REPower

Ceres Wind Farm Project

Construction and Environmental Management Framework for the HDVC Marine Cable

14 June 2013

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1. Introduction

This Construction and Environmental Management Framework (CEMF) has been prepared to identify the environmental management and monitoring measures that will be implemented by REpower, ABB and any contractor(s) to ensure that the potential environmental impacts are managed during the construction of the marine cable across Gulf St Vincent.

This document has been developed by REpower to provide guidance to the contractor(s) and assurance to government agencies on how potential impacts will be avoided or mitigated during construction. A number of management plans will need to be developed to protect the environmental assets from construction impacts associated with drilling, trenching and vessels.

The environmental risks associated with the project will be managed through implementation of the CEMF which will guide the preparation of a Construction Environmental Management Plan by the contractor(s).

The CEMF also details REpower and ABB's environmental commitments to the cable installation project and the relevant legislation and guidelines that are relevant to the project.

1.1 Project description

The construction and installation of the cable across Gulf St Vincent is part of the Ceres Wind Farm project. The wind farm project would be located on the Yorke Peninsula, near the townships of Port Julia and Port Vincent, approximately 20 kilometres south-west of Ardrossan. The wind farm will be linked to the Adelaide power grid via approximately 60 kilometres of marine cable across Gulf St Vincent.

REpower has sought approval from the Development Assessment Commission under Section 49 of the *Development Act* 1993 as the proposed 199 wind turbines and associated infrastructure is key public infrastructure.

1.2 Purpose of this document

This CEMF has been developed for the marine cable component of the project and includes the land/ sea interface points at Port Julia and St Kilda where the land based issues may impact the marine environment.

Land based construction issues will be dealt with in the Construction and Environmental Management Plan for the wind farm to be prepared by the contractor(s) prior to construction commencing.

1.3 Existing environment

Gulf St Vincent is a large semi-enclosed embayment extending approximately 170 kilometres from Port Wakefield at the head to Kangaroo Island in the south. Gulf St Vincent is bordered by Yorke Peninsula on

the west and metropolitan Adelaide on the east. The waters of Gulf St Vincent are generally shallow with a mean depth of 21 m and a maximum depth of approximately 40 m in the central area.

To inform the development application a marine habitat survey was undertaken along the proposed cable alignment to describe the distribution of marine habitats and the presence of marine species. The marine habitats present within the survey area are dominated by seagrass communities that are widespread and common in the upper Gulf St Vincent.

Marine habitat surveys identified seagrass communities off both Port Julia and St Kilda. At Port Julia seagrass distribution was observed until the sand bank ended approximately 10 km offshore where water depth dropped significantly. At St Kilda seagrass distribution was observed to approximately 12 km offshore beyond a depth of 14 to 15 m where these particular seagrass species cease to exist due to the reduced light levels. The seafloor along the central section of cable alignment (up to 30 m deep) is dominated by filter feeding fauna, with razorfish, in particular, being very abundant.

The Coast Protection Board commissioned an assessment of the Section Bank in 2004 to establish a baseline and understand the condition of seagrass and mangrove communities in Outer Harbor[1]. The report identified that seagrass distribution at the Section Bank was in decline and in line with the metropolitan coast that there was little seagrass within approximately 1 km of the shore. Dieback and decline was also identified in mangrove communities based on aerial photography over the last 40 years. Sea level rise and the inability of mangroves to retreat due to coastal development were the key factors associated with their decline. The key impacts associated with dredging works on seagrass and mangrove communities were identified as turbidity (seagrasses) and wave action (mangroves).

At Port Julia and St Kilda there is no infrastructure along the coastline where the marine cable intersects with the proposed land cable.

At Port Julia the coastal cliffs meet the shoreline and whilst targeted geotechnical investigations are required to better understand the geology of the area, erosion movements in this area are considered to be minimal.

At St Kilda potential acid sulfate soils are likely to be present within the near shore tidal zone where the cable route proposes to pass through.

1.4 Legislative requirements

1.4.1 Development Application

A development application was lodged with the Development Assessment Commission (DAC) in January 2013. The public exhibition period commenced on 12 February and ended on 28 March 2013, however was subsequently extended until 18 April 2013.

REpower subsequently prepared a Response Document to formally respond to the DAC on matters raised during the public exhibition period. It is anticipated this report will be lodged with DAC in June 2013.

Based on the submission received from the EPA regarding the potential construction impacts associated with the marine cable, this Construction and Environmental Management Framework (CEMF) has been prepared to ensure that the potential environmental impacts are addressed. The framework provides further detail on the proposed construction methodology and the impacts associated with jet trenching and ploughing along the cable alignment.

[1] Natural Resources Services Pty Ltd (2004), *Section Bank, Outer Harbor: Baseline Monitoring Program to assess the potential impacts on seagrass and mangrove communities from the proposed sand dredging.*

DAC will consider the Response Document and prepare an Assessment Report, including a recommendation for the Minister's consideration on whether to approve the project, approve with conditions or refuse the project.

Following the Minister's consideration of the Assessment Report and other documentation, the Minister will make a decision on the final proposal and a Decision Notification will be provided to REpower. A Notice of the Decision will be notified in the Government Gazette, on the Department of Planning, Transport and Infrastructure (DPTI) website and to the appropriate media. There are no appeal rights against the Minister's decision.

1.4.2 Approval requirements

ABB was engaged by REpower to construct the marine cable and two converter stations. ABB will be required to obtain a number of approvals prior to commencing seabed investigations for the marine cable and its installation.

The key legislation relevant to the installation of the cable is outlined in Table 1 below.

Table 1.1 Relevant legislation to the CERES marine cable project

Act/Regulation/Policy	Relevance to the CERES Project	Approval requirements
Aboriginal Heritage Act 1988	If an Aboriginal site, object and/ or remains are found or needs to be disturbed during the project, REpower/ABB will undertake relevant actions according to the requirements made under the *Aboriginal Heritage Act 1988*. Intertidal and shallow water areas can commonly present heritage matters.	A cultural heritage management plan will need to be developed to manage the land/ coast interface of the proposed marine cable given the potential archaeological sensitivity in these areas. Consultation with the relevant Aboriginal groups and Aboriginal monitors present at sites identified as sensitive in terms of archaeological potential.
Adelaide Dolphin Sanctuary Act 2005	The Dolphin Sanctuary was established in 2005 to protect the dolphins in Port Adelaide River and Barker Inlet.	Barker Inlet is located within the Dolphin Sanctuary and measures to protect marine fauna are included in this framework.
Coast Protection Act 1972	The Act protects and conserves the coastline.	The CEMF includes measures to protect the cliff and intertidal zone during cable construction at the land/sea interface points.
Development Act 1993	Various proposed activities of construction of the Ceres Project require development approval under the *Development Act 1993*. Approval for the project is anticipated. Conditions of Consent will be communicated to the contractor(s) by REpower to be included in the Contractor(s) CEMP.	The conditions of approval will need to be adhered to.
Environment Protection and Biodiversity Conservation Act 1999	Actions that could have significant impacts on matters of national significance need referral to the Department of Sustainability, Environment, Water, Population and Communities. A referral for the project was lodged on 7 November 2012 and the project being determined a Not Controlled Action – Particular Manner decision, subject to a number of conditions being undertaken during project construction (Referral Number (2012/6612).	The project will be undertaken in accordance with the conditions of construction.
Environment Protection Act 1993	General Environmental Duty (as detailed in Part 4 (Section 25)) specifies that a person must not undertake an activity that pollutes, or might pollute, the environment unless the person takes all reasonable and practicable measures to prevent or minimise any resulting environmental harm. Generally, meeting the requirements of any Environment Protection Policy (under the *Environment Protection Act*) satisfies General Environmental Duty. Some commercial activities are of a size or type more likely to result in environmental harm; they are designated 'Prescribed Activities of	Authorisations to undertake prescribed activities of environmental significance will be obtained. This may include: ▪ ***Discharges to Marine Waters***: a prescribed activity as described in Schedule 1 (8)(7) of the Act as 'Discharges to Marine or Inland Water' where (a) the discharges raise the temperature of the receiving waters by more than 2 degrees Celsius at any time at a distance of 10 metres or more from the point of discharge or contain antibiotic or chemical water treatments; and (b) the total volume of the

