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Busselton Eastern Link Project

Construction Environmental Management Plan

Prepared for
City of Busselton
by Strategen

January 2018

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ENVIRONMENTAL

Busselton Eastern Link Project

Construction Environmental Management Plan

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January 2018

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Client: City of Busselton

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
				Form	Date
Draft Report	A	For client review	D White / H Morgan	Electronic	5 January 2018
Final Report	0	For submission with EPA referral	D White / H Morgan	Electronic	5 January 2018

Filename: CIB16605_01 R006 Rev 0 - 5 January 2018

Executive Summary

This Construction Environmental Management Plan (CEMP) has been prepared to support referral of the Busselton Eastern Link Project (the Proposal) under s 38 of the *Environmental Protection Act 1986* (EP Act). The CEMP demonstrates that appropriate management measures will be in place during construction of the Proposal to ensure that the Environmental Protection Authority's (EPA's) objectives for key environmental factors will be achieved.

Table ES-1 provides a summary of the preliminary key environmental factors, objectives and CEMP provisions for the Proposal.

Table ES-1: Construction environmental management summary

Required information	Response
Title of proposal	Busselton Eastern Link Project
Proponent name	City of Busselton
Purpose of the CEMP	To support referral of the Proposal under s 38 of the EP Act and demonstrate that appropriate management measures will be in place during construction to ensure that the EPA's objectives for key environmental factors will be achieved.
Preliminary key environmental factors and CEMP objectives	**Flora and Vegetation** • Minimise impacts to flora and vegetation outside of Development Envelope as far as practicable. **Terrestrial Environmental Quality** • Minimise impacts from acid sulfate soils, monosulfidic black ooze and site contamination as far as is practicable. **Terrestrial Fauna** • Minimise impacts to terrestrial fauna during construction as far as practicable **Inland Waters Environmental Quality** • Minimise impacts to water quality and aquatic ecology of Lower Vasse River and Vasse River Delta Wetlands as far as is practicable. **Social Surroundings** • Minimise disturbance to nearby residential, commercial and heritage properties and impacts to amenity of Vasse River and wetlands as far as is practicable.
Key provisions in the CEMP	**Management target 1:** • No environmental impacts occur that are attributable to lack of awareness in construction personnel. **Management target 2:** • No native vegetation is cleared outside of designated clearing areas. **Management target 3:** • No construction vehicle or plant access occurs outside of designated access tracks / areas. **Management target 4:** • Revegetation and Rehabilitation Plan targets are met. **Management target 5:** • No weed infestation present within Development Envelope at the completion of construction. **Management target 6:** • Acid Sulfate Soil and Dewatering Management Plan targets are met. **Management target 7:** • Monosulfidic Black Ooze Management Plan (if required) targets are met. **Management target 8:** • All suspected contamination is characterised and appropriately managed. **Management target 9:** • No mortality of threatened, priority or migratory fauna species during clearing works. **Management target 10:** • All fauna identified as injured, abandoned or visibly distressed is handled by a qualified fauna spotter / catcher or in accordance with DBCA wildcare hotline instruction.

Required information	Response
	Management target 11: • No mortality of threatened, priority or migratory fauna species in trenches or excavations. **Management target 12:** • Turbidity of Vasse River outside of silt curtains remains comparable to reference point upstream. **Management target 13:** • No noticeable sediment deposition in wetlands adjacent to Development Envelope. **Management target 14:** • No spills or leaks of hazardous materials or wastes enter the Vasse River, Vasse River Delta Wetlands or groundwater. **Management target 15:** • Translocation management targets for Carters Freshwater Mussel are met. **Management target 16:** • No complaints received due to lack of notification of property owners. **Management target 17:** • All complaints received are documented and responded to within 24 hours for severe impacts and five business days for minor impacts. **Management target 18:** • No repetitive / sustained complaints received due to dust, noise or traffic and parking impacts. **Management target 19:** • Any burials uncovered during excavation works are managed in accordance with directions of Aboriginal cultural monitors.

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1. Context, scope and rationale

This Construction Environmental Management Plan (CEMP) has been prepared to support referral of the Busselton Eastern Link Project under s 38 of the *Environmental Protection Act 1986* (EP Act). The CEMP demonstrates that appropriate management measures will be in place during construction of the Proposal to ensure that the Environmental Protection Authority's (EPA's) objectives for key environmental factors will be achieved.

The CEMP has also been prepared in accordance with *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA 2017).

1.1 Proposal

This CEMP addresses the scope of the Proposal as presented in the Environmental Review Document (Strategen 2018) that supports the s 38 referral. A summary of the Proposal is presented below.

The City of Busselton propose to construct a new two-lane road crossing linking Causeway Road to Cammilleri Street including a new bridge over the Vasse River in Busselton, Western Australia ('the Proposal'). The Proposal is located directly south of the Busselton CBD and approximately 1 km from the coastline of Geographe Bay (Figure 1).

The new bridge will have a width of 12 m and a span of 22 m between abutments. The new road will run approximately 240 m in length to connect Causeway Road to Cammilleri Street. The Proposal involves clearing of approximately 0.56 ha of native vegetation over a total disturbance envelope of approximately 2.64 ha (Figure 2).

The Proposal will be constructed over a period of 12 to 18 months and involve the following key activities:

- establish construction compound south of Rotary Par
- construct road embankment south of the river using imported fill material
- remove soft silt and mud from river banks and bed and construct temporary platforms into the river
- drive pre-cast concrete piles into the river banks then construct reinforced concrete abutments on top of the piles
- construct temporary hard stand near the river's southern bank to provide crane access
- lay large steel girders between abutments using a crane on the river's southern bank
- construct reinforced concrete bridge deck on top of steel girders, and concrete slabs on north and south approaches
- construct asphalt pavements, vehicle / cyclist barriers, kerbing, stormwater drainage and bio-filtration gardens
- install lighting and electrical services
- provide landscaping and erosion protection, including fauna under-passage and planting of Peppermint (*Agonis flexuosa*) trees
- remove temporary hard stand, construction platforms and construction compound.

Construction vehicle access will use Causeway Road as much as possible and minimise use of Causeway Bridge and Peel Terrace. Construction will be limited to between 7:00am to 7:00pm Monday to Friday, with construction on Saturdays by exception and limited to between 7:00am to 7:00pm. No construction works will be undertaken on Sundays or public holidays.

