



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 5631/2
Permit Holder:	Department of Transport
Duration of Permit:	30 November 2013 to 30 November 2018

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

PART I – CLEARING AUTHORISED

1. Purpose for which clearing may be done

Clearing for the purpose of dredge material disposal, dredge pipeline construction and vehicle access.

2. Land on which clearing is to be done

Lot 1337 on Deposited Plan 91032 (SOUTH CARNARVON 6701)

3. Area of Clearing

The Permit Holder must not clear more than 12.925 hectares of native vegetation within the area hatched yellow on attached Plan 5631/2.

4. Application

This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

PART II – MANAGEMENT CONDITIONS

5. Management Plan

The Permit Holder must implement and adhere to the Carnarvon Fascine Maintenance Dredging – Dredging Environmental Management Plan, Report No. 301_02_001/3_Rev0, October 2013, attached as Appendix 1 to this permit.

Jane Clarkson
ACTING MANAGER
NATIVE VEGETATION CONSERVATION BRANCH

*Officer delegated under Section 20
of the Environmental Protection Act 1986*



24 April 2014

Plan 5631/2

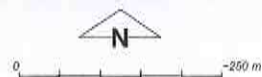


LEGEND

Clearing Instruments

-  Areas Approved to Clear
 Road Centrelines
 Local Government Authorities

- ☐ Cadastre for labelling
Carnarvon 1.4m Orthomosaic -
Landgate 2002



Scale 1:9000
(Approximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

J Clarkson

Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.



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Department of Environment Regulation

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Carnarvon Fascine Maintenance Dredging Dredging Environmental Management Plan

301_02_001/3_Rev0
October 2013

Carnarvon Fascine Maintenance Dredging Dredging Environmental Management Plan

Prepared for

Department of Transport

Prepared by

BMT Oceanica Pty Ltd

October 2013

Report No. 301_02_001/3_Rev0

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Quality Assurance

Quality
ISO 9001
SAI GLOBAL

BMT Oceanica Pty Ltd has prepared this report in accordance with our Quality Management System, certified to AS/NZS ISO 9001: 2008.

Status

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Approved for final release:**Author**

Date: 18/10/2013

Director (or delegate)

Date: 18/10/2013

Cover

Main image: Tramway Bridge, Carnarvon Fascine (BMT JFA Consultants);
Minor images: Cutter suction dredge at Carnarvon Boat Harbour (BMT Oceanica)
Harbour Road Reclamation Site, Carnarvon (BMT JFA Consultants);

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1. Introduction

1.1 Project description

The Carnarvon Fascine (the Fascine) is a large tidal waterway that was previously the 'South Arm' of the Gascoyne River. In 1987 the Babbage Island Causeway was constructed and cut off river flow through the area (DALSE & JFA 2003). The accretion of sediment within the Fascine has reduced water depths, posing a hazard to navigation (BMT JFA 2011). The Department of Transport (DoT) is proposing to undertake maintenance dredging to restore navigable depths in the Fascine on behalf of the Shire of Carnarvon (SoC) in 2014. The maintenance dredging will involve the removal of ~25 000 m³ of marine sediment using a cutter-suction dredge over a period of ~8 weeks. There are a number of disposal options available for the dredged material in Carnarvon. A vegetation clearing permit is currently under application for two areas of land that are proposed to be used as disposal sites. In the instance that the vegetation clearing permit is granted, the details of the most likely scenarios are given below.

Approximately 15 000 m³ of material dredged from the Fascine Upper Channel will be disposed of to the Harbour Disposal Site, a 5 ha area of land immediately north of the Carnarvon Boat Harbour, which has been used previously for disposal of dredged material (Figure 1.1). Containment bunds ~3 m high and 20 m wide will be constructed around the site boundaries to create a settlement pond to contain the disposed dredged material (BMT JFA 2013). These bund walls will allow suspended sediment to settle and return water to drain out through a weir box at the southern corner of the site into a mangrove tidal creek. Additionally, an internal bund wall will be present to lengthen the flow path and further decrease turbidity in the return water. It is proposed that this site continue to be used for dredge material disposal over the medium term (i.e. the next 0–5 years) and in the longer term may ultimately be developed by the DoT for use as a commercial area.

Approximately 10 000 m³ of material dredged from the Fascine Lower Channel will be used to reclaim land at the Harbour Road Reclamation Site, a ~430 m length of shoreline on the eastern side of the Fascine (Figure 1.1). It is anticipated that temporary bunds will be constructed around the site to contain disposed material and allow sediment to settle, and return water will drain through an outlet point into the eastern Fascine. It is expected that this land will be used for harbour/boating infrastructure in the future. The timing for the development of this area will be dependent on economic growth in Carnarvon.

Material dredged from the south-western side of the Fascine (where the channel adjoins the eastern shoreline of Babbage Island spit) may be used to nourish the beach adjacent to Pelican Point Road where erosion issues are currently being experienced. This disposal site is known as Pelican Point Nourishment Site (Figure 1.1). Some material may also be used to re-build the dune at a weak point in the spit known as Babbage Island Spit Nourishment Site (Figure 1.1).

The DoT will undertake dredging within the Fascine on behalf of the SoC. Typically, maintenance works on various coastal facilities in Western Australia are completed under a maintenance dredging contract. BMT JFA Consultants Pty Ltd (BMT JFA) is contracted by the DoT to complete the engineering aspect of maintenance dredging works. CGC Dredging (CGC) performs the dredge activities and provides the required equipment. BMT Oceanica Pty Ltd (BMT Oceanica) regulate and implement the environmental monitoring of all DoT dredging works.

1.2 Purpose of this document

This document is a Dredging Environmental Management Plan (DEMP) that outlines the environmental monitoring and management procedures to be implemented during dredging and disposal of material from the Fascine. This DEMP defines the specific environmental monitoring methods, environmental management actions and the roles of the Principal (DoT, and BMT JFA/BMT Oceanica on behalf of the DoT) and Contractor (CGC), as outlined in the DoT's Environmental Management Framework (EMF) (Oceanica 2012). The design of the monitoring and management program is based on the assessment of potential environmental and socio-economic issues undertaken in the Dredging Environmental Impact Assessment (DEIA) (BMT Oceanica 2013; Section 1.3).