Act/Regulation/Policy	Relevance to the CERES Project	Approval requirements
	Environmental Significance' and are listed in Schedule 1 of the *Environment Protection Act 1993*. Dredging is an activity listed under Schedule 1 and requires a Dredging and Earthworks Licence from the EPA. The method of jet trenching may constitute 'dredging' under Schedule 1 of the *Environment Protection Act 1993*, as that activity is described as 'removing solid matter from the bed of any marine waters or inland waters by any digging or suction apparatus, but excluding works carried out for the establishment of a visual aid to navigation and any lawful fishing or recreational activity'. The use of a plough would also constitute dredging.	discharges exceeds 50 kilolitres per day. ▪ ***Earthworks Drainage***: a prescribed activity as described in Schedule 1 (7)(6) of the Act as 'Earthworks Drainage' as the conduct of earthworks operations in the course of which more than 100 kilolitres of waste water containing suspended solids in a concentration exceeding 25 milligrams per litre is discharged directly or indirectly to marine waters or inland waters. ▪ ***Dredging***: a prescribed activity as described in Schedule 1(7)(4) of the Act as 'Dredging' as removing solid matter from the bed of any marine waters or inland waters by any digging or suction apparatus, but excluding works carried out for the establishment of a visual aid to navigation and any lawful fishing or recreational activity.
Environment Protection (Water Quality) Policy 2003	Construction activities must satisfy the requirements of this policy.	A Turbidity Monitoring Program will need to be developed in consultation with the EPA to manage potential water quality impacts during construction.
Environment Protection (Noise) Policy 2007	The General Environmental Duty provisions in Section 25 of the Act must be complied with by taking all reasonable and practicable measures to minimise environmental harm.	Consultation with EPA and construction noise at Port Julia and St Kilda must comply with requirements of this policy.
Environment Protection (Waste to Resources) Policy 2010)	Construction activities must aim to achieve sustainable waste management through the application of the waste management hierarchy.	The Construction and Environmental Management Plan will include a waste management plan including spoil disposal measures.
Fisheries Management Act 2007	The Act provides for the management of fishing activities to provide for the conservation, enhancement and management of fisheries in South Australian waters. The Act seeks to manage fishing and fish stocks to ensure the long-term sustainability of the industry.	The marine cable has the potential to impact marine habitats, commercial fishing and aquaculture, including prawn and marine scale fin fisheries. A marine exclusion area will be implemented during the construction period to ensure a separation distance is maintained for fishing trawlers.
Harbors and Navigation Act 1993	The project will require approval for any navigation safety issues such as approval for stationary investigation vessels (if over an extended period of time). A seabed licence will be required from DPTI to provide access over the water and seabed. The licence will be required for preliminary works, including soil sampling, or disturbance to the seabed.	A seabed licence from DPTI and approval for any navigation safety issues (e.g. markers/ buoys). A marine exclusion area will be implemented during the construction period to ensure the safe operation of marine activities. A Notice to Mariners will be a likely requirement of approval.
Native Vegetation Act 1991	Gulf St Vincent and the proposed cable corridor contain seagrasses which are classified as native vegetation under the *Native Vegetation Act*	Some clearance of seagrasses along the cable alignment will be required. Approval will need to be secured from the Native

Act/Regulation/Policy	Relevance to the CERES Project	Approval requirements
	1991. As the proposed development has been assessed as a Section 49 Crown Development Application under the *Development Act 1993*, this is likely to be assessed under Regulation 5(1)(d) of the *Native Vegetation Regulations 2003*. This Regulation encompasses clearance for the provision of infrastructure, and is likely to be applicable providing that all criteria under this Regulation are fulfilled and that a significant environmental benefit (SEB) is achieved to offset the clearance. The marine cable will involve some clearance of seagrass for drilling investigations and cable installation.	Vegetation Council for any clearance.
Natural Resources Management Act 2004	Promote sustainable and integrated management of the State's natural resources. Provides laws on water, land, animal and plant control. To avoid discharging into the marine waters, an evaporation/ sediment pond will be constructed at Port Julia and St Kilda to manage wastewater during drilling activities. Port Julia lies within the Northern and Yorke NRM Board and St Kilda is within the Adelaide and Mount Lofty Ranges NRM Board.	Guidance is included in the various management plans and must be addressed within the contractor(s) CEMP. ABB will need to liaise with the NRM Boards regarding approval requirements for an evaporation/ sediment pond at Port Julia and St Kilda during drilling activities.
Road Traffic Act 1961	The Act details traffic control devices, road closing provisions, vehicle standards, heavy vehicles etc. Traffic Management Plans are required to satisfy DPTI requirement in consultation with local council (District Council of Yorke Peninsula and City of Salisbury). These Traffic Management Plans are to be approved before construction to allow sufficient time for public notification of traffic change and disruption.	Traffic management plans to be prepared for Port Julia and St Kilda and approved by the relevant Council/ DPTI.

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2. Construction methodology

The wind farm will be connected to the Adelaide power grid via a high voltage direct current (HVDC) submarine cable across Gulf St Vincent.

The HVDC connection system will comprise 75.5 kilometres of cable as follows:

- 2.5 kilometres from operations compound to the coast at Port Julia, mainly across private land owned by landowners involved in the project.
- 61.6 kilometres across the Gulf St Vincent from Port Julia to St Kilda, to a nominal depth of 1 m.
- 11.4 kilometres from landfall at St Kilda to the proposed converter station at Parafield Gardens West and then to a grid connection point.

Whilst the land cable is not included in this framework it includes the land/ sea interface points at Port Julia and St Kilda where the land-based issues may impact the marine environment. Land based construction issues will be dealt with in the Construction and Environmental Management Plan for the wind farm to be prepared by the contractor(s) prior to construction commencing.

2.1 Marine cable

HVDC is a state-of-the-art power system designed to transmit power underground, under water and over long distances. Buried beneath the sea floor or underground, HVDC offers a number of environmental benefits, including ‘invisible’ power lines, neutral electromagnetic fields, oil-free cables and compact converter stations. In its simplest form, HVDC technology works by converting traditional AC power to DC form, transporting it via special cable and re-converting back into AC form.

Two HVDC light cables will be laid together (bundled) on the seabed between Port Julia and St Kilda allowing power generated from the wind farm to be transmitted and placed into the power grid system in metropolitan Adelaide. The cable will consist of a 125 mm diameter cable (subsea) and 109mm diameter cable (land) for connection to the converter stations. The marine cable will have a central core of aluminium (or copper) and a number of other sheaths and insulating layers around it. The cables will be trenched to suitable depth.