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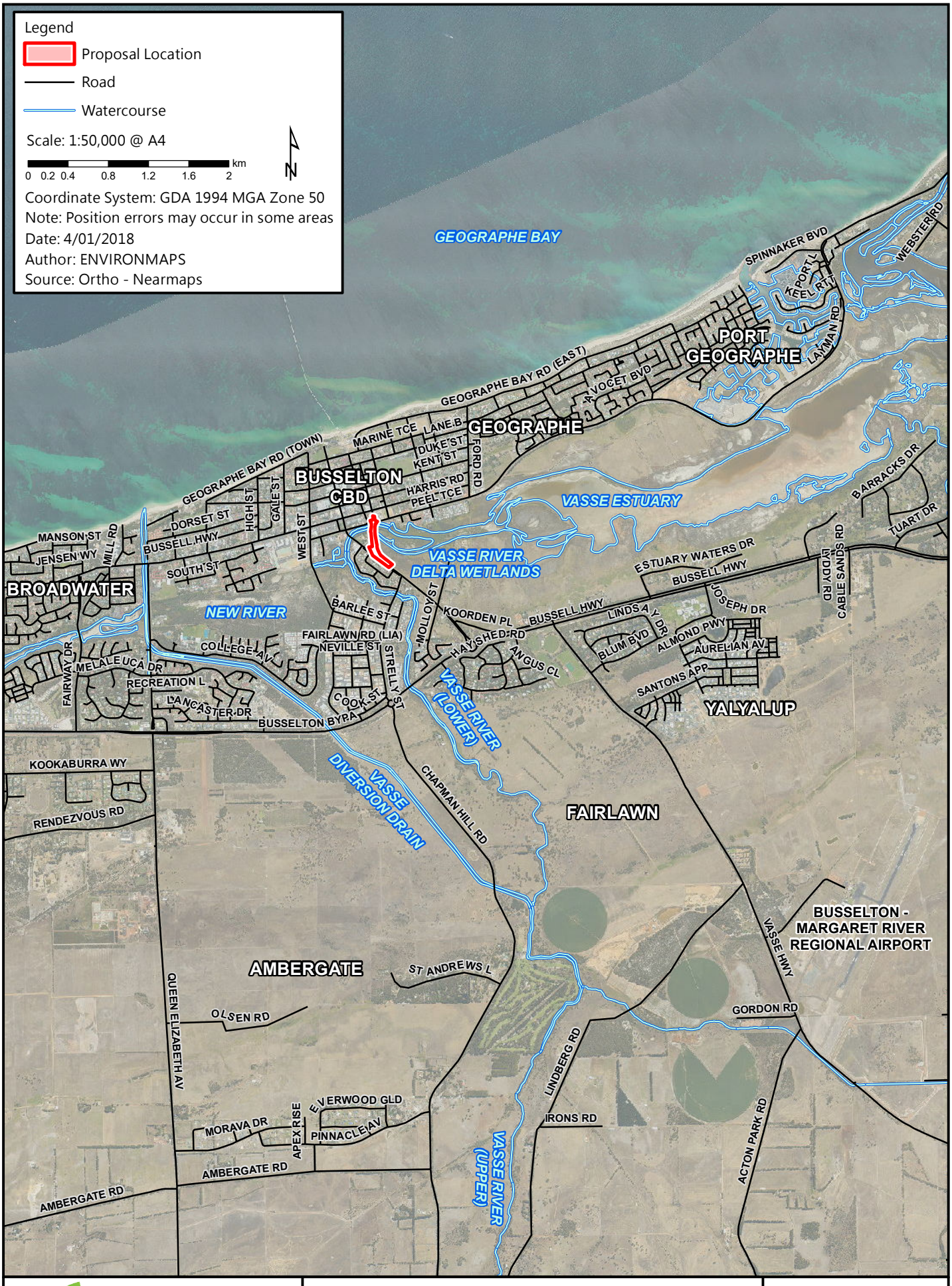

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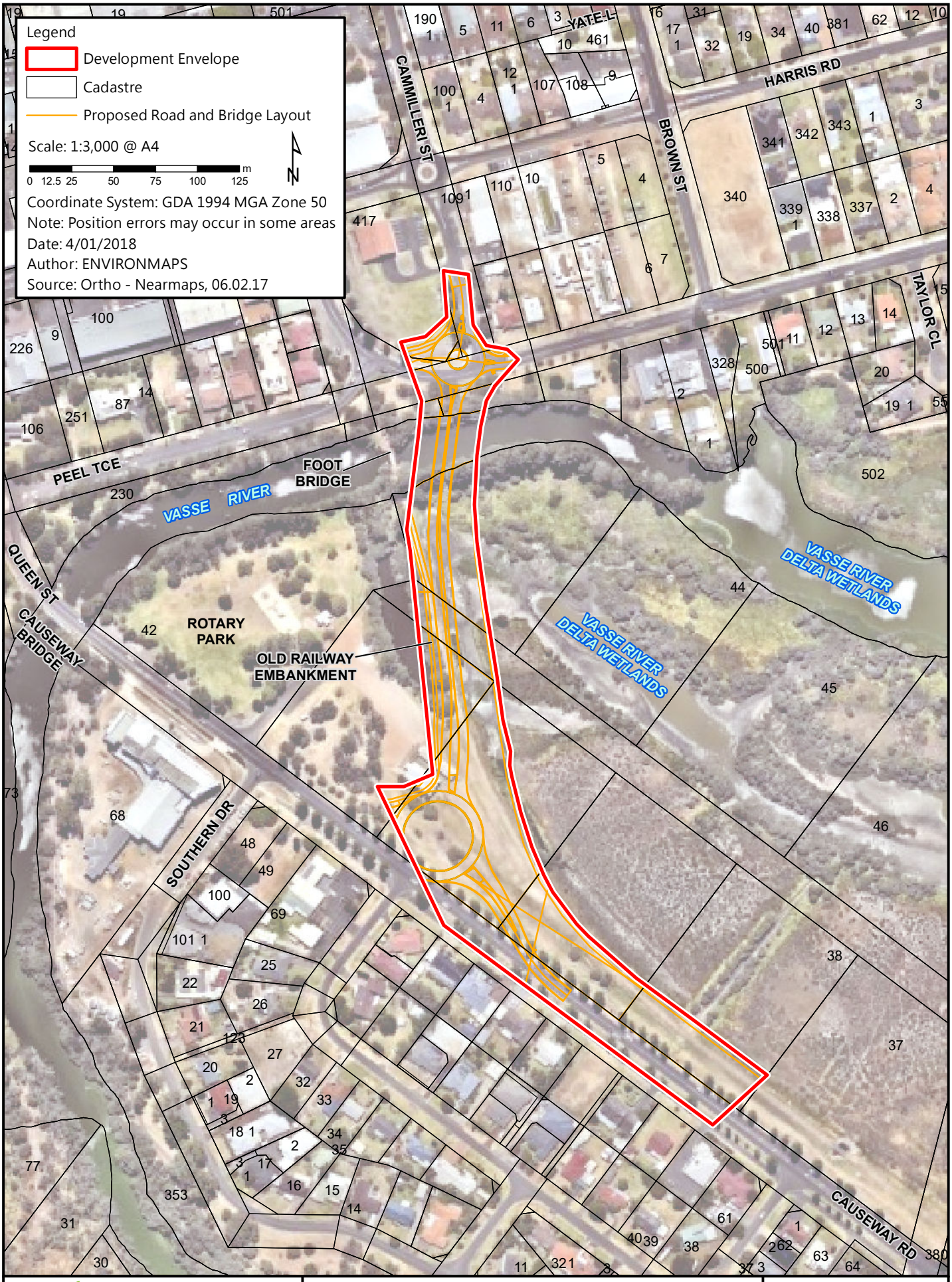

