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20 Hazard and risk

20.1 Chapter content

The Project impact assessment for hazard and risk was provided in Chapter 20 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 hazard and risk assessment are summarised Table 20.1.

Table 20.1 Summary of submission issues received in relation to the Project EIS hazard and risk assessment 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 |
|--|--|---|--|--|---|
| 12.93 | Chapter 11 to include reference to all climate change discussions included in other EIS chapters (e.g. Chapter 20 (hazard and risk)) | Section 20.7.2 | Section 20.2 | ✓ | |
| 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 20.7.2 | Section 20.2 | ✓ | |
| 1.01 7.01 | Provide the Queensland Ambulance Service (QAS) with a copy of the Emergency Response Plan | Section 20.6.5 | Section 20.3 | | ✓ |
| | | Appendix Q4 | Appendix I | ✓ | |

20.2 Risk assessment

This section replaces the Project EIS Section 20.7 (risk assessment).

20.2.1 Methodology

To assess and appropriately manage the hazards and risks discussed in this section, a risk assessment process has been implemented (herein referred to as 'risk assessment'). The risk assessment methodology adopted is based on principles outlined in the:

- AS/NZS ISO 31000:2009 Risk management – Principles and guidelines
- HB 203:2012 Handbook: Managing environment-related risk.

The risk assessment identifies and assesses the hazards (natural and human/technological) and health and safety risks to and from Project for the establishment of the WBE reclamation area and BUF, dredging activities, installing navigational aids and maintenance activities on the WB and WBE reclamation areas.

The purpose of this risk assessment is to identify potential hazard, health and safety impacts to prioritise environmental management actions and mitigation measures, and to inform the Project decision making process.

The risk management framework incorporates the Australian/New Zealand Standard for Risk Management (AS/NZS 4360:2004) and contains quantitative scales to define the **likelihood** of the potential impact occurrence and the **consequence** of the potential impact should it occur.

An overview of the interaction between Project activities (drivers/stressors), sensitive values/receptors and the risk impact assessment process is provided in Figure 20.1.