The marine cable differs to the onshore cable and will be jointed in transition pits located adjacent to Port Julia on the Yorke Peninsula and St Kilda on the eastern shore. No structures are required to connect to the joint bits above ground on completion of works.

Fifty-seven (57) per cent or 34.8 km of the marine route is in water depths of greater than 10 m and the maximum depth along the route is 25 m.

2.2 Project Schedule

Table 2.1 provides an overview of the different project phases, including planning, pre-construction and construction.

Table 2.1 Project phases

Documentation	Timeframe	Status
Planning		
Development Application	Lodged with DAC in January 2013	☑
Scope CEMP	Included in Development Application	☑
Construction and Environmental Management Framework for marine cable prepared to respond to EPA's request for further information on the construction methodology, potential impacts and environmental management measures	June 2013	Current stage
Detailed design of cable component	Late 2013	
Pre-construction		
Geotechnical – seabed survey and seabed sampling	Mid to late 2014	
Hazard identification and assessment	Mid to late 2014	
Burial protection assessment	Mid to late 2014	
Construction		
Contractor to prepare final Construction and Environmental Management Plan for wind farm	Prior to construction commencing – 2015	
Contractor to prepare final Construction and Environmental Management Plan for marine cable	Prior to construction commencing – 2015	

2.2.1 Route optimisation

Whilst the route alignment has been designed to minimise impacts to the marine environment, more detailed investigations are required prior to construction to confirm the construction methodology based on seabed characteristics and constraints (refer Table 2.2).

At Port Julia the even distribution of seagrass communities means that the shortest cable route is suitable to minimise impacts on seagrass communities.

At St Kilda the patchy distribution of seagrass may enable the cable route to be adjusted to minimise impacts on seagrass communities.

Table 2.2 Route optimisation sequence

Route optimisation sequence	Description of stage
Seabed survey	▪ Seabed surveying and seabed sampling ▪ Corridor width of 300-400m surveyed ▪ Identify areas of rocky substrate and seaward extent of limestone reefs at Port Julia

Route optimisation sequence	Description of stage
Route optimisation	▪ Within defined corridor ▪ Optimisation based on surveyed soil conditions – may result in some deviations from proposed pre-survey cable route but within offshore route corridor ▪ Avoid contacts/ gradients ▪ Avoid constraints – seagrasses, mangroves, fish breeding grounds
Risk assessment/ engineering	▪ Hazard identification and assessment e.g. location of rocks/ boulders ▪ Control measures prior and during construction
Cable load/ transport	▪ Manufactured at ABB's cable factory in Karlskrona, Sweden ▪ Pre-mobilise cable lay spread for transport and cable laying ▪ Locally mobilised trenching spread or trenching spread pre-mobilised on lay platform
Route preparation	▪ Route clearance (approx. 0.5m) using a grapnel to ensure clear of obstructions e.g. fishing nets, marine equipment , out of service cables ▪ Discussions with relevant authorities e.g. Dolphin Sanctuary, migratory bird season and marine operations commencement

2.2.2 Cable installation

Jet trenching is the preferred methodology for cable installation and is discussed in more detail in section 2.3.3.2. Blasting will not be used during cable installation. The installation methodology is proposed in advance of preliminary investigations and as such relies on assumptions regarding benthic/ sediment conditions. A summary of cable installation is provided in Table 2.3.

Based on the shallow water depths at St Kilda and Port Julia, a barge is proposed as the cable laying platform. Construction of the cable would commence at St Kilda with the barge being positioned as close as necessary to the HDD exit point offshore.

The cable-laying vessel can lay between 5–20 km (depending on substrate type) of cable a day and can operate day and night in accordance with any approval conditions.

Once the cable is laid on the seabed, it will be buried, either by jetting it into the seabed, or by using a special plough to create a trench under the cable. From a risk management perspective burial of the cable is desirable to protect the threat of damage from anchors and trawlers.

The target burial depth along the route is 1m into the seabed however the burial protection study will determine target cable burial depth along the route, as well as likely risks to the cable and the level of protection offered into the different sediments.

Table 2.3 Cable installation

Installation methodology	Port Julia						St Kilda	
	Transition bay	Shallow water	Seagrass colonies	Offshore	Seagrass colonies	Intertidal	Mangrove	Transition bay
HDD/ duct	1,200mm HD bore running from west of the hard packed road and car park for Port Julia observation point to 4m LAT						500m HDD bore running from behind the revetment adjacent to St Kilda to seaward of the mangroves	
Shore pull and/or float in			Surface lay of cable by float in		Surface lay of cable by combination of shore pull and float in			
Surface installation			Cable burial assumed not to be acceptable to authorities	Only where localised soil conditions are not suitable for vertical injector or dredge plough	Cable burial assumed not to be acceptable to authorities			
Cable lay and burial				Vertical injector or jet assisted plough. Nominal 1m depth of burial.				
Length	1.2km		9.3km	32km	18.5km		0.5km	
Approximate water depth	n/a	4m	4-10m	10-12m	12m	0m	0m	n/a
	← **Cable lay direction**							

2.2.2.1 Horizontal Directional Drilling

Horizontal directional drilling (HDD) will be used at the land/ sea interface points to facilitate construction of the cable and minimise environmental impact on the marine and inter-tidal environment. HDD will be used to install ducts, thus avoiding the need for excavation or trenching. The duct itself would probably be steel or polyethylene as it must have a degree of flexibility to follow the curved drill path.

Onshore to offshore drilling is proposed in order to allow better control and retention of drilling fluids at the HDD site. The drilling fluid is likely to be based on bentonite (a naturally occurring clay) which poses minimal risk to the environment.

St Kilda

The HDD will run from adjacent St Kilda for a distance of 500 m beneath the mangroves, either just above the intertidal zone or in the shallow waters of Barker Inlet. The length and profile of the drilling will be confirmed following site visits and detailed geotechnical investigations and designed to minimise environmental impact whilst avoiding stress on the drill pipe and ducting.

A 500 m bore running from behind the revetment adjacent to St Kilda would allow the HDD exit pit to be positioned seaward of the mangroves and ideally in the sand region prior to the commencement of seagrasses. From the HDD exit point, the cable will either be surface installed over the seagrass to the start of clear seabed and commencement of trenching or alternatively the 500 m point would be an intermediate HDD pit to enable a further HDD bore to be run from this point in the offshore direction.

The duct sections, typically 6-12 m in length would need to be assembled by welding prior to pulling through the bore. This assembly can be done either from a barge located near the exit pit to off-site and floated in as pre-assembled sections.

Whilst this approach will avoid the seagrasses and mangroves and minimise environmental impact in these sensitive areas there are a number of potential environmental impacts, including turbidity and smothering of seagrasses.

Port Julia

At Port Julia, HDD is proposed to route the cable from the proposed transit pit on the cliff top and immediately west of the hard packed road and car park (Port Julia observation point) to the base of the cliff and to a point sufficiently far offshore to avoid disturbance to the sensitive coastal environment and intertidal and sub-tidal reef (3 to 4 m). The cliff height at the Port Julia land/sea connection point is approximately 20 m.