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Busselton Eastern Link Project
Construction Environmental Management Plan
Proposal Development Envelope and Layout

Figure 2

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1.2 Key environmental factors

Six preliminary key environmental factors are identified in the referral for the Proposal, as follows:

1. Flora and Vegetation.
2. Terrestrial Environmental Quality.
3. Terrestrial Fauna.
4. Hydrological Processes.
5. Inland Waters Environmental Quality.
6. Social Surroundings.

Of these factors, Hydrological Processes is identified with respect to potential impacts during operations, with impacts during construction expected to be insignificant (Strategen 2018). Accordingly, this CEMP does not include provisions for Hydrological Processes.

Table 1 presents the five preliminary key environmental factors relevant to construction, the Proposal activities that would affect the factors and the site-specific environmental values, uses and sensitive components that will be affected.

Table 1: Key environmental factors, construction activities and site characteristics

Preliminary key environmental factor	Proposal construction activities that would affect the factor	Site specific environment values, uses and sensitive components
Flora and Vegetation	• Clearing of up to 0.56 ha of native vegetation. • Soil erosion and sediment. • Storage and handling of hazardous materials and wastes.	• Vegetation comprises planted and remnant vegetation varying in condition from completely degraded to very good, representing 0.01% of estimated remaining extent of Vasse vegetation complex. • No threatened or priority ecological communities or flora species will be impacted.
Terrestrial Environmental Quality	• Excavation, dewatering and dredging of riverine sediments. • Soil erosion and sediment. • Storage and handling of hazardous materials and wastes.	• Presence of acid sulfate soils (ASS) on land and potential presence of monosulfidic black ooze (MBO) in river sediments.
Terrestrial Fauna	• Clearing of up to 0.56 ha of native vegetation including up to 17 Peppermint trees (0.1 ha). • Construction vehicle movements. • Construction plant operation. • Soil erosion and sediment. • Storage and handling of hazardous materials and wastes.	• Peppermint trees comprise habitat for threatened species Western Ringtail Possum. • Western Ringtail Possums identified during fauna survey. • No significant habitat for Black Cockatoos, with no roosting or breeding trees. • Potential waterbird habitat in Vasse River and Vasse River Delta Wetlands adjacent / downstream to Proposal.
Inland Waters Environmental Quality	• Excavation, dewatering and dredging of riverine sediments. • Soil erosion and sediment. • Storage and handling of hazardous materials and wastes.	• Threatened species Carters Freshwater Mussel located in Vasse River within bridge footprint. • Vasse River has poor water quality and low fish species diversity. No threatened fish species recorded in surveys. • Vasse River mapped as a conservation category wetland. Adjacent Vasse River Delta Wetlands mapped as multiple use wetlands. • Potential presence of MBO in river sediments.

Preliminary key environmental factor	Proposal construction activities that would affect the factor	Site specific environment values, uses and sensitive components
Social Surroundings	• Construction vehicle movements. • Construction plant operation including pile driving. • Soil erosion and sediment. • Storage and handling of hazardous materials and wastes.	• Residential and commercial properties in the vicinity. • Vasse River foreshore comprises public open space and connections to walk trails. • State heritage listed buildings (St Mary's Anglican Church and Old Butter Factory) in the vicinity. • No Aboriginal heritage sites present. • Potential for burials on northern bank of river.

1.3 Rationale and approach

The CEMP provisions have been developed with consideration of the key environmental factor objectives, the findings of surveys and studies, and the environmental risks posed by the Proposal construction activities.

1.3.1 Survey and study findings

This CEMP has been prepared with consideration of the following site specific environmental investigations:

- *Reconnaissance Flora, Vegetation and Fauna Survey* (Ecosystem Solutions 2017)
- *Detailed Flora and Vegetation Survey (*Strategen 2017a)
- *Acid Sulfate Soil Investigation Report* (Strategen 2017a)
- *Baseline assessment of Carter's Freshwater Mussel* (Beatty et al. 2017)
- *Report of an Aboriginal Heritage Survey* (Brad Goode & Associates 2017).

The reports and findings from these environmental investigations are provided in the Environmental Review Document (Strategen 2018) supporting the Proposal referral. The key findings are summarised in Table 1.

1.3.2 Key assumptions and uncertainties

Key uncertainties include the following:

- seasonal usage of wetlands by migratory waterbirds
- potential horizontal and vertical variation in ASS properties and specific properties in excavation and dewatering areas may potentially vary from those in investigation bores
- presence and characteristics of MBO within the Development Envelope remain uncertain
- presence of subsurface burials along the Vasse River banks remain uncertain.