Figure 1.1 Carnarvon Fascine Channel and disposal sites

1.3 Potential environmental and socio-economic issues

The DEIA undertaken for the Fascine maintenance dredging works (BMT Oceanica 2013) identified the following key environmental issues that require active monitoring and management during the maintenance dredging campaign.

1.3.1 Increase in water column turbidity

The disturbance of sediment on the seabed during dredging is likely to result in increased water column turbidity at the dredging site. Turbidity may also be generated at the points where return water drains from the onshore disposal sites into coastal waters. If turbidity is sufficiently persistent in time and space, it could reduce penetration of light through the water column and lead to a reduction in productivity of nearby marine flora. Any water turbidity close to recreational areas may also reduce the aesthetics and public enjoyment of the marine environment.

1.3.2 Release of nutrients from the dredged material

The release of nutrients from the sediment at the dredging site or near the disposal sites has the potential to lead to eutrophication if the nutrients are not readily dispersed. Sampling and analysis of the sediment from the Fascine dredge area in May 2013 indicated that the expected concentration of nutrients in the dredge slurry may exceed the trigger values for physical and chemical stressors stipulated in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000). Nutrient concentrations are expected to be diluted when the return waters enter the Fascine and mangrove tidal creeks, which are flushed daily by tidal currents. Therefore, there it is considered that there is a low risk of eutrophication occurring, but monitoring and management of nutrient release will be undertaken as a precaution (Section 4.3).

1.3.3 Damage to terrestrial vegetation

Terrestrial vegetation growing at the Harbour Road Reclamation Site and Harbour Disposal Site is intended to be cleared prior to the disposal of dredged material (Section 2). Based upon regrowth of vegetation at the Pickles Point reclamation site after disposal of dredged material at that site in 2003, it is likely that natural regrowth of vegetation will stabilise the disposal sites within ~2–5 years. The vegetation at the Harbour Road Reclamation Site is considered as 'Good' on the Keighery vegetation scale, but the structure is considered to be 'significantly altered by multiple disturbances' although the area 'retains its basic structure/ability to regenerate' (Keighery 1994). The Harbour Disposal Site is considered as 'Completely Degraded' on the Keighery vegetation scale (Keighery 1994). The area is 'completely/almost completely without native species'.

1.3.4 Damage to wetland habitats

Return water from the Harbour Disposal Site will drain into a nearby mangrove tidal creek. There is potential for erosion of the mangrove wetland habitat if the return flow reaches high current velocities. There is also a risk of direct damage to the mangrove trees as land-based machinery manoeuvres around the boundaries of the sites.

1.3.5 Disturbance of migratory birds

The southern extremity of the dredge area in the Fascine Lower Channel is near to a site on the end of Babbage Island spit that has been identified as a roosting site for greater sand plovers and sometimes bar-tailed godwits (George 2009). These are both listed as migratory species under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. However, a recent survey indicated that this roosting site had been abandoned and roosting was now occurring on sandbars off Whitmore Island to the north (George 2009). The majority of the dredging campaign is not expected to occur near the Babbage Island spit, therefore there is a

small risk of disturbance of any migratory birds that return to roost on the end of the spit or start to roost at any other sites near to dredging and disposal areas.

1.3.6 Hydrocarbon spillage

Various hydrocarbons will be used on the site of the dredging and disposal works site, including fuel, oil and lubricants for the dredge and support vessel, and the land-based machinery operating at the disposal sites. Therefore, there is a risk of accidental hydrocarbon spillage to both the marine and terrestrial environments.

1.3.7 Noise

Both the land-based machinery and the dredge vessels used during the dredging and disposal works will generate noise that could potentially disturb people and wildlife located within hearing range of the works. There are a number of residential properties on the eastern side of the Fascine (along Harbour Road) that are within 100 m of the Harbour Road Reclamation Site, which are likely to be affected by noise generated by land-based machinery managing the site. There are also a large number of residential properties on the eastern side of the Fascine, northwest of the Carnarvon Yacht Club, which may be affected by noise generated by dredging in the Fascine Upper Channel (~50–100 m away).

1.3.8 Dust and wind-blown sand

Onshore disposal of the dredged material may lead to the generation of dust following draining and drying of the dredge material. The mobilisation, transport and deposition of dust and sand in public areas can potentially cause a number of social and environmental problems. As only sandy material dredged would be disposed to the Babbage Island Spit Nourishment Site, dust generation here is likely to be to be within the range of natural aeolian sand transport experienced along the existing dunes.

The generation and transport of dust from within the Harbour Disposal Site is likely to be minimal, as the large bunds will provide shelter from the winds and will help to contain any wind-mobilised material. However, there is a greater risk of dust generation on the exposed outer bund slopes. The smaller bunds surrounding the Harbour Road Reclamation Site will be lower in height and will provide less wind-sheltering and dust-containment, so the risk of dust generation is higher at that site.

1.3.9 Odour

Flooding in Carnarvon in 2011 resulted in large amounts of wood and other organic material and debris being deposited in the Lower Fascine. The decomposing organic material has the potential to generate some odour during dredging and disposal that may be unpleasant for nearby residents, particularly at the residential properties within 100 m of the Harbour Road Reclamation Site.

1.3.10 Public safety and beach access

The operation of land-based machinery and discharge of dredged material at the onshore disposal sites poses a public safety hazard to members of the public attempting to access the disposal sites. Therefore, access to all disposal sites will be restricted while works are underway. The restriction of access to recreational beaches during onshore disposal of dredged material must be appropriately managed to minimise the adverse impact on the recreational value of the beaches.