2.2.2.2 Jet trenching

Jet trenching is envisaged for the majority of the 60 kilometre cable alignment and is considered the most viable means of achieving the target burial depth of 1m. The geotechnical survey as part of the preliminary investigations will confirm the expected soil conditions along the route.

Jet trenching involves pressurised water being injected below the seabed to fluidise the sediment, creating a trench typically 1–2 m in depth. The cable then sinks into the fluidised sediment trench under its own weight and the fluidised sediment settles out of the water column to bury the cable. The jet trencher would be expected to operate at a rate of approximately 100 m/hour.

Whilst jet trenching is an ideal tool for cable burial on sand of soft clays, it is not the ideal mechanism for firm to stiff clay or peat, soft rock or in harder rock and if such sediments are identified during the preliminary investigations a reassessment of trenching tool would be required or the contractor would need to make a decision regarding the acceptance of reduced burial at discrete locations along the route.

One potential impact associated with jet trenching is suspended soil generation. The pressurised water that is injected into the seabed is likely to cause the sediment to become fluidised and partially suspended in the water column.

A coastal process and hydrodynamic assessment of the proposed HVDC cable was undertaken by Water Technology (2012) to inform the development application. The report estimated that approximately 240 tonnes of suspended soils would be generated in the vicinity of Barker Inlet through the use of the jet trencher. Depending on whether the rate is 100m/hr to 200m/hr the total trenching time is estimated at between 50 and 100 hours respectively in the vicinity of Barker Inlet. The estimated volume of suspended sediment was based upon a conservative assumption of 5% particles finer than 0.06 mm. Particles greater than 0.0 6mm are classed as sands and do not stay in suspension for any significant length of time.

The key environmental issue of concern is the potential migration of suspended soils to Barker Inlet potentially smothering the pneumatophores of the grey mangroves.

2.2.2.3 Dredge plough

A dredge plough will be used where seagrass is present on the seabed to minimise the environmental impact. This method will be used for a length of approximately 12 km at St Kilda and 10 km at Port Julia and will result in relatively minor and temporary damage to the seagrass communities along the cable route.

Alternatively, following completion of the route optimisation ABB will undertake a risk assessment and make a decision regarding surface lay of cable at the St Kilda end to minimise impact to seagrass communities. The risk assessment would include a review of external threats (anchoring and fishing) and seabed currents.

2.2.3 Construction timing

Cable construction will take approximately 4 months (18 weeks). Preliminary investigations are likely to commence during 2014 with construction of the cable during 2015.

Whilst installation works will be subject to review of specific site investigation data from preliminary investigations, the 4 month schedule is outlined in Table 2.2. It is preferable that cable works are conducted during Autumn to minimise potential impacts to seagrasses.

Table 2.4 Proposed construction timing

Timeframe	Construction activity
Week 1 - 4	Drilling on land side at Port Julia
Week 5 – 8	Drilling on land side at St Kilda
Week 9 – 14	Construction to commence at St Kilda Cable installation - cable lay, including ploughing, trenching and burial
Week 15-18	Tie-ins and connections

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3. Environmental values of Gulf St Vincent

3.1 Environmental processes

3.1.1 Tidal currents and waves

At Port Julia, tidal currents are predicted to be relatively weak at approximately less than 0.2 m/s. Tidal currents are predominantly orientated north-south, parallel with the orientation of the western coastline of Gulf St Vincent. Waves are generally small at less than 0.5 m and from the south to south east. Wave periods frequently exceed 10 seconds and are remnants of ocean swells which have propagated into Gulf St Vincent from the Southern Ocean.

Across the Gulf, the depth averaged currents above the proposed HVDC connection alignment are almost completely bidirectional. The tidal currents are still predominantly north to south direction and velocities can reach a maximum of approximately 0.4 m/s. Waves in the centre of Gulf St Vincent along the proposed alignment are relatively small at less than 0.75 m significant and primarily from the west to south west. Larger wave heights exceeding 1.25 m are occasionally observed from all directions and these larger waves are generated within Gulf St Vincent.

At St Kilda, tidal currents flows are west-east. Tidal current velocities are relatively low and reach a maximum of approximately 0.25 m/s. Waves north of Port Adelaide are generally small at less than 0.75 m and from the west to south west.

3.1.2 Coastal geomorphology and processes

The Gulf St Vincent has an almost complete lack of significant quantities of terrestrial and fluvial erosional inputs and is relatively free of coastal embayments.

The coastline in the vicinity of Port Julia is characterised by coastal cliffs of weathered sandstone to mixed boulder, cobble and sandy beaches. During storms, the base of cliffs are subjected to repeated hydraulic pressure changes and abrasion from suspended rock fragments, sand and gravel due to wave action.

The sediment characteristics at Port Julia are described as >50% terrigenous, moderately to poorly sorted fine sand with a mean grain size between 0.125–0.25 mm.

The prevailing south to south east wave directions are expected to generate a net northerly longshore sediment transport and based on wave climate and grain size it is estimated that the net longshore sediment transport is approximately 10,000–20,000 m^3/year to the north. Erosion movements at Port Julia are considered to be minimal.

Surficial sediments in the Gulf consist predominantly of Holocene biogenic carbonate material and some terrigenous sediments. Carbonate accumulation rates in the deeper subtidal environments, below 15–20 m water depth, have been estimated at approximately 0.5–2 m over the last 8,000 years. Terrigenous sediment concentrations are generally low and typically inversely proportional to carbonate concentrations.

The sediments around the St Kilda cable alignment area are comprised of well-sorted, fine to coarse grained shelly quartz sediment and categorised as 'Semaphore sand' and are part of the Holocene St Kilda Formation.

The south-west to south waves result in a predominantly net northerly transport of sediment along this part of coastline. The net northerly drifting of sediments has resulted in the formation of the Le Fevre Peninsula over the last 7,000 years. It has been estimated that the annual northward drift along the Adelaide metropolitan beaches to south of St Kilda is between 30,000–80,000 m^3.

3.2 Environmental assets

The following information has been obtained by desktop reports and data (e.g. DEWNR benthic habitat reports and maps), as well as a project specific field survey that examined 61 towed camera transects along the proposed cable route (with transects ranging between 30 and 500 m in length).

3.2.1 Seagrass meadows and other habitats

The Gulf St Vincent has a wide variety of subtidal benthic habitats, with seagrasses covering approximately 2,000 km^2. Seagrasses are important in trapping and stabilising sediments, and baffling wave action such that water movement slows and fine suspended particles can settle out, and are trapped in the root mesh of the seagrasses. The main primary producer within the Gulf, seagrasses also provide vital nursery habitat for many recreationally and commercially important species.

There are 11 species of seagrasses in South Australia, and all are protected under the *Native Vegetation Act 1993*.

Seagrass meadows are extensive in Gulf St Vincent and flourish the shallower depths of less than 15 m, but can be found in deeper waters. The distribution and health of seagrass communities is influenced by a number of factors including light penetration to the seabed, water depth, currents, temperature and salinity.

At Port Julia, the seagrass beds vary between continuous heterogeneous dense stands, to patchy and sparse homogenous stands. Overall, the alignment traverses healthy medium and dense continuous seagrass beds for approximately 10 km from the intertidal zone, however it was acknowledged that these were widespread and common to the upper part of the Gulf St Vincent.

There is also intertidal and subtidal (3 – 4 m) reefs at Port Julia which provide substrate for algal attachment, as well as species such as mussels, sponges and ascidians. These reefs will be avoided by altering the cable laying technique (i.e. directional drilling for approximately 800 m offshore from the cliffs).