To address these uncertainties the CEMP adopts a conservative approach to protecting wetlands, managing ASS and MBO, and monitoring for subsurface burials.

1.3.3 Management approach

This CEMP adopts a risk based approach to identify and prioritise actions, which addresses the key environmental values, uses and sensitive components summarised in Table 1.

1.3.4 Rationale for choice of provisions

This CEMP adopts provisions based on industry standard practices for minimisation and rehabilitation of environmental impacts during construction. The provisions reflect the potential for intermittent, episodic and acute impacts posed by construction activities, such as un-authorised clearing, dust emissions during high winds, or accidental spills of hazardous materials or wastes.

2. CEMP provisions

This section of the CEMP presents the proposed provisions for environmental management during construction of the Proposal. The CEMP provisions represent the Proponent's commitments for environmental management and demonstrate that construction activities will be appropriately managed to achieve the EPA's objectives for the key environmental factors identified for the Proposal.

This CEMP utilises management-based provisions. The selection of management based provisions rather than outcome based provisions is due to the Proposal construction activities posing environmental risks that are generally intermittent, episodic or acute impact events that are less applicable to objective measurement and reporting.

Table 2: CEMP provisions – Flora and Vegetation

EPA factor objective:	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
CEMP objective:	Minimise impacts to flora and vegetation outside of Development Envelope as far as practicable.
Key environmental values:	Riparian vegetation and samphire surrounding Proposal is representative of Vasse vegetation complex and provides habitat for threatened and migratory species.
Key impacts and risks:	• clearing beyond the defined clearing areas of Development Envelope • introducing and/or spreading weeds and dieback • soil erosion and sediment discharge • accidental spills or leaks of hazardous materials or wastes

Management actions	Management targets	Monitoring	Reporting
Induct all construction personnel in: • avoiding clearing and access outside designated areas, particularly clearing of Peppermint trees • reporting all un-authorised clearing and access. Risk priority: High Timing: Prior to construction commencing	No environmental impacts occur that are attributable to lack of awareness in construction personnel.	Induction records.	Post-construction report.
Clearly mark all clearing areas on construction drawings and on the ground (e.g. pegging) and ensure areas of vegetation nominated to be excluded from clearing (e.g. mature trees where practicable) are visually identifiable to construction personnel. Risk priority: High Timing: Prior to clearing	No native vegetation is cleared outside of designated clearing areas.	Visual inspection of boundaries of clearing areas for evidence of un-authorised clearing. Daily inspection during clearing works. Weekly inspection once clearing is completed.	Post-construction report. Report of all un-authorised clearing.
Restrict all construction vehicle and plant access to designated access tracks / areas. Risk priority: High Timing: At all times	No construction vehicle or plant access occurs outside of designated access tracks / areas.	Visual inspection of boundaries of designated access tracks / areas for evidence of un-authorised access.	Post-construction report. Report of all un-authorised access.
Undertake re-planting and rehabilitation of vegetation in accordance with a Revegetation and Rehabilitation Plan approved by Department of Biodiversity, Conservation and Attractions. Risk priority: Moderate Timing: to be specified in Revelation and Rehabilitation Plan	Revegetation and Rehabilitation Plan success criteria are met.	As specified in Revegetation and Rehabilitation Plan	As specified in Revegetation and Rehabilitation Plan
Ensure all imported fill, soil, mulch, plants and seedlings used on site are certified weed and dieback free. Risk priority: High Timing: At all times	No weed infestation present within Development Envelope at the completion of construction.	Reconciliation of earthworks and landscaping against delivery certification.	Post-construction report.

EPA factor objective:	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
CEMP objective:	Minimise impacts to flora and vegetation outside of Development Envelope as far as practicable.
Key environmental values:	Riparian vegetation and samphire surrounding Proposal is representative of Vasse vegetation complex and provides habitat for threatened and migratory species.
Key impacts and risks:	• clearing beyond the defined clearing areas of Development Envelope • introducing and/or spreading weeds and dieback • soil erosion and sediment discharge • accidental spills or leaks of hazardous materials or wastes

Management actions	Management targets	Monitoring	Reporting
Control all weed outbreaks within construction area using mechanical or chemical means. All use of herbicides to be approved by the City Representative. Risk priority: Moderate Timing: throughout construction.	No weed infestation present within Development Envelope at the completion of construction.	Weekly inspection of construction area for weed infestation.	Post-construction report.
All construction plant and vehicles entering the construction compound and construction work areas to be free of soil, plant and organic material. All plant and vehicles found to contain soil, plant or organic material to be turned away for washing off-site or else washed down at the construction compound with washwater draining into a sump. Sump contents to be regularly cleaned out and disposed of at a licenced landfill. Risk priority: High Timing: At all times	No weed infestation present within Development Envelope at the completion of construction.	Inspection of all construction plant and vehicles upon entry to the construction compound or construction works areas. Inspection to include tyres, underside and earthmoving components.	Report all incoming plant and vehicles washed to remove soil, plant or organic material.
Soil erosion and sediment controls as specified in Table 5: CEMP provisions – Inland Waters Environmental Quality	See Table 5	See Table 5	See Table 5
Hazardous materials and waste management as specified in Table 5: CEMP provisions – Inland Waters Environmental Quality	See Table 5	See Table 5	See Table 5