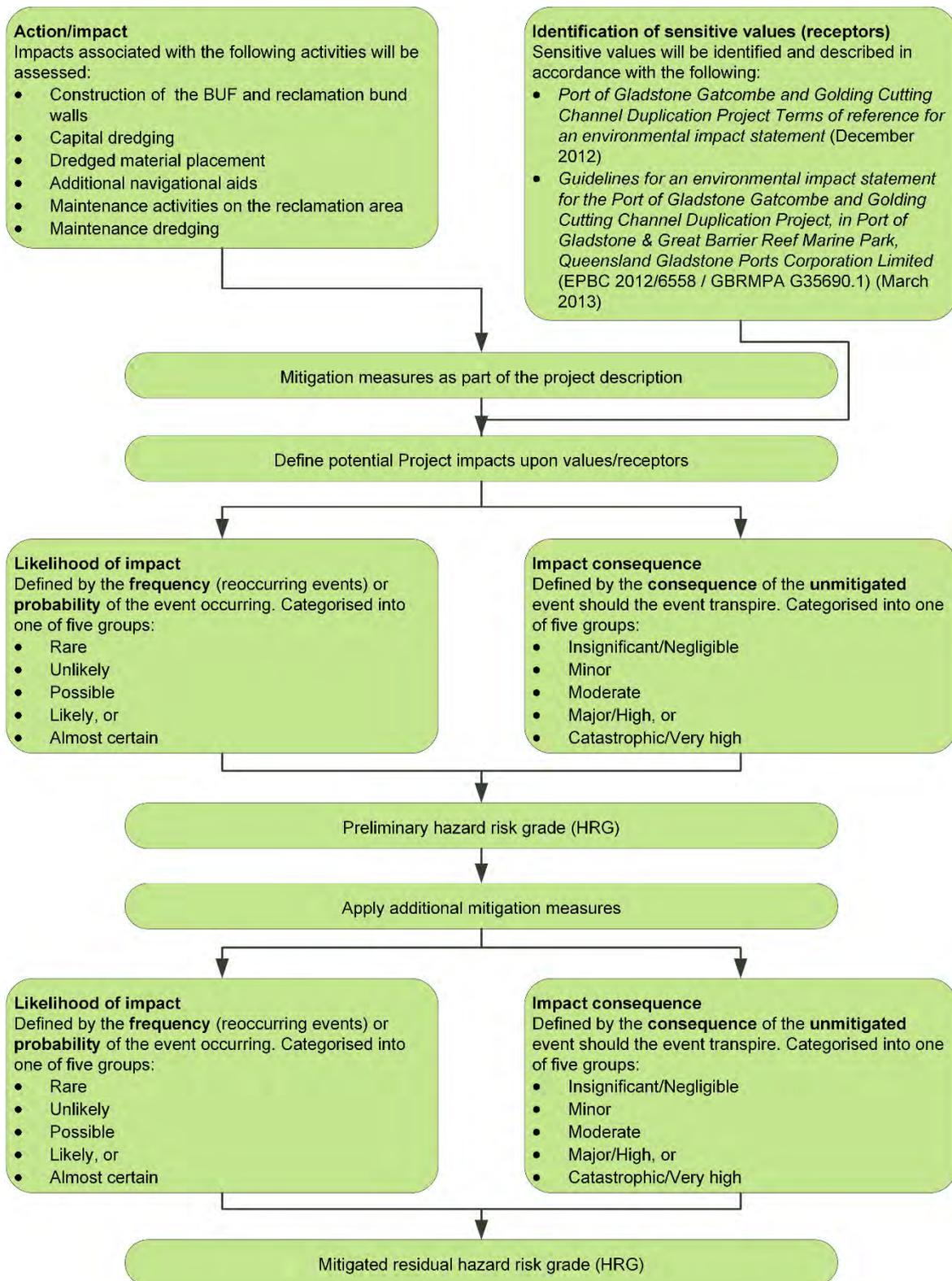


Figure 20.1 Risk assessment framework

Criteria used to rank the **likelihood** and **consequence** of potential impacts are provided in Table 20.2 and Table 20.3, respectively.

Table 20.2 Environmental (ecosystem), public perception and financial consequence category definitions (adapted from GBRMPA 2009)

| Description | Definition/quantification ¹ | | |
|----------------------------|--|--|---|
| | Environmental* | Public perception | Financial |
| Negligible (Insignificant) | No impact or, if impact is present, then not to an extent that would draw concern from a reasonable person No impact on the overall condition of the ecosystem | No media attention | Financial losses up to \$500,000 |
| Low (Minor) | Impact is present but not to the extent that it would impair the overall condition of the ecosystem, sensitive population or community in the long term | Individual complaints | Financial loss from \$500,001 to \$5 million |
| Moderate | Impact is present at either a local or wider level Recovery periods of 5 to 10 years likely | Negative regional media attention and region group campaign | Financial loss from \$6 million to \$50 million |
| High (Major) | Impact is significant at either a local or wider level or to a sensitive population or community Recovery periods of 10 to 20 years are likely | Negative national media attention and national campaign | Financial loss from \$51 million to \$100 million |
| Very high (Catastrophic) | Impact is clearly affecting the nature of the ecosystem over a wide area or impact is catastrophic and possibly irreversible over a small area or to a sensitive population or community Recovery periods of greater than 21 years likely or condition of an affected part of the ecosystem irretrievably compromised | Negative and extensive national media attention and national campaigns | Financial loss in excess of \$100 million |

Table notes:

1 Quantification of impacts should use the impact with the greatest magnitude in order to determine the consequence category

* For Matters of National Environmental Significance (MNES) protected under the provisions of the EPBC Act the *Matters of National Environmental Significance – Significant Impact Guidelines 1.1 – Environmental Protection and Biodiversity Conservation Act 1999* (DoE 2013) are to be used to determine the consequence category

Table 20.3 Likelihood category definitions (adapted from GBRMPA 2009)

| Description | Frequency | Probability |
|----------------|--|-----------------------------|
| Rare | Expected to occur once or more over a timeframe greater than 101 years | 0-5% chance of occurring |
| Unlikely | Expected to occur once or more in the period of 11 to 100 years | 6-30% chance of occurring |
| Possible | Expected to occur once or more in the period of 1 to 10 years | 31-70% chance of occurring |
| Likely | Expected to occur once or many times in a year (e.g. 1 to 250 days per year) | 71-95% chance of occurring |
| Almost certain | Expected to occur more or less continuously throughout a year (e.g. more than 250 days per year) | 96-100% chance of occurring |

Once the likelihood and the consequence has been defined, determination of the HRG of the potential hazard will be determined through the use of a five by five matrix (refer Table 20.4).