Much of the Gulf is comprised of a sandy benthic environment.

At St Kilda, the seagrass communities and meadows are much patchier, reflective of the proximity to high nutrient inputs and altered water quality. The patchy distribution may enable the cable route to be adjusted to minimise impacts on seagrass communities. A report commissioned by the Coast Protection Board in 2004 identified that seagrass distribution at the Section Bank was in decline and in line with the metropolitan coast that there was little seagrass within approximately 1 km of the shore.

3.2.2 Fauna

More than 200 fish species are found in the Gulf St Vincent, and these are generally typical of those found in southern Australian coastal waters. Although the variety of fish in the gulf is relatively small when compared with warmer Australian waters, there is an abundance of economically important species, with approximately 15 species fished in the gulf.

Whilst there are no major colonies of seals or sealions, or herds of whales, individuals of many species are regularly seen in the gulf, and on local beaches. However, breeding sites are not known and unlikely for these animals. Bottlenose Dolphin and Common Dolphin are common in the Gulf St Vincent.

Benthic fauna include sessile and attached species (razorfish, sponges and ascidians) that are patchily distributed across the sandy substrate, and within seagrass meadows.

The coastal zone supports a range of native fauna species, some of which are resident and restricted to the coastal habitats and others which may utilise or fly over inland habitats. In addition, a number of shorebird species of conservation significance were recorded during the EBS flora and fauna survey undertaken in 2012 to inform the development application.

Shorebirds may fly across the wind farm project area between habitats on Gulf St Vincent and Spencer Gulf, or north/south across land during their long range migration. Based on database records, there are also a number of coastal waders that may occur in the project area or along the adjacent coast.

3.2.3 Marine pests/noxious species

South Australia has many pest species in the marine environment that threaten the health and viability of natural ecosystems. There is a risk of spreading these species into new areas through disturbance activities, or introducing new species if vessels are coming from international or interstate ports. These risks will require management measures to eliminate or mitigate any impacts.

Whilst there are crustaceans (Northern European crab) and worm species (European fan worm) already established throughout the Gulf St Vincent, the distribution of Aquarium Caulerpa (*Caulerpa taxifolia*) is restricted to the Port River and a containment area is in place.

Aquarium Caulerpa is very invasive, grows rapidly and is considered a serious threat to native seagrass meadows and bottom-dwelling communities, threatening fish breeding and feeding grounds. Fish do not generally eat Aquarium Caulerpa because it contains a toxin that makes it distasteful to them.

The weed can regenerate and start a new colony from a plant fragment as small as one square centimetre and pieces of the seaweed can survive out of water for up to two weeks. This means that even small pieces left or entangled in boat trailers, anchors and fishing gear can be transported between bays and waterways and remain viable.

4. Environmental management

4.1 Construction and environmental management framework

This Construction and Environmental Management Framework (CEMF) has been developed to provide guidance to the contractor(s) on the potential impacts associated with the construction of the marine cable.

The purpose of this document is to:

- Provide a framework for the management of environmental impacts during construction of the marine cable
- Address the statutory requirements for the project
- Identify the mitigation measures to be implemented to manage environmental impacts during construction
- Address community and government concerns regarding potential environmental impacts
- Outline REpower and ABB's environmental commitments to manage the perceived impacts.

The following sections outline the environmental management plans that will need to be developed to address all issues associated with construction of the marine cable.

The key potential construction issues identified for the cable are:

- Drilling management
- Vessel and other traffic management
- Acid Sulfate Soils management
- Trenching management

The project has the potential to result in both direct and indirect impacts. Direct impacts are impacts resulting from project construction, such as trenching or drilling. Indirect impacts are those arising from project activities but are more spatial in nature such as the spread of marine pests from vessels or the disturbance of acid sulfate soils.

Each management plan outlines the environmental objectives, performance indicators, potential impacts, mitigation measures and monitoring and reporting requirements.

Table 4.1 provides a summary of the potential impacts associated with the cable construction activity and the environmental asset at risk.

Table 4.1 Potential impacts and threats to assets during cable construction

Activity	Potential impacts	Environmental assets at risk
Drilling	▪ Spoil disposal and wastewater ▪ Noise and vibration ▪ Sediment and erosion run-off ▪ Water quality ▪ Vegetation clearance ▪ Smothering of mangroves	▪ Cultural heritage sites or places ▪ Receiving marine waters ▪ Sensitive receivers and residents of Port Julia and St Kilda ▪ Flora and fauna, particularly seagrasses and mangroves ▪ Pneumatophores of the grey mangroves
Vessel and other traffic	▪ Turbidity generation ▪ Entanglements ▪ Introduction or spread of marine pests ▪ Stakeholder complaints associated with road closures, contractor car parking, lighting etc. ▪ Discharge or spills from vessels	▪ Flora and fauna ▪ Port function ▪ Contractor reputation
Trenching	▪ Sedimentation and turbidity generation ▪ Vegetation clearance ▪ Noise and vibration ▪ Water quality	▪ Flora, particularly seagrass (turbidity) ▪ Fauna (noise and vibration) ▪ Receiving marine waters
Acid Sulfate Soils	▪ Disturbance of ASS ▪ Water quality ▪ Infrastructure impacts	▪ Flora and fauna ▪ Leaching of ASS to receiving marine waters and surrounding land

The following environmental assets are discussed under the relevant construction issue:

- Flora and fauna management
- Water Quality management
- Cultural heritage management
- Noise and Vibration management
- Marine pest management
- Stakeholder management.

4.2 Drilling management

4.2.1 Spoil disposal

Table 4.2 Drilling activity spoil disposal management framework

Objective	▪ To minimise the production of waste during drilling activities ▪ Waste from construction activities disposed of in accordance with EPA requirement
Target and performance indicators	▪ Identify the relevant statutory requirements for disposal and where practicable re-use opportunities for clean fill.
Potential impacts	▪ Water and slurry from construction activities resulting in environmental damage ▪ Inappropriate disposal of spoil
Mitigation measures	▪ Liaise with Yorke Peninsula District Council and City of Salisbury regarding the re-use of any clean fill ▪ All waste to be disposed to a licensed waste disposal facility ▪ Adopt best practice drilling methodology ▪ Develop a spoil disposal management plan which includes: - Dredge spoil to be disposed of onshore ▪ Develop an Acid Sulfate Soil Management Plan will be prepared including an appropriate disposal method should acid sulfate soils be discovered and/or disturbed (refer 4.4) ▪ Investigate the need for an evaporation/ sediment pond to be constructed at St Kilda and Port Julia and wastewater to be tested and disposed in accordance with EPA requirements
Monitoring and reporting	▪ Review of certificates of disposal ▪ Daily environmental inspections ▪ Weekly reporting
Associated documentation	▪ Contaminated Material Management Plan ▪ Acid Sulfate Management Plan

4.2.2 Erosion and sediment

Table 4.3 Drilling activity erosion and sediment management framework

Objective	▪ To reduce the potential erosion, particularly at Port Julia, and drainage of sediment into Gulf St Vincent. ▪ Minimise water quality impacts associated with sediment into the marine waters.
Target and performance indicators	▪ Compliance with the EPA's *Water Quality Policy 2004*.
Potential impacts	▪ Reduced water quality ▪ Increased sediment in run-off and potential for runoff entering the marine environment

