBDDP dewatering process was always below the metal water quality limits prior to licenced discharges into the Port
- Project Dredging EMP and Environmental Monitoring Procedure (refer AEIS Appendices F and H, respectively) will be implemented to manage dredging turbidity and water quality impacts of the Project
- Project Environmental Monitoring Procedure will be implemented to manage dewatering impacts within the Western Basin and WBE reclamation areas, including licenced metal water quality discharge limits (refer AEIS Appendix H).

6.4 Risk assessment summary

This section replaces the Project EIS Section 6.8.2 (summary of risk assessment). The risk assessment methodology is provided in Section 6.8.1 of the Project EIS.

The implementation of mitigation measures (refer Section 6.7 of the Project EIS) will result in the potential impacts being generally assessed as a low risk.

AEIS Appendix F (Dredging EMP) and AEIS Appendix G (Project EMP) provide a range of mitigation measures to reduce the potential sediment quality impacts of the Project. As part of the risk assessment the management plans and associated mitigation measures below have been applied to determine the post mitigation HRG shown in Table 6.2.

- Dredging EMP (refer AEIS Appendix F)
 - Air quality management plan (refer Section 9.2)
 - Vegetation management plan (refer Section 9.4)
 - Water quality management plan (refer Section 9.10)
- Project EMP (refer AEIS Appendix G)
 - Air quality management plan (refer Section 8.2)
 - Vegetation management plan (refer Section 8.6)
 - Water quality management plan (refer Section 8.10)

The potential sediment quality impacts risk assessment is summarised in Table 6.2.

Table 6.2 Potential sediment quality impacts and risk assessment ratings

Potential impact	Project phase					Preliminary HRG			Post mitigation HRG		
	Reclamation area and BUF establishment	Dredging	Navigational aids	Demobilisation	Maintenance	Likelihood	Consequence	HRG	Likelihood	Consequence	HRG
Resuspension of sediment and mobilisation of contaminants during bund wall and BUF construction											
<ul style="list-style-type: none"> Contamination of marine water Toxicity to marine and/or intertidal flora and fauna Public health risks 	✓					Unlikely	Low	Low	Unlikely	Low	Low
Resuspension of sediment and mobilisation of contaminants during dredging activities											
<ul style="list-style-type: none"> Contamination of marine water Toxicity to marine and/or intertidal flora and fauna Public health risks 		✓	✓			Likely	Low	Medium	Unlikely	Low	Low
Resuspension of sediment and mobilisation of contaminants during unloading and placement of dredged materials											
<ul style="list-style-type: none"> Contamination of marine water Toxicity to marine and/or intertidal flora and fauna Increased algal blooms Public health risks 		✓				Likely	Low	Medium	Unlikely	Low	Low
Dewatering of reclamation area											
<ul style="list-style-type: none"> Contamination of marine water Toxicity to marine and/or intertidal flora and fauna Increased algal blooms Public health risks 		✓			✓	Likely	Low	Medium	Unlikely	Low	Low

Potential impact	Project phase					Preliminary HRG			Post mitigation HRG		
	Reclamation area and BUF establishment	Dredging	Navigational aids	Demobilisation	Maintenance	Likelihood	Consequence	HRG	Likelihood	Consequence	HRG
Exposure during stabilisation and maintenance activities of the reclamation area											
<ul style="list-style-type: none"> Health risks to construction workers Public health risks Odours 					✓	Possible	Negligible	Low	Unlikely	Negligible	Low