2. Vegetation Clearing Management Actions

An application for a vegetation clearing permit has been lodged, requesting permission to clear 11.116 ha of land covering the Harbour Disposal Site and the Harbour Road Reclamation Site. The Department of Environment Regulation (DER) raised a number of factors which are at variance to their principles relating to the conservation of native vegetation. The following section of the DEMP specifically addresses each of the principles that were classed as 'at variance' or 'may be at variance' in the DER's Assessment of Application. In the Assessment, it was also recommended that appropriate management for the potential risk of acid sulfate soil be considered. This is addressed in Section 2.5.

2.1 Increased sedimentation and eutrophication within the Fascine (Principle F)

It is not expected that there will be significant sedimentation in the Fascine due to the clearing of vegetation and exposure of soil at the Harbour Road Reclamation Site and the Harbour Disposal Site, due to the measures that will be implemented to minimise sedimentation. However, to address the issue of sedimentation, bund walls will be constructed around the two disposal sites in conjunction with the vegetation clearing, as described in Section 1.1, and a fringe of vegetation ~2.5 m wide will be left uncleared at the waterline of the Harbour Road Reclamation Site (Section 4.2). The settlement period provided by the bund walls will reduce the turbidity and the total suspended solids (TSS) within the return water entering the Fascine and mangrove tidal creek.

The vegetation fringe left at the Harbour Road Reclamation Site will minimise wind and wave erosion of the exposed soil at the waterline. The bund walls will further minimise erosion by providing additional protection from wind erosion at both sites. Any sediment that flows into the Fascine as a result of these works will be dredged from the Fascine itself, and the volume of this sediment is expected to be minimal.

It has been estimated that a cyclone impact causing wind gusts in excess of 90 km/h in the vicinity of Carnarvon and Shark Bay occurs on average once every 5 years (BOM 2013a). It is considered highly unlikely that a cyclonic event will occur when the disposal sites are cleared and exposed with no stabilisation, particularly as the works will occur outside of the cyclone season which finishes at the end of March. The earliest date at which the proposed bund construction and dredging works is likely to commence is April 2014. Regardless of the cyclone season, works will not take place in hazardous weather conditions.

Nutrient levels in the return water will be monitored as outlined in Section 4.3 and any evidence of eutrophication will be monitored as outlined in Section 3.1.2. Due to the high flushing rate in the Fascine it is expected that any elutriate nutrients will be rapidly diluted and it is not anticipated that excess nutrients will cause eutrophication in the Fascine or surrounding areas.

2.2 Land erosion (Principle G)

The DER raised concerns about land degradation caused by topsoil flowing into the Fascine from the cleared areas due to heavy rainfall. This is not considered an issue as the works will be scheduled such that the vegetation will be cleared immediately prior to construction of the bund walls at both sites, greatly limiting the duration that soils are exposed.

The cleared vegetation will be stockpiled and respread over the disposed dredged material following completion of the works. This is discussed in further detail in Section 4.2. The application of vegetation to the sites will encourage revegetation and long-term stabilisation. The

line of fringing vegetation (described in Section 2.1) will also act to minimise land erosion along the waterline at the Harbour Road Reclamation Site.

Wind/silt fences will be constructed as necessary at both disposal sites to control any wind-blown material (discussed further in Section 4.2). After all dredge material has been disposed of to the Harbour Road Reclamation Site, the bund walls will be flattened to mimic the natural slope of the site near the waterline (Section 4.2).

2.3 Potential impacts on the Wooramel Seagrass Bank (Principle H)

The Wooramel Seagrass Bank is one of the largest bodies of carbonate sediment in the world. The Bank is highly diverse with 13 species of seagrass present. It is 129 km long with an average width of 8 km. It covers ~103 000 ha on the eastern shore of Shark Bay, and is situated ~10 km west of Carnarvon (Department of the Environment 2013).

A plume is expected to be generated in the Fascine by the dredging and disposal of material. This will be monitored as described in Section 3.1.1 and Section 4. A plume is not anticipated to be generated by the clearing of vegetation or by soil being exposed after clearing.

The dredging and disposal plumes are not expected to extend beyond the entrance of the Fascine, and are definitely not expected to extend to the northern section of Wooramel Seagrass Bank. The DoT undertook dredging of the Fascine entrance from June–October 2013 and this material was disposed to the ocean beach on Babbage Island (Oceanica 2013). Plume monitoring during this dredging and disposal program indicated that turbid plumes did not extend more than ~100 m offshore.

Wind strengths and directions are likely to play a significant role in the extent of the plume. The plume generated from the 2013 works extended ~1 km northwards along the shoreline under the influence of prevailing southerly winds. The typical wind directions throughout the year are predominantly southerly to south-westerly (BOM 2013b), suggesting that the wind direction will cause the plume to extend away from the Bank. Therefore, it is not expected that the proposed works will impact on the Wooramel Seagrass Bank.

2.4 Quality of surface or underground water (Principle I)

The DER raised concerns regarding an increased sedimentation of the surface water running into the Fascine, particularly in the scenario of a cyclonic event.

Management measures described in Section 4.2, e.g. spreading of cleared vegetation, construction of bund walls and construction of wind/silt fences will be undertaken and therefore it is considered unlikely that the quality of surface or underground water will be affected.

2.5 Acid sulfate soils

The sediments within the Fascine were sampled in May 2013. It was determined that dredging in the Fascine and disposal of dredged material onshore are unlikely to generate actual acid sulfate soils at the dredging or disposal sites due to the low net acidity and high acid neutralising capacity (ANC) of the sediments (BMT Oceanica 2013). Analysis indicated that the existing pH levels of the sediment to be dredged were all >7 and therefore not actually acidic. Some samples indicated a limited potential acidity with the reduced inorganic sulfur content (S_{CR}) above the Action Criteria of 0.03%. However, in all instances the ANC was sufficient to neutralise this acidity and therefore the net acidity was negative in all of the sediment samples.

3. Contractor Commitments

The following sections outline the environmental monitoring and management commitments that CGC shall adhere to during the Carnarvon Fascine maintenance dredging campaign in 2014. Communication between BMT JFA and CGC will continue throughout the bund construction and dredging works to ensure requirements are followed at all times.