Table 3: CEMP provisions – Terrestrial Environmental Quality

EPA factor objective:	To maintain the quality of land and soils so that environmental values are protected.		
CEMP objective:	Minimise impacts from acid sulfate soils, monosulfidic black ooze and site contamination as far as is practicable.		
Key environmental values:	Development Envelope lies in proximity to wetlands that support threatened Carters Freshwater Mussel and migratory waterbird habitat.		
Key impacts and risks:	• excavation and dewatering of acid sulfate soils or contaminated material • dredging of riverine sediments potentially containing monosulfidic black ooze • soil erosion and sediment discharge • excavation of unexpected contamination • accidental spills or leaks of hazardous materials or wastes		
Management actions	Management targets	Monitoring	Reporting
Induct all construction personnel in: • reporting all suspected contamination encountered during earthworks. Risk priority: Moderate Timing: Prior to construction commencing	All staff inducted.	Induction records.	Post-construction report.
Undertake excavation and dewatering in accordance with an Acid Sulfate Soil and Dewatering Management Plan (ASSDMP) approved by Department of Water and Environmental Regulation (DWER). Risk priority: High Timing: ASSDMP approved prior to commencement of excavation.	As specified in ASSDMP	As specified in ASSDMP	Approved ASSDMP. ASSDMP implementation reporting as specified in ASSDMP
Riverine sediments to be removed for abutment construction will be subject to sampling and management in accordance with advice of DWER. This will include • sampling of sediments over the proposed footprint and depth of construction platforms • laboratory analysis of samples to determine MBO characteristics • assessment of hazard posed by MBO characteristics and proposed volume/method of removal Prepare MBO Management Plan (MBOMP) to address the hazard, incorporating advice from DWER and guidance from the Commonwealth Department of Agriculture and Water Resources. MBOMP to be reviewed and approved by DWER. Risk priority: High Timing: MBOMP approved prior to commencement of dredging.	As specified in MBOMP	As specified in MBOMP	MBO investigation report. Approved MBOMP (if required). MBOMP implementation reporting as specified in MBOMP
In the event of excavation encountering suspected contaminated materials, the excavation works are to be stopped and advice sought from a qualified environmental professional. If required, the suspected contamination will be sampled and analysed to determine the appropriate remediation and disposal. Risk priority: Moderate Timing: throughout excavation works.	All suspected contamination is characterised and appropriately managed.	Visual monitoring during excavation.	Reporting of all suspected contamination. Contamination report from environmental professional.
Soil erosion and sediment controls as specified in Table 5: CEMP provisions – Inland Waters Environmental Quality	See Table 5	See Table 5	See Table 5

EPA factor objective:	To maintain the quality of land and soils so that environmental values are protected.		
CEMP objective:	Minimise impacts from acid sulfate soils, monosulfidic black ooze and site contamination as far as is practicable.		
Key environmental values:	Development Envelope lies in proximity to wetlands that support threatened Carters Freshwater Mussel and migratory waterbird habitat.		
Key impacts and risks:	• excavation and dewatering of acid sulfate soils or contaminated material • dredging of riverine sediments potentially containing monosulfidic black ooze • soil erosion and sediment discharge • excavation of unexpected contamination • accidental spills or leaks of hazardous materials or wastes		
Management actions	Management targets	Monitoring	Reporting
Hazardous materials and waste management as specified in Table 5: CEMP provisions – Inland Waters Environmental Quality	See Table 5	See Table 5	See Table 5

Table 4: CEMP provisions – Terrestrial Fauna

EPA factor objective:	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.		
CEMP objective:	Minimise impacts to terrestrial fauna during construction as far as practicable.		
Key environmental values:	Development Envelope contains habitat for Western Ringtail Possum and migratory waterbirds.		
Key impacts and risks:	• clearing of native vegetation comprising fauna habitat • construction vehicle movements • construction plant operation • excavation of trenches • soil erosion and sediment discharge • accidental spills or leaks of hazardous materials or wastes		
Management actions	Management targets	Monitoring	Reporting
Vegetation clearing controls as specified in Table 2: CEMP provisions – Flora and Vegetation	See Table 2	See Table 2	See Table 2
Weed and dieback controls as specified in Table 2: CEMP provisions – Flora and Vegetation	See Table 2	See Table 2	See Table 2
Re-vegetation and rehabilitation as specified in Table 2: CEMP provisions – Flora and Vegetation	See Table 2	See Table 2	See Table 2

EPA factor objective:	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.
CEMP objective:	Minimise impacts to terrestrial fauna during construction as far as practicable.
Key environmental values:	Development Envelope contains habitat for Western Ringtail Possum and migratory waterbirds.
Key impacts and risks:	• clearing of native vegetation comprising fauna habitat • construction vehicle movements • construction plant operation • excavation of trenches • soil erosion and sediment discharge • accidental spills or leaks of hazardous materials or wastes

Management actions	Management targets	Monitoring	Reporting
Induct all construction personnel in: • avoiding injury or harassment of native fauna during operation of vehicles or equipment • reporting all injured, abandoned or otherwise visibly distressed fauna • prohibition on feeding fauna, hunting or keeping of firearms or pets on site. Risk priority: High Timing: Prior to construction commencing	No environmental impacts occur that are attributable to lack of awareness in construction personnel.	Induction records.	Post-construction report.
Engage qualified fauna spotter / catcher prior to and during clearing works to inspect vegetation and remove all threatened fauna species. Risk priority: High Timing: Prior to and during clearing	No mortality of threatened, priority or migratory fauna species during clearing works.	Visual monitoring of clearing areas.	Post-clearing report. Reporting of all threatened fauna species mortality.
Conduct clearing in a sequential manner and in a way that encourages escaping wildlife away from the activity into adjacent natural areas and not onto roads, trenches or other areas of threat. Risk priority: Moderate Timing: During clearing	No mortality of threatened, priority or migratory fauna species during clearing works.	Visual monitoring of construction work areas.	Post-clearing report. Reporting of all threatened fauna species mortality.
Ensure a qualified fauna spotter / catcher is on call during clearing works to handle any injured, abandoned or otherwise visibly distressed fauna. If any injured, abandoned or otherwise visibly distressed fauna are observed when a wildlife handler/fauna spotter is not available, contact the Department of Biodiversity and Conservation (DBCA) wildcare hotline on 08 9474 9055. Risk priority: High Timing: At all times	All fauna identified as injured, abandoned or visibly distressed is handled by a qualified fauna spotter / catcher or in accordance with DBCA wildcare hotline instruction.	Visual monitoring of construction work areas.	Post-construction report. Reporting of all fauna handling.
Check open excavations and trenches for fauna and remove any trapped animals by authorised fauna handlers Risk priority: High Timing: immediately prior to backfill and twice daily when trenching present.	No mortality of threatened, priority or migratory fauna species in trenches or excavations.	Visual monitoring of excavations and trenches.	Reporting of all threatened fauna species mortality.

