7 IMPACT ASSESSMENT

7.1 RISK ASSESSMENT METHODOLOGY

The Risk Assessment methodology used to identify and rank the potential environmental impacts associated with the Harriet Point Dredging proposal is based on BHP Billiton's Risk Management Guidelines (BHPBIO 2008b). The identification and assessment of risk is embedded in BHPBIO's critical business processes and guides the implementation of activities to ensure consistency and comparability across all operations.

7.2 BACKGROUND

The overarching principles of sustainability and biodiversity have been applied to the Harriet Point Dredging proposal to ensure that it avoids, as far as practicable, hazards that could lead to potential environmental impacts. These principles form an integral part of the impact assessment approach outlined in this ERD and have been used to identify the preferred dredging method and material management approach.

As outlined in **Section 1** and **Figure 1.3**, a qualitative risk-based approach has been adopted to systematically determine the relevant environmental and social factors for the Harriet Point Dredging proposal. These factors have been identified through existing information, findings of investigative studies, consultation with the EPA and other stakeholders.

In order to determine the 'key' and 'other' relevant environmental factors, the inherent risk of each factor was assessed using BHP Billiton's risk assessment methodology to categorise the significance as either critical, major, moderate, minor or low. The key environmental factors were defined as those:

- Having a critical, major or moderate significance;
- Requiring a more detailed assessment; and
- Requiring a higher level of management measures and controls to ensure potential impacts are minimised.

The key environmental factors have been identified as:

- Marine water quality;
- Acid sulphate soils;
- Marine habitat disturbance (mangroves); and
- Land use.

Those factors not considered key, have been termed as other relevant environmental factors. Other environmental factors were defined as those:

- Having a minor or low significance;
- Requiring a less detailed assessment; and
- Requiring a lower level of management measures and controls to ensure impacts are minimised and in general can be managed via existing management controls established in the BHPBIO construction Environmental Management Plan.

The other relevant environmental factors have been identified as:

- Marine habitat disturbance (non-mangrove);
- Marine fauna;
- Marine pest species;
- Coastal processes;
- Terrestrial flora and fauna;
- Construction dust;
- Construction noise;

- Visual amenity;
- Indigenous Heritage;
- Recreation;
- Waste management; and
- Hydrocarbons and hazardous materials.

7.3 KEY & OTHER FACTORS – RISK ASSESSMENT PROCESS

A further risk assessment process was completed for these factors to determine the residual risk ranking following the implementation of relevant management measures. The process included the following:

- Setting the risk context, including objectives and the proposed activities;
- Identification of potential impacts associated with the relevant environmental factors;
- Determination of management measures for each of the identified potential impacts. Depending on the impact, these management measures were based on existing controls (e.g. the construction EMP) or were measures in addition to existing controls; and
- Assignment of a severity and likelihood factor for each potential impact to determine the residual risk rating (residual risk ranking = severity factor multiplied likelihood factor) and its significance as either low, minor, moderate, major or critical.

The severity factor (**Table 7.1)** is defined as a measure of the expected degree of gain, harm, injury or loss (impact) from the most severe event associated with a risk issue. The severity factory includes several impact types (e.g. health and safety, natural environment, social/cultural heritage, community/government/reputation/media and legal).

The likelihood factor (**Table 7.2**) is defined as a measure of the chance of an impact at that selected level of severity actually being incurred. The likelihood is assessed assuming reasonable effectiveness of existing and tested preventative management controls. For this ERD, the severity factor was assigned after the consideration of the proposed management measures.