Mitigation measures	▪ Undertake a targeted intrusive geotechnical investigation to better understand the geology over the western approach to Gulf St Vincent, identifying variations in soil/rock type, strength and stiffness. ▪ Prepare an erosion/sediment control plan, including implementing sediment and erosion control measures including: - Fence off and restrict access to areas with a high potential for erosion - Defined work area footprint - Control access points to work areas, particularly at Port Julia - Store machinery and construction materials away from sensitive areas - Diverting run-off away from trench lines - Provision of appropriate wash down facilities ▪ Investigate the need for an evaporation/ sediment pond to be constructed at St Kilda and Port Julia and liaise with the local NRM Boards to secure the required approvals
Monitoring and reporting	▪ Inspect sediment and erosion control measures on daily basis to ensure working effectively ▪ Weekly reporting
Associated documentation	▪ Water Quality Monitoring Program ▪ *EPA Stormwater Pollution Prevention – Code of Practice for the Building and Construction Industry*

4.2.3 Noise and vibration

Table 4.4 Drilling activity noise and vibration management framework

Objective	▪ To ensure that noise or vibration from construction activities does not adversely affect the health and amenity of residents of Port Julia and St Kilda ▪ To minimise adverse impacts during the construction phase on neighbouring residents and stakeholders
Target and performance indicators	▪ Compliance with the EPA *Noise Policy 2007* and EPA Construction Noise Information Sheet (EPA 425/10) ▪ Noise and Vibration Management Plan is developed for construction of the marine cable
Potential impacts	▪ Construction noise at land/ sea interface points disturbing local residents at Port Julia or St Kilda
Mitigation measures	▪ Prepare a noise and vibration management plan ▪ Maximising the distance between vibration sources and receivers if possible ▪ Notify residents within 1 kilometre of the works area of the times of expected high noise levels ▪ Ensure works comply with normal working hours as outlined in Noise Policy ▪ Use machinery and equipment with minimal noise output levels where appropriate. ▪ Undertake monitoring to verify that noise levels are not exceeding the EPA guidelines ▪ Notification of residents of Port Julia and St Kilda of works and construction hours ▪ Provide a toll free number for community concerns or complaints
Monitoring and reporting	▪ Daily environmental inspections to review effectiveness of construction noise mitigation measures ▪ Weekly reporting

Associated documentation	▪ Noise and Vibration Management Plan ▪ *Environment Protection (Noise) Policy 2007*

4.2.4 Flora and fauna

Table 4.5 Drilling activity flora and fauna management framework

Objective	▪ To minimise disturbance to flora and fauna terrestrial and aquatic species at the land/ sea interface points ▪ Protect the ecological integrity and values of the samphire and mangrove communities at St Kilda ▪ To minimise clearance requirements as a result of construction activities
Target and performance indicators	▪ Impacts on flora minimised during construction through implementation of appropriate technology ▪ All clearing of vegetation is authorised under appropriate legislation
Potential impacts	▪ Disturbance to mangrove and samphire communities at St Kilda ▪ Impacts to sensitive coastal environment at Port Julia
Mitigation measures	▪ HDD will be undertaken at St Kilda for approximately 500m beneath the mangroves to minimise impacts ▪ HDD will be undertaken at Port Julia to avoid disturbance to the sensitive coastal environment and intertidal and sub-tidal reef ▪ Minimise the construction footprint and work area to be clearly delineated ▪ Directional drilling channels and entry/ exit points are to be filled as soon as possible ▪ Undertake staff and contractor induction prior to construction activities commencing to promote understanding of sensitive coastal environment and ecological value of mangrove communities ▪ Avoid construction activities during non-resident time for migratory shorebirds if possible ▪ Construction works will be planned to minimise the cumulative operation of noise generating machinery ▪ Drilling to be undertaken to depth of 3-4m to avoid impacts to mangrove roots ▪ Avoid construction activities during the shorebird and migratory bird breeding season (July - September) if possible.
Monitoring and reporting	▪ Daily environmental inspections ▪ Weekly reporting
Associated documentation	▪ Ceres Wind Farm Project Flora and Fauna Management Plan (EBS 2012)

4.2.5 Cultural heritage

Table 4.6 Drilling activity cultural heritage management framework

Objective	▪ To prevent or minimise disturbance to cultural heritage sites or areas of archaeological sensitivity and where disturbance is unavoidable, ensure works are undertaken in accordance with all appropriate approvals.
Target and performance indicators	▪ Appropriate management of any Indigenous discoveries
Potential impacts	▪ Disturbance to Aboriginal sites or objects

Mitigation measures	▪ Liaise with the relevant Aboriginal groups for intertidal investigations at the land/ coast interface given the potential archaeological sensitivity in these areas. ▪ Aboriginal monitors present on site during proposed works in sand ridges, coastal areas and areas of medium risk, due to the possibility of encountering archaeological materials during directional drilling and other ground disturbance activities. ▪ Preparation of Indigenous and Non-Indigenous Heritage Plan that includes a procedure for discovery of Aboriginal site or artefact. In the event of any unidentified culturally significant sites or objects being discovered during construction, works in the area will stop and the procedure for the discovery of Aboriginal site or artefact will be implemented.
Monitoring and reporting	▪ Daily environmental inspections ▪ Weekly reporting
Associated documentation	▪ REpower Aboriginal Site Discovery Procedure ▪ Indigenous and Non-Indigenous Cultural Heritage Management Plan

4.3 Vessel and land-based traffic management

Table 4.7 Vessel management framework

Objective	▪ Vessels are managed to minimise impacts to flora and fauna ▪ To avoid the introduction, spread and establishment of marine pests during the construction phase of the project ▪ To minimise the impact to the public associated with construction activities ▪ Minimise impacts to marine recreational activities and the number of community complaints received during construction ▪ To minimise adverse impacts during the construction phase of the project on neighbouring residents and stakeholders ▪ Maintain the function of the port ▪ To ensure the safe operation of marine activities ▪ To ensure a separation distance is maintained for fishing trawlers
Target and performance indicators	▪ No collision with fauna ▪ No reduced port function ▪ Minimised flora loss ▪ Complaints from the public regarding traffic management are dealt with within 24 hours
Potential impacts	▪ Drag line on vessel striking marine mammals ▪ Animal entanglements ▪ Road closures and restricted public access ▪ Interaction of vessels with marine fauna ▪ Impacts on prawn and fin fish fisheries