EPA factor objective:	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.		
CEMP objective:	Minimise impacts to terrestrial fauna during construction as far as practicable.		
Key environmental values:	Development Envelope contains habitat for Western Ringtail Possum and migratory waterbirds.		
Key impacts and risks:	• clearing of native vegetation comprising fauna habitat • construction vehicle movements • construction plant operation • excavation of trenches • soil erosion and sediment discharge • accidental spills or leaks of hazardous materials or wastes		
Management actions	Management targets	Monitoring	Reporting
Ensure trenches remain open only for the time required for construction purposes and be backfilled as soon as the trenches are no longer required. Risk priority: Moderate Timing: Throughout construction.	No mortality of threatened, priority or migratory fauna species in trenches or excavations.	Visual monitoring of excavations and trenches.	Reporting of all threatened fauna species mortality.
Soil erosion and sediment controls as specified in Table 5: CEMP provisions – Inland Waters Environmental Quality	See Table 5	See Table 5	See Table 5
Hazardous materials and waste management as specified in Table 5: CEMP provisions – Inland Waters Environmental Quality	See Table 5	See Table 5	See Table 5

Table 5: CEMP provisions – Inland Waters Environmental Quality

EPA factor objective:	To maintain the quality of groundwater and surface water so that environmental values are protected.		
CEMP objective:	Minimise impacts to water quality and aquatic ecology of Lower Vasse River and Vasse River Delta Wetlands as far as is practicable.		
Key environmental values:	Development Envelope lies in proximity to wetlands that support threatened Carters Freshwater Mussel and migratory waterbird habitat.		
Key impacts and risks:	• excavation and dewatering of acid sulfate soils or contaminated material • dredging of riverine sediments potentially containing monosulfidic black ooze • dredging of riverine sediments containing Carters Freshwater Mussel • soil erosion and sediment discharge • accidental spills or leaks of hazardous materials or wastes		
Management actions	Management targets	Monitoring	Reporting
Induct all construction personnel in: • maintaining soil erosion and sediment controls • hazardous materials and waste management, including reporting and responding to spills and leaks. Risk priority: High Timing: Prior to construction commencing	No environmental impacts occur that are attributable to lack of awareness in construction personnel.	Induction records.	Post-construction report.

EPA factor objective:	To maintain the quality of groundwater and surface water so that environmental values are protected.
CEMP objective:	Minimise impacts to water quality and aquatic ecology of Lower Vasse River and Vasse River Delta Wetlands as far as is practicable.
Key environmental values:	Development Envelope lies in proximity to wetlands that support threatened Carters Freshwater Mussel and migratory waterbird habitat.
Key impacts and risks:	• excavation and dewatering of acid sulfate soils or contaminated material • dredging of riverine sediments potentially containing monosulfidic black ooze • dredging of riverine sediments containing Carters Freshwater Mussel • soil erosion and sediment discharge • accidental spills or leaks of hazardous materials or wastes

Management actions	Management targets	Monitoring	Reporting
Soil erosion and sediment controls • Maintain silt curtains either side of bridge abutments for the duration of bridge construction works and until turbidity levels are visually observed as equivalent to background levels upstream of silt fence. • Maintain silt fences at the base of all embankments adjacent to waterways and wetlands. • Stabilise embankments and earth worked areas as soon as practicable to minimise soil erosion. • Provide temporary stormwater drainage to direct surface runoff to sumps for sediment retention and infiltration. Risk priority: High Timing: throughout construction	Turbidity of Vasse River outside of silt curtains remains comparable to reference point upstream. No noticeable sediment deposition in wetlands adjacent to Development Envelope.	Visual inspection of turbidity in Vasse River within and adjacent to silt curtains and at a reference point upstream. Daily inspection during abutment construction period and weekly inspection thereafter. Visual inspection of wetlands adjacent to Development Envelope. Daily inspection during road embankment construction and weekly inspection thereafter. Weekly inspection of erosion and sediment controls during construction and following rainfall events exceeding 10 mm in one day.	Post-construction report.

EPA factor objective:	To maintain the quality of groundwater and surface water so that environmental values are protected.
CEMP objective:	Minimise impacts to water quality and aquatic ecology of Lower Vasse River and Vasse River Delta Wetlands as far as is practicable.
Key environmental values:	Development Envelope lies in proximity to wetlands that support threatened Carters Freshwater Mussel and migratory waterbird habitat.
Key impacts and risks:	• excavation and dewatering of acid sulfate soils or contaminated material • dredging of riverine sediments potentially containing monosulfidic black ooze • dredging of riverine sediments containing Carters Freshwater Mussel • soil erosion and sediment discharge • accidental spills or leaks of hazardous materials or wastes

Management actions	Management targets	Monitoring	Reporting
Hazardous materials and waste management • All refuelling of construction vehicles and plant to be via mobile tankers – no fuel storage on site. • All scheduled / major maintenance of construction vehicles and plant to be undertaken off-site. • Minimise on-site storage and handling of hazardous materials. • Maintain an inventory and materials safety data sheets (MSDS) for all hazardous materials on site. • Clearly label and placard all hazardous materials. • Hazardous materials to be stored in bunded facilities within construction compound. No storage to occur within 10 m of waterways or wetlands. • Putrescible wastes to be stored in covered containers and collected at least weekly to prevent odours, insect breeding and animal scavenging. • Waste storage areas to be located within construction compound and kept in a clean and tidy condition. No storage to occur within 10 m of waterways or wetlands. • Wind-blown litter to be managed through daily collection and provision of wind fencing, if required. • Portable toilets maintained at construction compound. • Maintain spill response procedure. • Maintain spill response equipment on site to response to small spills. • Immediately respond to all spills within construction site to prevent discharge into Vasse River, wetlands or groundwater. All contaminated soils, spill response materials and equipment to be disposed of at a licensed waste facility. • Provide floating absorbent booms (at least 30 m long) to Busselton Fire & Rescue prior to construction commencing. • Conduct a spill response drill in the Vasse River prior to construction commencing, in collaboration with Busselton Fire & Rescue. Risk priority: High Timing: prior to and throughout construction	No spills or leaks of hazardous materials or wastes enter the Vasse River, Vasse River Delta Wetlands or groundwater.	Daily inspection of hazardous material and waste storage areas for evidence of spills, leaks and litter. Visual monitoring of construction work areas for evidence of spills and litter.	Post-construction report. Reporting of all spill / leak incidents into waterways, wetlands or groundwater. Contamination reporting as required under the *Contaminated Sites Act 2003*.