Table 7.1 – Severity Factor

Severity Level	Impact Types						Severity Factor
	Financial Impact	Health and safety	Natural environment	Social/cultural heritage	Community / Govt /Reputation / Media	Legal	
7	> US$1 billion	> 500 fatalities or very serious irreversible injury to ▸5000 persons.	Very significant impact on highly valued species, habitat or eco system.	Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order.	Prolonged international condemnation.	Potential jail terms for executives and/or very high fines for company. Prolonged, multiple litigation.	1000
6	US$100 million – US$1 billion	>50 fatalities, or very serious irreversible injury to ▸500 persons.	Significant impact on highly valued species, habitat, or ecosystem.	Irreparable damage to highly valued items of cultural significance or breakdown of social order.	International multi-NGO and media condemnation.	Very significant fines and prosecutions. Multiple litigation.	300
5	US$10 million – US$100 million	Multiple fatalities, or significant irreversible effects to ▸50 persons.	Very serious, long-term environmental impairment of ecosystem function.	Very serious widespread social impacts. Irreparable damage to highly valued items.	Serious public or media outcry (international coverage).	Significant prosecution and fines. Very serious litigation, including class actions.	100
4	US$1 million – US$10 million	Single fatality and/or severe irreversible disability (▸30%) to one or more persons.	Serious medium term environmental effects.	On-going serious social issues. Significant damage to structures/ items of cultural significance.	Significant adverse national media/ public/ NGO attention.	Major breach of regulation. Major litigation.	30
3	US$100,000 – US$1 million	Moderate irreversible disability or impairment (<30%) to one or more persons.	Moderate, short-term effects but not affecting ecosystem function.	Ongoing social issues. Permanent damage to items of cultural significance.	Attention from media and/or heightened concern by local community. Criticism by NGOs.	Serious breach of regulation with investigation or report to authority with prosecution and/ or moderate fine possible.	10
2	US$10,000 – US$100,000	Objective but reversible disability requiring hospitalisation.	Minor effects on biological or physical environment.	Minor medium-term social impacts on local population. Mostly repairable.	Minor, adverse local public or media attention and complaints.	Minor legal issues, non-compliances and breaches of regulation.	3
1	< US$10,000	No medical treatment required.	Limited damage to minimal area of low significance.	Low-level repairable damage to commonplace structures.	Public concern restricted to local complaints.	Low-level legal issue.	1

Table 7.2 - Likelihood Factor

Study and Project Delivery Likelihood Factors	
Based on Company and Industry experience with similar Studies or projects, the event:	**Likelihood Factor**
Could be expected to occur more than once during the Study or Project Delivery	10
Could easily be incurred and has generally occurred in similar Studies or Projects	3
Incurred in a minority of similar Studies or Projects	1
Known to happen, but only rarely	0.3
Hasn't occurred in similar Studies or Projects, but could	0.1
Conceivable, but only in extreme circumstances	0.03

Each determined residual risk rating, was assigned a qualitative classification as either low, minor, moderate, major or critical as outlined in **Table 7.3** below.

Table 7.3 - Residual risk rating classification

Low
Minor
Moderate
Major
Critical

LIKELIHOOD	SEVERITY FACTOR							
		1	**3**	**10**	**30**	**100**	**300**	**1000**
	0.03	0.03	0.09	0.3	0.9	3	9	30
	0.1	0.1	0.3	1	3	10	30	100
	0.3	0.3	0.9	3	9	30	100	300
	1	1	3	10	30	100	300	1000
	3	3	9	30	90	300	900	3000
	10	10	30	100	300	1000	3000	10000

For each of the identified key and other relevant environmental factors **Sections 8** and **9** provide a discussion on the following:

- EPA objective;
- Potential impacts;
- Management measures; and
- Resulting residual risk rankings.

During the risk assessment process, to ensure the risks for each of the key factors was reduced to 'As Low as Reasonably Practicable' (ALARP), management plans were developed and are provided in **Appendices C, D, E and F**. The management measures applied to all environmental factors, have ensured that each of the residual risks has been reduced to ALARP.

In the case for the Harriet Point Dredging proposal, no environmental factors had a residual risk rating greater than 3 and are therefore considered relatively to have a relatively minor impact and can be managed with in the scope of the project (see **Table ES.3** for residual risk rankings for all environmental factors).