Table 20.4 Hazard risk assessment matrix (adapted from GBRMPA 2009)

| Likelihood | Consequence rating | | | | |
|----------------|----------------------------|-------------|----------|--------------|--------------------------|
| | Negligible (insignificant) | Low (minor) | Moderate | High (major) | Very high (catastrophic) |
| Rare | Low | Low | Medium | Medium | Medium |
| Unlikely | Low | Low | Medium | Medium | High |
| Possible | Low | Medium | High | High | Extreme |
| Likely | Medium | Medium | High | High | Extreme |
| Almost certain | Medium | Medium | High | Extreme | Extreme |

Table note:

Hazard risk categories identified in Table 20.4 are defined in Table 20.5

Table 20.5 Risk definitions and actions associated with hazard risk categories (adapted from GBRMPA 2009)

| Hazard risk category | Hazard risk grade definition |
|----------------------|---|
| Low | These risks should be recorded, monitored and controlled. Activities with unmitigated environmental risks that are graded above this level should be avoided. |
| Medium | Mitigation actions to reduce the likelihood and consequences to be identified and appropriate actions (if possible) to be identified and implemented. |
| High | If uncontrolled, a risk event at this level may have a significant residual adverse impact on MNES, MSES, GBRWHA and/or social/cultural heritage values. Mitigating actions need to be very reliable and should be approved and monitored in an ongoing manner. |
| Extreme | Activities with unmitigated risks at this level should be avoided. Nature and scale of the significant residual adverse impact is wide spread across a number of MNES and GBRWHA values. |

20.2.2 Summary of risk assessment

The risk assessment framework developed for the Project was applied to the potential impacts of hazard, health and safety on construction and maintenance activities. A summary of the risk assessment is provided in Table 20.4. In general, the potential impacts identified can be managed through a combination of design mitigation measures for natural hazard events and the implementation of the Project EMP, Dredging EMP, a Cyclone Management Plan as well as a Project Health and Safety Plan and an Emergency Response Plan.

The Dredging EMP (refer AEIS Appendix F) and the Project EMP (refer AEIS Appendix G) provide a range of mitigation measures to reduce the potential hazard and risk 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 20.6.

- Dredging EMP (refer AEIS Appendix F)
 - General environmental management measures (refer Section 8)
 - Air Quality Management Plan (refer Section 9.2)
 - Fauna Management Plan (refer Section 9.3)
 - Vegetation Management Plan (refer Section 9.4)
 - Waste Management Plan (refer Section 9.9)
 - Water Quality Management Plan (refer Section 9.10)

- Project EMP (refer AEIS Appendix G)
 - Air Quality Management Plan (refer Section 8.2)
 - Fauna Management Plan (refer Section 8.5)
 - Vegetation Management Plan (refer Section 8.6)
 - Waste Management Plan (refer Section 8.9)
 - Water Quality Management Plan (refer Section 8.10).

Risk is the likelihood of disaster or hazard. This probability is implied to occur to an asset or a resource. In determining risk, mitigation measures could be implemented in order to reduce the likelihood of risk. The potential impact risk assessment is summarised in Table 20.6.