EPA factor objective:	To maintain the quality of groundwater and surface water so that environmental values are protected.
CEMP objective:	Minimise impacts to water quality and aquatic ecology of Lower Vasse River and Vasse River Delta Wetlands as far as is practicable.
Key environmental values:	Development Envelope lies in proximity to wetlands that support threatened Carters Freshwater Mussel and migratory waterbird habitat.
Key impacts and risks:	• excavation and dewatering of acid sulfate soils or contaminated material • dredging of riverine sediments potentially containing monosulfidic black ooze • dredging of riverine sediments containing Carters Freshwater Mussel • soil erosion and sediment discharge • accidental spills or leaks of hazardous materials or wastes

Management actions	Management targets	Monitoring	Reporting
Undertake translocation of Carters Freshwater Mussel in accordance with a Regulation 17 licence and approved translocation proposal. Risk priority: High Timing: as specified in translation proposal.	As specified in translocation proposal	As specified in translocation proposal	As specified in translocation proposal
ASS and dewatering management as specified in Table 3: CEMP provisions – Terrestrial Environmental Quality.	See Table 3	See Table 3	See Table 3
MBO management as specified in Table 3: CEMP provisions – Terrestrial Environmental Quality.	See Table 3	See Table 3	See Table 3
Contamination management as specified in Table 3: CEMP provisions – Terrestrial Environmental Quality.	See Table 3	See Table 3	See Table 3

Table 6: CEMP provisions – Social Surroundings

EPA factor objective:	To protect social surroundings from significant harm.
CEMP objective:	Minimise disturbance to nearby residential, commercial and heritage properties and impacts to amenity of Vasse River and wetlands as far as is practicable.
Key environmental values:	Development Envelope lies in proximity to residential and commercial properties, State heritage listed buildings. Vasse River foreshore comprises public open space and linkage to walk trails.
Key impacts and risks:	• dust emissions from cleared and earthworked areas and stockpiles • noise from construction vehicles and equipment • impacts to Vasse River amenity through excavation, dewatering, dredging, sediment discharge, accidental spills or leaks of hazardous materials or wastes.

Management actions	Management targets	Monitoring	Reporting
Induct all construction personnel in: • restrictions in vehicle and plant movements and operations to minimise noise and traffic impacts to nearby properties and roads Risk priority: High Timing: Prior to construction commencing	No environmental impacts occur that are attributable to lack of awareness in construction personnel.	Induction records.	Post-construction report.
Inform the public and nearby properties of construction activities, timing and query / complaints hotline. Nearby properties informed via letter drops. Public informed via City newsletter / facebook page. Risk priority: High Timing: Prior to construction commencing	No complaints received due to lack of notification of property owners.	Not applicable.	Not applicable.
Maintain complaints hotline throughout construction. For all complaints received, determine the impact (if any) associated with construction works, any corrective and/or remedial action required, and provide a response to the complainant within 24 hours for severe impacts and within five business days for minor impacts. Risk priority: High Timing: throughout construction.	All complaints received are documented and responded to within 24 hours for severe impacts and five business days for minor impacts.	Not applicable	Post-construction report.

EPA factor objective:	To protect social surroundings from significant harm.
CEMP objective:	Minimise disturbance to nearby residential, commercial and heritage properties and impacts to amenity of Vasse River and wetlands as far as is practicable.
Key environmental values:	Development Envelope lies in proximity to residential and commercial properties, State heritage listed buildings. Vasse River foreshore comprises public open space and linkage to walk trails.
Key impacts and risks:	• dust emissions from cleared and earthworked areas and stockpiles • noise from construction vehicles and equipment • impacts to Vasse River amenity through excavation, dewatering, dredging, sediment discharge, accidental spills or leaks of hazardous materials or wastes.

Management actions	Management targets	Monitoring	Reporting
Dust management • Minimise area of clearing and earthworks to that required for construction activities. • Schedule vegetation clearing to occur immediately before planned earthworks to minimise duration of exposure of cleared ground, as far as practicable. • Avoid dust generating activities during unfavourable weather conditions (e.g. high wind speed) and unfavourable wind directions, where practicable. • Stabilise cleared areas and any dry, dust-prone areas or stockpiles to prevent dust lift off. Stabilisation methods may include wetting, application of hydromulch or other sealing material. • Restrict site access to designated access and construction areas. • Enforce maximum speed limit in construction areas to reduce dust lift off. • Implement dust suppression (e.g. water spray/wet down of unsealed tracks\stockpiles) if high levels of dust are observed or considered likely to occur. • Dust suppression equipment maintained on site. • Ensure haul truck loads are covered to prevent dust emissions. Risk priority: Moderate Timing: throughout construction.	No repetitive / sustained complaints received due to dust impacts.	Ongoing visual inspection of dust levels in construction areas. Daily check of weather conditions that may affect dust emissions.	Post-construction report.
Noise management • Construction limited to 7 am and 7 pm Monday to Friday. Any works for Saturday to be authorised in writing by City Representative. • Operation of construction plant restricted to within Development Envelope. • Construction vehicles and plant maintained in accordance with manufacturers specification. • Trucks not left idling and construction traffic minimised along Peel Terrace and local roads north of Development Envelope. Risk priority: Moderate Timing: throughout construction.	No repetitive / sustained complaints received due to noise impacts.	Daily check of noise levels in construction areas.	Post-construction report.

EPA factor objective:	To protect social surroundings from significant harm.
CEMP objective:	Minimise disturbance to nearby residential, commercial and heritage properties and impacts to amenity of Vasse River and wetlands as far as is practicable.
Key environmental values:	Development Envelope lies in proximity to residential and commercial properties, State heritage listed buildings. Vasse River foreshore comprises public open space and linkage to walk trails.
Key impacts and risks:	• dust emissions from cleared and earthworked areas and stockpiles • noise from construction vehicles and equipment • impacts to Vasse River amenity through excavation, dewatering, dredging, sediment discharge, accidental spills or leaks of hazardous materials or wastes.