3.1 Environmental monitoring

3.1.1 Water quality monitoring

Daily plume sketches

A sketch of the turbid plume at the dredging and disposal sites will be completed by CGC on every day that dredging is undertaken. When disposing to the bunded areas at the Harbour Disposal Site and the Harbour Reclamation Site, the plume sketch should be undertaken at the point at which return water reaches the Fascine or the mangrove tidal creeks. The plume sketch will be completed daily between 1100 and 1300 when sun glint on the water surface is minimal. The plume sketch will be completed on a pre-designed template (Appendix A). All fields in the plume sketch template are to be completed and the location of the dredge and disposal site at the time of the sketch must be noted clearly on the template. CGC will provide completed plume sketches to BMT JFA at the end of each week of the dredging campaign.

Following completion of the dredging campaign, BMT Oceanica will compile and digitise the plume sketches using Geographic Information Systems. The extent and duration of the plume will be defined and any issues presented in the dredging close-out report.

Daily plume photographs

BMT Oceanica and BMT JFA will install remote imagery units to capture still images at the dredging and disposal sites (Section 4.4). Therefore, CGC will not be required to take daily plume photos during maintenance dredging at Carnarvon in 2014. However, in the event that the units malfunction or there are problems with their installation, CGC will be directed to take daily plume photographs of the dredge site and current disposal site. In this case, CGC will take plume photographs on every day that dredging occurs. The plume photographs will be taken at a time (nominally between 1100 and 1300) and direction to minimise sun glint from the water surface. A digital camera with a resolution of ≥ 6 megapixels will be used to take the photographs. Wherever possible, the same camera will be used for the duration of the dredging to ensure all photographs are of the same quality. The camera should be configured such that the date and time of the photographs will be automatically stamped on the image. All photographs will be provided to BMT JFA at the end of each week throughout the dredging campaign.

BMT JFA will direct CGC as to time periods when daily plume photographs are required. In the event that photographs need to be taken by CGC, photos of the dredging and disposal sites will be taken from the locations in Table 3.1 that corresponds to the particular disposal site being used.

Table 3.1 The sites of daily plume photographs

Disposal site	Plume photograph location
Harbour Disposal Site	Where return water enters the mangrove tidal creek
Harbour Reclamation Site	Where return water enters the Fascine
Babbage Island Spit Nourishment Site	The water on either side of the beach nourishment site
Pelican Point Road Nourishment Site	The water in front of the beach nourishment site

3.1.2 Habitat monitoring

Daily habitat observations will be undertaken at both the dredging and disposal sites by CGC and the observations will be recorded on the Daily Observation Form (Appendix A). When a BMT JFA representative is on site, they will assist with the monitoring to provide quality control for the data collected by CGC. The following shall be documented on the forms:

- the presence of birds near the dredge and/or disposal site
- evidence of any erosion or damage to the mangrove habitats near the disposal sites
- excessive algae growth or the accumulation of foam, oil and/or litter in any of these areas:
 - at or near the dredging site within the Fascine
 - within the settlement ponds at the disposal sites
 - at or near the point of return water discharge into the Fascine or mangrove tidal creeks.

If any of the above are observed, CGC should also take a photo and record the time and date of the occurrence. CGC shall verbally notify BMT JFA of issues within 24 hours and provide BMT JFA with written notification and photographic evidence as soon as possible/practical. This will not be necessary for bird sightings, which should be noted and reviewed with the submission of weekly environmental monitoring data to BMT JFA. The contingency measures outlined in Section 6 of this DEMP will be implemented by both CGC and BMT JFA/BMT Oceanica to manage the habitat disturbance or damage.

3.2 Environmental management

CGC and any sub-contractor used to aid with the clearing of vegetation will complete the works under the Contract in such a way as to minimise any impacts on the surrounding environment and to comply with any of the requirements detailed by the relevant regulatory authorities.

3.2.1 Environmental incidents

If an environmental incident (including leak/failure of bunds or leakage of material en route to disposal site) occurs, immediate (within 1 hour where possible/practical) verbal notification will be provided to BMT JFA. Written notification of any incident will follow within 24 hr. A summary of the contingency measures to be implemented in the event of certain incidents is outlined in Section 6 of this DEMP.

3.2.2 Vegetation

Vegetation growing within the boundaries of the Harbour Road Reclamation Site and the Harbour Disposal Sites will be cleared before the disposal of dredged material commences at those sites (Section 2). Sediment and vegetation within the disposal sites will be excavated using land-based machinery and the uprooted vegetation and topsoil will be stockpiled outside the disposal site for subsequent spreading. The topsoil will be retained as this typically holds seeds that can aid in the natural revegetation of cleared areas. The vegetation-free sediment will then be used to construct bunds around the disposal sites. No clearing will be undertaken prior to the approval of the permit application or after the expiry of the permit. CGC will ensure no damage, smothering or removal of vegetation occurs in any areas not covered by the clearing permit.

3.2.3 Dust and windblown material

CGC will implement procedures to control excess dust and wind-blown material generated at the dredge or disposal site by the works. Dust control measures must comply with the standards required by the relevant regulatory authorities, including the DER. BMT JFA will implement land surface stabilisation measures at the disposal sites, as outlined in Section 4.2 of this DEMP, and CGC will employ these measures at all times.

If CGC receives any public complaints about dust generated by dredging and disposal activities, they should notify BMT JFA as soon as possible. The contingency measures outlined in Section 6 will then be implemented by BMT JFA and CGC.

3.2.4 Noise

CGC will restrict dredging operations in the Fascine to between 0600 and 1800, Monday to Saturday, unless otherwise approved by BMT JFA. CGC will restrict the operation of land-based machinery at the Harbour Road Reclamation Site to between 0800 and 1800 Monday to Friday, to minimise disturbance to residents living within 100 m of the site.