Mitigation measures	**Vessel management** ▪ Develop Vessel Code of Conduct, including - Imposing speed limits for vessels to reduce impacts associated with entanglements and turbidity generation - Develop marine fauna observation procedure and document any sightings of marine fauna - Inductions for vessel operators ▪ Establish a 500m safety exclusion zone around the construction area to ensure a separation distance is maintained for recreational and commercial vessels and ensure the safe operation of marine activities ▪ Navigational aids to be used to identify locations of marine structures in accordance with DPTI and regulatory requirements ▪ Anchoring system procedure developed to minimise impacts to seagrass meadows ▪ Develop and implement communication protocols with recreational fishers to minimise disruption to recreational activities ▪ No waste to be discharged from vessels and waste disposal measures implemented in accordance with EPA guidelines ▪ Any hazardous materials will be stored in accordance with EPA guidelines ▪ Development of emergency response procedures in the event of an incident ▪ Annual monitoring of cable to be undertaken to confirm depth of burial is adequate from a risk management perspective **Marine pest management** ▪ Follow quarantine protocol for all barges, tugs and other vessels used for placement of the cables. If vessels are to arrive from outside of Australian waters, they should be inspected for biofouling and sediments in accordance with the Australian Quarantine and Inspection Service (AQIS) requirements and the *Quarantine Act 1908*. ▪ Develop a Marine Pest Risk Assessment and Monitoring Plan including: - Cleaning and sterilisation of equipment before departure and routinely during operations. - Dry docking, slipping and /or diver surveys to remove biofoul growth - Inspect and clean all berthing lines, anchors, anchor chains, cables and other submersible equipment to ensure they are free of attached or entangled marine growth. - Manage Ballast Water - on arrival to a South Australian port, discharge any seawater carried into the state into a land-based water system (e.g. sewer or waste contractor) that does not discharge into the marine environment. ▪ Develop a Marine Equipment Inspections Plan ▪ Awareness of the *Caulerpa taxifolia* containment area in the vicinity of St Kilda **Land-based traffic management** ▪ Prepare a Traffic Management Plan in consultation with Councils and DPTI which includes: - Consider local parking rules when parking vehicles, machinery or materials on site. Vehicles should not be illegally parked or placed obstructing the road or footpath while delivering/loading. - Establish designated access route to the compound areas at Port Julia and St Kilda and inform drivers of these routes, parking areas and acceptable delivery times. - Limit vehicle speeds as enter and exit Port Julia and St Kilda - Develop communication protocols with the local Port Julia and St Kilda community to manage any impacts associated with traffic - Entry and departure of heavy vehicles to and from the compound areas restricted to standard daylight hours - Public safety controls in and around the construction areas ▪ Use signage to notify the public of works and nature of potential danger ▪ Notification of residents of Port Julia and St Kilda of works and construction hours ▪ Provide a toll free number for community concerns or complaints

Monitoring and reporting	▪ Daily inspections to ensure construction traffic to and from Port Julia and St Kilda is complying with traffic management controls including speed limits, driver routes, parking areas and working hours ▪ Weekly reporting
Associated documentation	▪ Traffic Management Plan ▪ Marine Pest Risk Assessment and Monitoring Plan ▪ Marine Equipment Inspections Plan ▪ Emergency Response Procedures

4.4 Acid sulfate soil management

Table 4.8 Acid sulfate soil management framework

Objective	▪ To prevent or minimise disturbance to acid sulfate soils at the land/sea interface points
Target and performance indicators	▪ Compliance with Guideline and Acid Sulfate Soils Management Plan ▪ No contaminating event as a consequence of the project
Potential impacts	▪ The installation of the cable has the potential to disturb acid sulfate soils in the low-lying terrestrial and inter tidal areas resulting in habitat loss and degradation.
Mitigation measures	▪ Liaise with the CPB regarding coastal acid sulfate soils at the coastal interface, particularly at St Kilda. ▪ Develop an Acid Sulfate Management Plan which includes - Field identification at likely spots - Undertake testing pre-construction to check if field identification indicators indicate the presence of acid sulfate soils in the vicinity of the cable alignment - Appropriate containment and disposal method should acid sulfate soils be discovered and/or disturbed
Monitoring and reporting	▪ Monitoring carried out in accordance with Guideline and Acid Sulfate Soils Management Plan ▪ Daily inspections and checking of likely spots ▪ Weekly reporting
Associated documentation	▪ EPA Acid Sulfate Soil Material Guideline (November 2007) ▪ Coast Protection Board Policies (ASS Guideline)

4.5 Trenching management

4.5.1 Sediment generation

Table 4.9 Trenching sediment management framework

Objective	▪ To minimise suspension of sediments during trenching and ploughing activities ▪ To minimise water quality impacts associated with construction activities
Target and performance indicators	▪ Comply with the requirements of the *Environment Protection (Water Quality) Policy 2003* ▪ Do not exceed surface water turbidity levels that are 50 NTU above control site NTU levels ▪ Develop a Turbidity Monitoring Program as part of the Dredging Management Plan to the satisfaction of the EPA
Potential impacts	▪ Suspended solids generation - estimated between 20–30 per cent of sediments excavated per unit length of trench will be injected into the water column above the trench. ▪ Visible plumes of suspended sediment transported predominantly east-west with the prevailing tidal current directions in Barker Inlet
Mitigation measures	▪ Liaise with EPA to determine acceptable levels of suspended soils and/or turbidity for inclusion in EPA licencing requirements once extent and scope of dredging operations being determined. ▪ Prepare a Dredge Management Plan that includes: - Specific mitigation measures for jet trenching and dredge ploughing works, including monitoring and shut down levels - Best practice measures to minimise dredge footprint - Sediment and turbidity controls including turbidity trigger levels that when levels are exceeded work will cease - Timing of works to avoid dodge tide events - Dredging to be undertaken during autumn if possible to minimise impacts on seagrasses - Dredging to coincide with suitable local currents and swell patterns - Management and disposal of spoil in accordance with EPA licence requirements ▪ Implement water quality monitoring (refer Section 4.5.2)
Monitoring and reporting	▪ Daily environmental inspections ▪ Weekly reporting ▪ Dredging activities would need to comply with approval and monitoring requirements included within the EPA licence conditions and permit for dredging ▪ Monitoring and reporting requirements will be detailed by the contractor once stipulated by the EPA as part of the licence agreements. ▪ Undertake monitoring post completion of trenching activities to identify the occurrence of sediment erosion and impacts to water quality due to turbidity
Associated documentation	▪ EPA Guidelines for Dredging and Earthworks Drainage ▪ Water Quality Monitoring Program

4.5.2 Water quality

Table 4.10 Trenching water quality management framework

Objective	▪ To protect water quality in Gulf St Vincent ▪ To develop a Turbidity Monitoring to the satisfaction of the EPA and in accordance with the *Environment Protection (Water Quality) Policy 2003* ▪ To minimise the potential impact to seagrass and fauna from increased sedimentation and turbidity levels
Target and performance indicators	▪ Protect the marine water quality through no deterioration of receiving waterways for salinity, pH, turbidity and dissolved oxygen.
Potential impacts	▪ Reduced water quality ▪ Turbidity
Mitigation measures	▪ Develop a Turbidity Monitoring Program including - Establish a baseline for water quality monitoring (salinity, dissolved oxygen, pH, turbidity, water temperature) - Real time monitoring and shut down when unacceptable impacts - Comply with water quality targets determined by EPA ▪ Maintain a clean work area (vessel) to avoid loss of construction materials and debris to water ▪ Appropriate storage of liquids to avoid spills of liquids into water ▪ Implement water quality monitoring to ensure that turbidity levels do not have the potential to impact on marine flora and fauna
Monitoring and reporting	▪ Daily environmental inspections ▪ Weekly reporting ▪ Monitoring and reporting requirements will be detailed by the contractor once stipulated by the EPA in accordance with the Policy guidelines
Associated documentation	▪ *Environment Protection (Water Quality) Policy 2003* ▪ Water Quality Monitoring Program