Table 20.6 Potential hazard and health and safety 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 |
| Extreme rainfall, exacerbated by climate change (including storm surge/flooding) | | | | | | | | | | | |
| Potential injury or death <ul style="list-style-type: none"> Falling from dredging vessel or other Project vessel; swept to sea from BUF, Western Basin or WBE reclamation areas Equipment failure Vehicle loss of control due to wet conditions | ✓ | ✓ | | ✓ | ✓ | Possible | High | High | Unlikely | High | Medium |
| Overload of stormwater management system, causes runoff and localised flooding | ✓ | | | | ✓ | Possible | Low | Medium | Unlikely | Low | Low |
| Damage to bund walls or BUF and movement of sediment leading to potential decrease in surrounding water quality, time delays due to additional dredging and clean up requirements including additional costs | ✓ | ✓ | | | ✓ | Possible | Moderate | High | Unlikely | Moderate | Medium |
| Increase in average and seasonal temperatures | | | | | | | | | | | |
| Damage of outer BUF and/or bund walls due to exceeding heat tolerances of construction materials | ✓ | | | | ✓ | Possible | Moderate | High | Unlikely | Low | Low |
| Instability of the final landform of the reclamation area and long term future land use outcomes | | | | | ✓ | Possible | Moderate | High | Unlikely | Low | Low |
| Increase in average and seasonal temperature profiles and decrease in annual rainfall | | | | | | | | | | | |
| Increased evaporation rates and annual rainfall leading to changes in the soil moisture profile resulting in instability and movement of the reclamation area | ✓ | | | | ✓ | Unlikely | Low | Low | 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 |
| Sea level rise | | | | | | | | | | | |
| Future inundation of the BUF and reclamation area, and not providing long term beneficial land use outcomes | ✓ | | | | ✓ | Possible | Low | Medium | Unlikely | Low | Low |
| Tropical storms and cyclones, increased intensity | | | | | | | | | | | |
| Potential injury or death – drowning from dredging vessel or swept to sea from the BUF, Western Basin or WBE reclamation areas | ✓ | ✓ | | ✓ | ✓ | Possible | High | High | Unlikely | High | Medium |
| Dredging vessels and/or other Project equipment incident potential injury or death or damage to equipment | ✓ | ✓ | ✓ | ✓ | ✓ | Possible | High | High | Unlikely | High | Medium |
| Damage of outer BUF and/or bund walls resulting in decrease in marine water quality | ✓ | ✓ | | | ✓ | Possible | Moderate | High | Unlikely | Moderate | Medium |
| Increased sediment load in the channel resulting in an increased requirement for maintenance dredging and associated costs | | | | | ✓ | Possible | Low | Medium | Unlikely | Low | Low |
| Tropical storms and cyclones, increased intensity and increase in sea level | | | | | | | | | | | |
| Damage to BUF and/or bund walls, and movement of sediment leading to potential decrease on surrounding water quality, time delays due to additional dredging and clean up requirements including additional costs | ✓ | ✓ | | | ✓ | Possible | Moderate | High | Unlikely | Moderate | Medium |
| Earthquake | | | | | | | | | | | |
| Damage to bund walls or BUF and movement of sediment leading to potential decrease on surrounding water quality, time delays due to additional dredging and clean up requirements including additional costs | ✓ | | | | ✓ | Unlikely | Moderate | Medium | Rare | Moderate | Medium |

| 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 |
| Bush fire | | | | | | | | | | | |
| Potential injury or death | ✓ | | | | | Unlikely | Low | Low | Rare | Low | Low |
| Hydrocarbons, including chemicals, fuels or other liquid spills | | | | | | | | | | | |
| <ul style="list-style-type: none"> ■ Contamination of soil and sediment through leaching ■ Contamination of water ■ Toxicity to marine and/or intertidal flora and fauna ■ Odour | ✓ | ✓ | ✓ | | ✓ | Likely | Moderate | High | Unlikely | Moderate | Medium |
| Vessel collision | | | | | | | | | | | |
| Third party vessel collides with dredger, barge, tug, dredging equipment, bund wall, BUF and/or reclamation area. Resulting in spill from dredger or barge: potential injury/fatality; time delays; increase in dredging and navigational aid installation costs; damage to GPC reputation | | ✓ | ✓ | | ✓ | Possible | High | High | Unlikely | High | Medium |
| Dredger pipeline leaking and/or breaking releasing dredged material during barge access channel dredging | | ✓ | | | ✓ | Possible | Moderate | High | Unlikely | Moderate | Medium |

20.3 Project Emergency Response Plan

As part of the Project, 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 Project Emergency Response Plan. Additionally, QAS Gladstone will be notified ahead of any Emergency Response Plan testing or exercises to facilitate possible attendance.

This Project commitment has been included in AEIS Appendix I.