CGC will ensure equipment and silencers are in good working order to maintain acceptable noise levels. The control of noise practices will, at all times, be in accordance with Australian Standards 1269 and 2436, Environmental Protection (Noise) Regulations 1997, and any additional requirements of the local government authority and relevant regulatory authorities. If CGC receive any public complaints about noise generated by dredging and disposal activities, they must notify BMT JFA immediately (within 1 hour where possible/practical). The contingency measures outlined in Section 5 will then be implemented.

3.2.5 Rubbish and hazardous waste

CGC will implement procedures to maintain clean and tidy work areas, including the safe storage of all potentially hazardous substances at all times. CGC will also ensure the work site is clear of rubbish at the end of the dredging campaign.

3.2.6 Hydrocarbons

CGC will inspect and maintain dredge equipment daily and will follow their approved refuelling procedures (CGC 2013a) to ensure no hydrocarbon spills occur. All fuels, oils and lubricants on site must be appropriately stored such that they do not pose a threat to the health and safety of personnel and the environment. A spill kit with all necessary materials for mitigation of accidental spillage of hydrocarbons will be kept on site at all times. If a hydrocarbon spill occurs, CGC will immediately follow the approved spill response and clean-up procedures to minimise environmental damage as outlined in the Project Execution Plan (PEP) (CGC 2013b). CGC will also verbally notify BMT JFA immediately (within 1 hour where possible/practical) and will call the DoT Marine Safety Oil Spill Response Unit (24 hour reporting number: 08 9480 9224) if the spill is likely to impact coastal waters. CGC will provide written notification of the incident to BMT JFA within 24 hours.

3.2.7 Public safety and beach access

Public safety during dredging works will be managed primarily by CGC, and will be monitored throughout the campaign by BMT JFA. CGC will conform to the approved Safety Management Plan as outlined in the PEP (CGC 2013b) at all times.

CGC will erect safety signage at the disposal sites to warn the public of the works. CGC may also be required to erect temporary safety fencing to around all or part of the disposal sites to restrict public access, as directed by BMT JFA. Any restriction of access to Babbage Island Spit Nourishment Site will be limited to the nourishment area only, to minimise the impact of the works on beach users. Public access to the small recreational beach between the Harbour Road public boat ramp and the Harbour Road Reclamation Site will be maintained at all times.

In the event of a safety issue arising, CGC will verbally notify BMT JFA immediately and will follow the incident contingency plan outlined in Section 6.

4. Principal Commitments

4.1 Stakeholder consultation

BMT JFA and BMT Oceanica will consult local government and community groups about the dredging operation to help manage any public concerns relating to the works. Stakeholders that shall be consulted include:

- SoC
- Gascoyne Regional Manager for the DoT
- Local Department for Parks and Wildlife (DPaW) office
- Carnarvon Land Conservation District Committee Chairperson
- any other community groups (e.g. watersports clubs, commercial fishermen) that may be affected by or interested in the works
- Carnarvon Marina Manager/Commodore.

Stakeholders shall be notified of the commencement of dredging and disposal works, and consulted regularly throughout the works as required. Public information signs describing the nature of the works shall be displayed at all dredging and disposal sites throughout the duration of the campaign.

4.2 Land surface stabilisation

BMT JFA will implement land surface stabilisation measures at the disposal sites to minimise wind and water erosion of disposed sediment, which could also cause increased sedimentation within the Fascine if not managed efficiently (Section 2). As outlined in the DEIA (BMT Oceanica 2013) and Section 1.3.8, the likelihood of dust generation differs at each of the potential disposal sites, so the land surface stabilisation measures will vary accordingly.

4.2.1 Harbour Disposal Site

The land surface within the Harbour Disposal Site will be sheltered by the large bunds surrounding the site, which will minimise wind erosion and help contain any wind-mobilised material (Section 1.3.8). Therefore, no active stabilisation of the land surface after the placement of dredged material will be required. However, vegetation cleared from the site will be spread evenly across the more exposed outer bund areas, to provide a barrier to erosion by wind and overland flow. This will be undertaken immediately after the bunds have been constructed. Application of the cleared vegetation will also encourage revegetation and long-term stabilisation of the land surface as described above.

Ongoing management of the Harbour Disposal Site in the long-term is not proposed, as the site is expected to be used again for the disposal of dredged material within the next 5 years, and may eventually be used for commercial development.

Wind/silt fences will be constructed where necessary at the site to control any wind-blown material (Section 2.2). Fencing is likely to be in the form of a series of 0.5–1.0 m high silt fences spaced ~20 m apart. The orientation and location of these fences will be dependent on the prevailing wind direction throughout the dredge operation.

4.2.2 Harbour Road Reclamation Site

After the placement of dredged material at the site, the cleared vegetation (which shall be stockpiled) will be spread evenly across the new land surface over the entire site to provide a

barrier to erosion by wind and overland water flow. The application of this vegetation to the site will also encourage revegetation and long-term stabilisation of the land surface by:

- encouraging seeds to fall from native cleared vegetation onto the land surface
- trapping wind-blown seeds
- encouraging seed germination by aiding soil moisture retention during the day and heat retention during cool nights
- protecting seedlings from direct sun, wind and grazing animals.

Wind/silt fences will also be constructed where necessary at the site to control any wind-blown material (Section 2.2). They will be in the same format as the wind/silt fences constructed at the Harbour Disposal Site.

A fringe of vegetation will be left along the waterline of the Harbour Road Reclamation Site to minimise the impacts on shoreline erosion from the disposal works. Bund walls at this site will also be contoured after all dredge material has been disposed. The contouring of the bund walls will be undertaken to reduce the gradient from 1:3 to 1:1, to match the natural slope of the area and thereby reduce the potential for enhanced land erosion. Ongoing management of the site in the long term is not proposed, as commercial development is intended on the reclaimed land.

4.2.3 Pelican Point Road Nourishment Site

Erosion and wind transport of sediment is not expected to cause any social or environmental problems at the Pelican Point Road Nourishment Site (Section 1.3.8). However, some dune stabilisation measures such as brushing, matting or replanting may be implemented on the rebuilt dune system by SoC to reduce wind and water erosion.