4.5.3 Flora and fauna

Table 4.11 Trenching flora and fauna management framework

Objective	▪ To minimise seagrass clearance during both preliminary investigations and construction activities ▪ Protect the ecological integrity and values of the marine environment ▪ Noise and vibration emissions disturbing marine mammals
Target and performance indicators	▪ Clearance of seagrass minimised ▪ Sedimentation managed to minimise impacts to flora and fauna ▪ Noise and Vibration Management Plan is developed for construction of the marine cable

Potential impacts	▪ Fragmentation of seagrass meadows ▪ Erosion of the seagrass communities may be initiated where the seafloor has been disturbed during cable installation ▪ Potential bird strikes ▪ Potential impact to marine mammals including entanglements ▪ Noise disturbing marine fauna Introduction of marine pests
Mitigation measures	**Flora** ▪ Obtain all necessary approvals for vegetation removal from NVC ▪ Reduce construction footprint as far as practicable ▪ Undertake post-construction monitoring of the cable route to ensure that 'blow-outs' are detected and stabilised **Fauna** ▪ Water quality monitoring to be implemented to ensure that turbidity levels do not have the potential to impact on marine fauna ▪ In the event of injured marine mammals or birds contact FISHWATCH (1800 065 522) ▪ Dredging works not to be undertaken when fish and/ or marine mammal activity or sensitivity is lowest ▪ If works required during breeding seasons the contractor must submit mitigation measures for approval in Environmental Management Plans ▪ Use machinery and equipment with minimal noise output levels where appropriate ▪ Undertake monitoring to verify that noise levels are not exceeding the EPA guidelines ▪ Warning techniques/ sound being used prior to dredging activities to scare marine fauna from the construction area ▪ Develop marine fauna observation procedure and document any marine animals sighted to ascertain numbers and occurrences in Gulf St Vincent during construction works ▪ A marine mammal spotter should be employed during dredging activities and an exclusion zone established whereby dredging stops if a marine mammal is spotted within 500m of the dredging vessel ▪ Prior to any work being undertaken in the marine environment, Dr Catherine Kemper at the South Australian Museum will be contacted to determine if any whales are known to be in the Gulf at the time ▪ The boat crew will remain vigilant for any marine mammals coming close to the boat during construction activity. If a whale is sighted or is known to be in the gulf then a look-out will be posted ▪ All vessel masters are made aware that southern right whales (*Eubalaena australias*) may be in and around Gulf St Vincent and are made aware of the requirements under the *Environment Protection and Biodiversity Conservation Regulations 2000*
Monitoring and reporting	▪ Daily environmental inspections ▪ Weekly reporting
Associated documentation	▪ Ceres Wind Farm Project Flora and Fauna Management Plan (EBS 2012) ▪ Noise and Vibration Management Plan ▪ *Environment Protection (Noise) Policy 2007*

5. Training inspection and auditing

5.1 Training and awareness

The Contractor(s) will need to provide training to all personnel that enter and undertake work on site, including:

- site induction
- familiarisation with the requirements of the CEMP
- environmental emergency response training
- familiarisation with the site environmental controls
- targeted environmental training for specific personnel working in sensitive environmental area such as Barker Inlet

Records of all training will be maintained and kept at the site office. The records will provide the following details:

- who was trained
- when training was undertaken
- name of trainer
- general description of training content.

5.1.1 Site environmental inductions

Site environmental inductions for employees, contractors and sub-contractors will be conducted and recorded. The induction will outline the site specific environmental issues and objectives and controls covered by the Contractor(s) CEMP and any associated documentation. A Site Environmental Induction Register will be maintained and kept at the site office.

5.2 Inspections and auditing

To assess the implementation of the CEMP, an environmental inspection and auditing schedule will be implemented during the construction of the project.

5.2.1 Environmental inspections

During construction, the Contractor(s) will conduct daily visual observations and weekly environmental compliance inspections of all active construction areas.

Daily observations will occur prior to the commencement of daily work activities. Any issues and associated actions will be recorded in the daily project diary.

Weekly environmental inspections will be undertaken of the site using the Environmental Inspection Checklist to document any non-conformances and/or corrective action requirements. Copies of the weekly inspection checklists will be available at the project site office.

5.2.2 Environmental auditing

In addition to the environmental inspections detailed above, an audit program will be established to assess and record whether activities are in conformance with regulatory requirements and the objectives outlined in the CEMP. The audit program will involve:

- External Environmental Compliance audits to assess ABB's and the Contractor(s) level of compliance with the CEMP.
- Internal Environmental audits by the Contractor(s) that review the implementation of the CEMP.

Records of all audits (completed checklists and reports) will be available at the project site office.

5.2.3 Non-conformance and corrective action

The Contractor(s) will identify in the CEMP their non-conformance and corrective action procedures. The procedures to be developed by the Contractor(s) must include (but may not necessarily be limited to) the following:

- Inspection to identify potential non-conformances
- Implementation of any non-conformance and/or corrective actions requirements as may be necessary
- Reporting of any incidents/non-conformances
- Corrective action procedures/actions to rectify deficient environmental protection measures
- Undertaking investigation procedures to identify reasons for incident / non-conformance
- Provision for the adjustment of procedures/plans to reflect corrective action.

In the event a non-conformance ABB will:

- follow up and verify the implementation of the Contractor(s) corrective action
- keep details of all non-conformances and corrective action requests.

5.3 Environmental incident management and emergency response plans

The Contractor(s) will develop an Environmental Response and Incident Management Plan which details the possible response to potential emergency situations and accidents to prevent or mitigate associated environmental impacts.

Any environmental incidents will be investigated and reported to the ABB's Environmental Management Representative as soon as practicable possible or no later than 24 hours from the commencement after stopping work. Reports will include details of incident and any corrective actions taken. Reporting to government authorities will be in accordance with legislative requirements.

Daily environmental inspections and weekly reports will be undertaken to ensure incidents are responded to in a timely manner in the event of an accident.

6. Reporting and review

Following project approval, a final Construction and Environmental Management Plan will need to be prepared by ABB (CEMP) prior to construction commencing. The CEMP will detail the reporting and review program. As a minimum the reporting program will need to include weekly environmental reports, non-conformance reports, CEMP status reports and any statutory reporting requirements.

6.1 Daily inspections

Daily environmental reports will include:

- environmental inspections
- environmental non-conformances
- outstanding corrective actions
- environmental incident statistics.

6.2 Weekly status report

A weekly status report will be prepared by the contractor(s) for ABB. This report will discuss the implementation and progress of the final Construction and Environmental Management Plan including:

- project status
- any environmental issues
- mitigation measures implemented
- effectiveness of control measures
- environmental incidents or complaints
- monitoring results
- other relevant information in relation to the environmental management of the project.

6.3 Non-conformance reports

Environment non-conformance reports will be completed in response to any identified environmental non-conformances as soon as practicable or no later than 24 hours. Reports will include details of non-conformance and actions implemented to rectify the non-conformance.

6.4 Other statutory reporting

As required by the conditions of any statutory licenses or permits.

6.5 Complaints

All complaints regarding construction activities will be directed to a project specific number and from there distributed out to the relevant person to handle the complaint.

A register of all calls, responses and follow up actions will be kept in a centralised database and included in the monthly status report.

6.6 Review

The final Construction and Environmental Management will be subject to a continual review process.

An initiated review or amendment will generally be in response to monitoring, inspections, audits, complaints and incidents. The object of this continual review process is to ensure that the management actions are current and effective in achieving the management objectives and further achieving the objective of continual improvement.