Management actions	Management targets	Monitoring	Reporting
Traffic management • Construction vehicles to use Causeway Road to access construction compound from the south rather than use Peel Terrace from the north, as far as is practicable. • Stage construction works to minimise the duration of traffic impacts at any particular location along Causeway Road, Peel Terrace and Camilleri Street. • Provide traffic controllers during all works on Causeway Road, Peel Terrace and Camilleri Street. • Develop and implement a strategy for maintaining access to the Old Butter Factory Museum during construction works, in consultation with the Busselton Historical Society. • Prohibit parking, standing or access by construction vehicles to verges alongside the Old Butter Factory and St Mary's Church. • Prohibit parking of construction vehicles in public carparks including Rotary Park or Peel Street outside of construction hours. Construction vehicle parking to be provided at construction compound. Risk priority: High Timing: throughout construction.	No repetitive / sustained complaints received due traffic and parking impacts.	Not applicable.	Post-construction report.
Engage Aboriginal cultural monitors during excavation works on the northern banks/foreshore of the Vasse River. Risk priority: Moderate Timing: during excavation works on north side of river	Any burials uncovered during excavation works are managed in accordance with directions of Aboriginal cultural monitors.	Aboriginal cultural monitoring.	Post-construction report.
ASS and dewatering management as specified in Table 3: CEMP provisions – Terrestrial Environmental Quality.	See Table 3	See Table 3	See Table 3
MBO management as specified in Table 3: CEMP provisions – Terrestrial Environmental Quality.	See Table 3	See Table 3	See Table 3
Contamination management as specified in Table 3: CEMP provisions – Terrestrial Environmental Quality.	See Table 3	See Table 3	See Table 3
Soil erosion and sediment controls as specified in Table 5: CEMP provisions – Inland Waters Environmental Quality	See Table 5	See Table 5	See Table 5
Hazardous materials and waste management as specified in Table 5: CEMP provisions – Inland Waters Environmental Quality	See Table 5	See Table 5	See Table 5

3. Adaptive management and review of the CEMP

The Proponent will apply an adaptive management approach to implementation of the CEMP as follows:

- response actions in the event of failure to achieve key management targets, as presented in Table 7
- review of CEMP provisions at three months and nine months from commencement of construction works.

Table 7: Adaptive management for CEMP provisions

Trigger	Indicators	Response actions
Clearing or access outside of designated areas.	• Cleared vegetation outside of demarcated boundary • Damage of clearing boundary fencing / demarcations. • Access tracks outside of demarcated boundary.	1. Investigate cause. 2. Report and investigate as an incident. 3. Stop construction activities. 4. Re-establish approved boundary with temporary fencing. 5. Rehabilitate impacted area. 6. Implement corrective action (e.g. induction, CEMP revision) based on cause findings.
New weeds, declared pests of high priority weed species observed within construction area.	Visual inspection of construction area during construction.	1. Investigate cause. 2. Report and investigate as an incident. 3. Arrange for weed control by a suitably qualified contractor, ensuring no spray drift into adjacent native vegetation or wetland areas. 4. Undertake inspection of treated areas after an expected re-growth period (considering species and season) and apply further weed control (if required) to knock back any re-growth. 5. Implement corrective action (e.g. plant washing, supplier warning, CEMP revision) based on cause findings.
Weeds present within Development Envelope at completion of construction.	Visual inspection of construction area at completion of construction.	1. Arrange for weed control by a suitably qualified contractor, ensuring no spray drift into adjacent native vegetation or wetland areas. 2. Undertake inspection of treated areas after an expected re-growth period (considering species and season) and apply further weed control (if required) to knock back any re-growth.
Threatened, priority or migratory fauna species mortality during clearing works or within trenches or excavations. Native fauna present onsite during construction.	Visual identification of dead fauna during construction.	1. Engage fauna spotter / catcher to confirm species. 2. Investigate cause. 3. Report and investigate as an incident. 4. Stop construction works associated with the mortality. 5. Fauna spotter / catcher to inspect vicinity of mortality to identify and relocate any fauna deemed to be at risk from the construction works. 6. Implement corrective action (e.g. induction, trench fencing, CEMP revision) based on cause findings.

Trigger	Indicators	Response actions
Turbidity of Vasse River outside of silt curtains is noticeably greater than reference point upstream. Noticeable sediment deposition in wetlands adjacent to Development Envelope.	• Visual observation of turbidity. • Visual observation of sediment deposition.	1. Investigate cause. 2. Report and investigate as an incident. 3. Stop construction activities. 4. Repair / reinstate all affected sediment and erosion controls. 5. Establish additional sediment and erosion controls (if required) to prevent ongoing impacts. 6. Conduct daily inspections of turbidity / deposition for one month to verify effectiveness of sediment and erosion controls.
Spill or hazardous material or waste entering Vasse River, wetlands or waterways	• Visual observation of spill contents in standing water. • Visual observation of contamination in groundwater upon excavation of contaminated soil during on-site spill / leak response.	1. Immediately contact Busselton Fire & Rescue to recover any spill contents within waterways or wetlands, using floating booms provided for the purpose. 2. Identify cause of the spill/leak and implement corrective action to prevent re-occurrence. 3. Implement remedial works to repair any damage from the spill (e.g. contaminated soils, groundwater, vegetation or deposition) under direction of a qualified environmental professional. 4. Any site contamination to be managed and reported in accordance with the *Contaminated Sites Act 2003*.
Sustained / repetitive complaints received due to dust, noise, traffic or parking impacts.	• Sustained / repetitive complaints received with verified impacts from construction.	1. Stop construction works associated with the specific impacts. 2. Review construction activities and replan as required to reduce impacts such as route selection, staging, parking restrictions, timing of works, and application of site controls (e.g. dust suppression / stabilisation). 3. Provide inductions to personnel (if required) on the replanned construction works / controls. 4. Undertake monitoring to verify the effectiveness of the replanned works / controls. 5. Update CEMP if required.

4. Stakeholder consultation

Consultation has been undertaken with relevant government agencies and key stakeholders to identify potential environmental impacts and mitigation strategies for the Proposal. The consultation is presented in Section 3 of the Environmental Review Document (Strategen 2018).

5. References

Beatty S, Ma L, Morgan D & Lymbery A 2017, *Baseline assessment of Carter's Freshwater Mussel, Westalunio carteri, at proposed bridge construction sites on the Lower Vasse River*, Freshwater Fish Group & Fish Health Unit, Centre for Fish & Fisheries Research, Murdoch University report to Strategen Environmental.

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