4.3 Water sampling and analysis

A water sampling program will monitor the impacts on water quality during the dredging and disposal campaign. The water body receiving the return water from the Harbour Road Reclamation Site and the Harbour Disposal Site will be sampled once before dredging commences to provide a baseline concentration of turbidity (TSS) and nutrients (ammonium (NH_4) and nitrogen oxides (NO_x)). The water body will then be sampled approximately fortnightly while discharge to the water body occurs. The sample site should not be more than ~20 m away from the discharge point and the location should be as similar as possible for each sampling event. TSS and nutrients will be sampled on each occasion at a NATA accredited laboratory.

The water quality results will not be immediately available for review by BMT Oceanica due to laboratory turnaround times, and will therefore not be subject to action criteria. However all data will be reviewed in the dredging closeout report and the results will assist in the management of water quality impacts in future dredging campaigns. The other environmental monitoring commitments (see Section 3.1, Section 4.4 and Section 4.5) will provide more immediate notification of any water quality impacts.

4.3.1 Turbidity

The turbidity of the return water will be assessed by measuring the TSS concentrations in the water body samples. A trigger has not currently been set for TSS levels (as the Fascine is already a highly turbid environment), however the aerial photography, daily plume sketches and daily images sent from the remote imagery units will be used as an immediate notification of extensive turbid plumes. Concentrations will also be compared to the baseline TSS levels taken prior to dredging. Due to the short period of time that each disposal site will be used (approximately 2–3 weeks), elevated turbidity levels are not expected to have an impact on nearby seagrass habitats.

4.3.2 Nutrients

Concentrations of ammonium (NH_4) and nitrogen oxides (NO_x) in the return water will be measured from samples of the water body. Testing of phosphorus concentration is not proposed, as Western Australian marine waters are primarily nitrogen-limited (Lourey et al. 2006) so the release of phosphorus is not likely to stimulate further algal growth. Concentrations of NH_4 and NO_x measured in the water samples will be compared against the baseline nutrient concentrations. Monitoring using the Daily Observation Forms will be used as an immediate indicator for elevated nutrient levels (in the form of nuisance algal blooms). As discussed in Section 1.3.2, any nutrients in the return waters are likely to be rapidly diluted and dispersed via tidal flushing in the tidal creek and the Fascine, and the risk of eutrophication is expected to be very low. Due to the short time periods that each disposal site will be discharged to, elevated nutrient levels are not expected to harm the local environment or cause prolonged algal blooms.

4.4 Remote imagery capture

A remote imagery unit shall be installed on the dredge to capture a visual record of environmental conditions at the dredging site. A second unit may be placed at the active disposal site. It is expected that the unit will be installed onto a light pole, which will provide sufficient height to gain a suitable field of view for monitoring turbidity. The unit will capture time- and date-stamped images to a resolution of up to 8 megapixels at set intervals. Daily (low-resolution) images from the unit will be sent to BMT Oceanica. Following retrieval of the unit, the high-resolution images will be compiled to form a time-lapse video of the dredging campaign. This will allow a visual review of the environmental conditions before, during and after dredging.

4.5 Aerial photography

Semi-oblique aerial photography will be captured three times during the dredging campaign (while dredging works are actively occurring), to capture a large-scale visual record of the works and the spatial extent of turbidity. The aerial photography will be captured when each of the disposal sites are being used and should occur ~2–3 days after discharge has started to each site. This photography will also provide quality control for the plume sketches provided by CGC. Additional aerial photography may be required if the dredging works continue for longer than the estimated 8-week time period. Aerial photography should be undertaken in accordance with the procedures outlined in Appendix B.

4.6 Reporting

Significant environmental incidents (including leak/failure of bunds at disposal site/large leakage of material en route to disposal site) shall be reported as soon as practicable by BMT Oceanica to the DER local office (if the leakage is large enough to create an environmental/traffic hazard this should also be reported to the SoC). All environmental monitoring data shall be reviewed weekly by BMT Oceanica to determine whether the dredging works are having a significant impact on the environment. Any public complaints and issues will be compiled into a complaints register. The DPaW, DER and SoC will be notified of any public complaints and the response. BMT JFA will also request notification from the SoC if they receive any complaints as they will also be compiled into the complaints register. BMT Oceanica will compile all environmental monitoring data in the dredging closeout report.

5. Monitoring and Management Summary

A summary of the environmental monitoring and management measures to be implemented during the Fascine dredging campaign is provided in Table 5.1.

Table 5.1 Monitoring and management requirements for the Fascine dredging campaign

Monitoring	Location	Timing/frequency	Responsibility
Plume sketch	Dredge and disposal sites	Daily during dredging	CGC
Plume photographs	Dredge and disposal sites	Daily during dredging	CGC
Habitat monitoring	Dredge and disposal sites	Daily	CGC
Sampling and testing of disposal site return water	Outlet at disposal site	Twice monthly	BMT JFA and BMT Oceanica
Remote imagery capture	Dredge site (and possibly disposal site)	Half-hourly during daylight hours during dredging	BMT Oceanica
Aerial photography	Dredge and disposal sites	Twice during campaign	BMT JFA
Management	Location	Timing/frequency	Responsibility
Dust mitigation	Disposal sites	Duration of campaign	CGC
Land surface stabilisation	Disposal sites	Immediately after dredging	BMT JFA
Hydrocarbon spillage	Dredge and disposal sites	Duration of campaign	CGC
Noise mitigation	Dredge and disposal sites	Duration of campaign	CGC
Stakeholder consultation	Carnarvon region	Before, during and after dredging	BMT JFA and BMT Oceanica

5.1 Environmental monitoring and management timeline

An indicative timeline for the proposed environmental monitoring and management actions associated with the vegetation clearing for the Fascine dredging campaign is provided in Table 5.2. This timeline is ordered chronologically and should be considered approximate.

Table 5.2 Indicative timeline of environmental monitoring and management for the clearing of vegetation

Action		Estimated duration
Clearing of vegetation		2 weeks
Construction of bund walls		3 weeks
Application of cleared vegetation to outer bund slopes (Harbour Disposal Site)		1 week
Dredge area	Disposal area	Estimated duration
Upper Fascine Channel	Harbour Disposal Site	2–3 weeks
Upper Fascine Channel	Harbour Road Reclamation Site	2–3 weeks
Lower Fascine Channel	Pelican Point Road Nourishment Site	2–3 weeks
Flattening of bund walls		2 days
Application of cleared vegetation and wind/silt fences		2 weeks
Remote imagery capture		Hourly
Visual habitat monitoring		Daily
Sampling and testing of return water body		Fortnightly
Aerial photography		Twice during campaign
Environmental reporting		After dredging ceases

6. Contingency Measures

CGC shall notify BMT JFA immediately of any environmental incidents. A number of contingency measures shall be implemented in the event of any environmental issues or incidents during the dredging (Table 6.1). The cause for the incident will be identified and, where possible, rectified immediately under the direction of the BTM JFA/DoT. If necessary, the dredging and disposal operations will cease until the required contingency measures can be implemented. The DER, DPaW and the SoC will be notified of any incident relevant to their department.

Table 6.1 Environmental contingency measures for the Fascine dredging campaign

Incident	Contingency measures
Weekly review of plume sketches/remote aerial imagery indicates continuous and excessive turbidity adjacent to dredging and/or disposal sites	<ul style="list-style-type: none"> BMT Oceanica to notify local DPaW, DER and SoC if issue persists BMT JFA to revise dredging or disposal strategy and implement turbidity control measures CGC to implement measures as directed by BMT JFA
Monitoring indicates erosion or damage to wetland habitats and/or migratory wading birds and their habitats	<ul style="list-style-type: none"> CGC to notify BMT JFA immediately BMT Oceanica to develop mediation strategies in conjunction with the local DPaW
Fuel spill to the environment	<ul style="list-style-type: none"> CGC to notify BMT JFA immediately and the DoT Marine Safety Oil Spill Response Unit (24 hour reporting number: 08 9480 9224) CGC to manage the spill using items in the spill kit if practical
Leak/failure of bunds at disposal site causing discharge of significant quantities of dredged material to mangrove habitat	<ul style="list-style-type: none"> CGC to notify BMT JFA immediately CGC to cease dredging and repair leak while the leak is repaired CGC to clean up spilled material if possible BMT Oceanica to notify the DPaW/DER if necessary
Leakage of material en route to disposal site	<ul style="list-style-type: none"> CGC to notify BMT JFA immediately CGC to clean up leaked material if practicable BMT JFA to contact DoT Pollution Response Branch and the SoC/DER if necessary
Public safety issue identified	<ul style="list-style-type: none"> CGC to notify BMT JFA immediately CGC to halt the activity posing safety risk until the safety issue is resolved CGC to review and rectify safety measures
Public complaints (e.g. regarding noise, dust or odour) or high level of community concern with dredging and disposal activities	<ul style="list-style-type: none"> CGC to notify BMT JFA if they receive complaint BMT JFA is to assess complaints and respond appropriately BMT JFA is to maintain a complaints register and to notify SoC of any serious complaints BMT Oceanica is to notify DPaW and DER of any serious registered complaints CGC to modify operations to address the cause for complaint if possible

7. References

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- DALSE, JFA (2003) Maintenance Dredging Teggs Channel & Carnarvon Boat Harbour Environmental Impact Assessment. Prepared for Department for Planning and Infrastructure by DAL Science & Engineering Pty Ltd and Jesz Fleming & Associates Pty Ltd, Report No 301/1, Perth, Western Australia, January 2003
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- Oceanica (2012) Department of Transport Maintenance Dredging – Environmental Management Framework. Prepared for Department of Transport by Oceanica Consulting Pty Ltd, Report No 179_004/2, Perth, Western Australia, February 2012
- Oceanica (2013) Carnarvon Boat Harbour, Entrance Channel, Teggs Channel and Bell Mouth Maintenance Dredging Program – Dredging Environmental Management Plan. Prepared for Department of Transport by Oceanica Consulting Pty Ltd, Report No 2013_03_001/1_Rev1, Perth, Western Australia, July 2013

Appendix A

Plume sketch template and Daily Observation Form



CARNARVON MAINTENANCE DREDGING DAILY ENVIRONMENTAL MONITORING FORM

Date:		Time:		Name:	
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Part A:

Weather	Sunny <input type="checkbox"/>	Overcast <input type="checkbox"/>	Raining <input type="checkbox"/>
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Current dredge area	Fascine Upper Channel <input type="checkbox"/>	
	Fascine Lower Channel <input type="checkbox"/>	
Dredge position	Easting (m WGS84)	Northing (m WGS84)

Disposal site	Harbour Disposal Site <input type="checkbox"/>
	Harbour Road Reclamation <input type="checkbox"/>
	Babbage Island Spit <input type="checkbox"/>

Birds (of any species) present?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	Take photo <input type="checkbox"/>	No action required

Part B: HARBOUR DISPOSAL SITE (complete if disposing here)

Algal bloom/foam/oil/litter present (circle): • At/near dredging site? • Within settlement ponds? • At/near return water outlets?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	Take photo <input type="checkbox"/>	No action required
	Size (m ²):	
	Colour:	
Damage/erosion of mangroves?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	Take photo <input type="checkbox"/>	No action required
	Describe damage:	

Maintenance Dredging Plume Sketch
Use Black Felt Tip Pen

Date:

Time:

Name:

- Disposal Site Plume Sketched ☐
Dredging Site Plume Sketched ☐
Disposal Site Photo(s) Taken ☐
Dredging Site Photo(s) Taken ☐

Draw Wind Direction (From):



WIND SPEED (kn) WAVE

- | | | |
|---------|----------------------------|--------------------------|
| <1 - 2 | Flat - Ripples with Crests | <input type="checkbox"/> |
| 3 - 6 | Small Wavelets | <input type="checkbox"/> |
| 7 - 10 | Large Wavelets | <input type="checkbox"/> |
| 11 - 15 | Small Waves | <input type="checkbox"/> |
| 16 - 26 | Moderate to Long Waves | <input type="checkbox"/> |

- TIDE High ☐ Mid ☐ Low ☐
Flood ☐ Slack ☐ Ebb ☐

Notes & Comments:

Projection : UTM49 - Datum : GDA94

Produced by Oceanica Consulting
Production : 26 Aug 2013, 5M, AT, DT
Imagery : Landgate Aug 2012
Project Ref : 301 02_001_01temporA4

This map is not to be used for
navigational purposes. Positional
accuracy should be considered
as approximate.



Government of Western Australia
Department of Transport

200 100 0 200
Scale in metres
Grid Scale - 100m

Appendix B

Aerial photography procedures

Aerial Photography Instructions

The Department of Transport's (DoT) Environmental Management Framework (EMF; Oceanica 2012) requires semi-oblique aerial photography of the dredge and disposal site to be captured on at least one or two occasions during the dredging campaign, and potentially more depending on the length/complexity of the campaign. The photographs will provide a visual record of the spatial extent of the dredging and disposal site plumes and will be included in the Close-Out report. The aerial photography of the dredge/disposal site and the adjacent coastline should be captured:

- by DoT nominated personnel;
- using a good quality digital camera with a resolution of ≥ 6 megapixels;
- while the dredge is operating at full capacity;
- during clear and sunny weather with calm seas and low sun glint (early morning/late afternoon) to maximise the visibility of the plume;
- at a semi-oblique angle ($\sim 45^\circ$); and
- through an open window of the aircraft.

The pilot should be instructed to fly as low as conditions permit and circle the dredge site and the disposal site a minimum of four times. The DoT nominated person should capture as many photographs as possible of the plumes at both the dredge and disposal sites as well as the coastline and offshore areas as the aircraft is circling the sites. Sun glint can significantly affect the quality of the photographs, therefore care needs to be taken that the plumes are adequately captured from a number of angles as the aircraft circles. Care should also be taken to minimise shadowing in the photographs that may be caused by tall structures along the coast.

In addition to photographing the dredge and disposal areas, the coastline either side of Carnarvon should be photographed where possible. The ideal aerial flight path extent for the coastline either side of Carnarvon is shown in Figure 1. Where it is not possible to fly the entire length of the path indicated, the flight path should extend as far along the coast either side of the dredge site as possible.

Examples of successful aerial photography during some of DoT's maintenance dredging campaigns are shown in Figure 1, Figure 2, and Figure 3.



Figure 1 The ideal aerial flight extent for the coastline either side of Carnarvon



Figure 1 An example of successful aerial photography: The dredge (left) and disposal site (right) at Beadon Creek, Onslow, 2012



Figure 2 An example of successful aerial photography: The dredge (left) and disposal site (right) at Kalbarri 2012



Figure 3 An example of successful aerial photography: The dredge (left) and disposal site (right) at Bandy Creek Boat Harbour 2007



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Clearing Permit Decision Report

1. Application details

1.1. Permit application details

Permit application No.: 5631/2
Permit type: Purpose Permit

1.2. Proponent details

Proponent's name: Oceanica Consulting Pty Ltd

1.3. Property details

Property: LOT 1337 ON PLAN 91032 (House No. 107 HARBOUR SOUTH CARNARVON 6701)
Local Government Area: Shire of Carnarvon
Colloquial name:

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
1.809		Mechanical Removal	Miscellaneous
11.116		Mechanical Removal	Stockpile / Bulk earthworks

1.5. Decision on application

Decision on Permit Application: Grant
Decision Date: 24 April 2014

2. Site Information

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description	Clearing Description	Vegetation Condition	Comment
Mapped Beard Vegetation Association 308 is described as mosaic - shrublands; <i>Acacia sclerosperma</i> sparse scrub/succulent steppe; saltbush and bluebush (Shepherd et al 2001).	The application to clear 12.925 hectares is for the purposes of dredge material disposal, dredge pipeline construction and vehicle access.	Completely Degraded: No longer intact; completely/almost completely without native species (Keighery 1994) To Good: Structure significantly altered by multiple disturbances; retains basic structure/ability to regenerate (Keighery 1994).	The amended application is to increase the clearing size by 1.809 hectares to 12.925 hectares for the additional purposes of dredge pipeline construction and vehicle access. Site 1 is to the east of Harbour Road and the vegetation is in a completely degraded to degraded (Keighery 1994) condition. This site has been used for dredge material disposal in the past and sparse regrowth has occurred. Site 2 is to the west of Harbour Road and is in good (Keighery 1994) condition, consisting of a variety of coastal shrub species, including <i>Tecticornia</i> sp. (samphire), <i>Acacia sclerosperma</i> (limestone wattle), <i>Ipomoea pes-caprae</i> (beach morning glory), <i>Scaevola spinescens</i> (currant bush), <i>Spinifex longifolius</i> (beach spinifex) and <i>Avicennia marina</i> (white mangrove). This site has been subject to disturbance from weed invasion (<i>Cenchrus ciliaris</i> - buffel grass) and recreational activities such as fishing and walking dogs. The description and condition of the vegetation has been determined by advice and photos received from the applicant (Oceanica Consulting 2013), advice from the Carnarvon Land Care District Council (Carnarvon LCDC 2013) and aerial imagery.

3. Assessment of application against clearing principles

Comments This amendment has been made to increase the clearing size by 1.809 hectares for the purposes of dredge pipeline construction and vehicle access.

The assessment against the clearing principles has not changed, the findings from the previous assessment is still relevant and can be found in Clearing Permit Decision Report CPS 5631/1.

Planning instrument, Native Title, Previous EPA decision or other matter.

Comments The assessment against Planning and Other Matters has not changed and can be found in Decision Report CPS 5631/1.

No submissions have been received.

4. References

- BMT Oceanica Pty Ltd (2013) Carnarvon Fascine Maintenance Dredging - Dredging Environmental Management Plan, prepared for Department of Transport, October 2013 (DER Ref: A686484).
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