360 environmental

Lower Vasse River

Dredge and Disposal Management Plan

Prepared for

City of Busselton

January 2022

people planet professional

Document Reference	Revision	Prepared by	Reviewed by	Admin Review	Submitted to Client	
					Copies	Date
4513AA_Rev0	Internal Draft	RM	AW	-	-	10/12/2021
4513AA_Rev1	Client Draft	RM	AW	NC	1 electronic	13/12/2021
4513AA_Rev2	Client Draft	RM	AW	NC	1 electronic	14/12/2021
4513AA_Rev3	Final for Issue	RM	AW	NC	1 electronic	18/01/2022

Disclaimer

Executive Summary

360 Environmental Pty Ltd (360 Environmental) was commissioned by the City of Busselton (the City) to prepare a Dredge and Disposal Management Plan (DDMP) for the proposed removal of a layer of nutrient-rich, fine organic sediments that has accumulated throughout the lower reach of the Lower Vasse River (the site) with an average depth 450 mm as part of a Living Streams approach to future management of the Lower Vasse River to ensure that the dredged sediments and return water are managed in accordance with the *National Guidelines for Dredging* (2020).

The site has accumulated a layer of nutrient-rich, fine organic sediments that feed the high nutrient concentrations within the surface waters causing algal blooms to occur which then increases the organic matter within the sediment when the algae die. The algae blooms are aesthetically (visual and odour) unpleasant to the surrounding residents and furthermore, the toxic blue-green algae can have severe human health implications.

The DDMP details the management actions and contingency measures that will be implemented for the duration of the project. The sediment removal will occur in multiple stages (Figure 1). Following the completion of each stage, an assessment of the success of the management measures will be undertaken and the DDMP revised accordingly, if required.

Table A details the commitment and references to achieve the primary objective to protect the ecological character of the Vasse Wonnerup Wetland System while undertaking the sediment removal and sediment dewatering activities.

Table A: DDMP Commitments

Significant Matter	Commitment	Indicator	Reference
Vasse Wonnerup Wetland System	No adverse impact to the water quality of the of the Vasse Wonnerup Wetland System	Measurement of water quality in the Lower Vasse River adjacent to return water outlet in comparison to baseline data and derived triggers.	• Section 2.2 of this DDDMP • ASSDMP (360 Environmental 2022)

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1 Introduction

The City of Busselton (the City) manages the Lower Vasse River, located in Busselton, WA (Figure 1). Due to high nutrient concentrations and subsequent extensive algal blooms along with the impacts to biodiversity and public amenity, the City intends to dredge a section of the Lower Vasse River to remove nutrient-rich sediment with the aim of improving water quality in the system and the wide receiving sites, including the internationally listed Ramsar wetland; Vasse Wonnerup Wetland System (City of Busselton, 2019).

1.1 Proponent Information

The Proponent information related to EPBC2021/9051 is detailed below.

Proponent:	City of Busselton
Physical Address:	2 Southern Drive, Busselton WA 6280
Postal Address:	Locked Bag 1, Busselton WA 6280
Email Contact:	Mathilde.Breton@busselton.wa.gov.au
ABN:	87 285 608 991

1.2 Purpose and Scope

The objective of this Dredge and Disposal Management Plan (DDMP) is to detail the mitigation strategy for dredging activities to minimise associated potential impacts to, and to protect the ecological character of, the Vasse-Wonnerup Wetlands and the Lower Vasse River.

1.2.1 Associated Management Plans

This DDMP should be read and implemented concurrently with:

- Environmental Management Plan for Carter's Freshwater Mussel *Westralunio carteri* (Beatty et al 2021)
- Acid Sulfate Soils and Dewatering Management Plan (360 Environmental 2022).

1.3 Sediment Removal Overview

The removal of accumulated sediment in the Lower Vasse River will be undertaken in multiple stages, with the initial stage to target an 800 m stretch of the Lower Vasse from the Butter Factory Museum to the old boat ramp (Figure 1). The first stage of the proposal will consist of targeted dredging of up to 15,000 m^3 of sediment (in-situ volume) and is expected to take approximately 10 weeks with commencement in March/April 2022. The sediment tubes will continue to dewater for a further few weeks upon completion of dredging. Disposal of the dewatered dredged material will occur post analysis for contamination potential, with the preferred option being to treat the sediment and use as soil nourishment for public open space, or secondarily for use as day cover at the City of Busselton Waste Facility.

1.3.1 Methodology

The dredging contractor will remove the accumulated sediment from the LVR using a GeoProTM Microdredge with a horizontal auger. The dredged sediments will be pumped into GeoProTM desludging tubes, located within an onshore lined and bunded laydown area. The sediments will be retained within the tubes while the dewater (return water) will be directed back to the river via a gravity fed channel, or contained within a sump and pumped back to the river.

1.4 Project Timing

The project is scheduled to commence in March/April 2022 with an expected dredging duration of approximately ten (10) weeks. All dredging works will be undertaken during hours stipulated in the *Environmental Protection (Noise) Regulations 1997* (0700-1900 Monday to Saturday). No project activities will be undertaken on Sundays or Public Holidays.

The desludging tubes will continue to dewater for several weeks beyond the completion of dredging until the sediment is sufficiently dry to open the tubes, treat (if required) and dispose offsite.

The sediment removal has been discussed with numerous specialists relating to dredging and dewatering, water quality, and the Carter's Freshwater Mussel (*Westralunio carteri*). The timing is reflective of the need to undertake the works during a predominantly dry period to facilitate successful dewatering of the sediment tubes, but not during the warmest months to minimise the potential for elevated nutrients to contribute to algal blooms in the Lower Vasse River. The timing also avoids the brooding and spawning periods for the Carter's Freshwater Mussel.

The remaining section(s) of the Lower Vasse River proposed dredge areas, extending up to the Busselton Bypass, will be dredged in future following a review of the outcomes to Stage 1.

2 Environmental Management

2.1 Environmental Factors

The key environmental factors considered relevant to the project are:

- Inland waters
- Terrestrial fauna[1].

The matters of national environmental significance (MNES) associated with the key environmental factors are the:

- Vasse Wonnerup Wetland System
- Carter's Freshwater Mussel (*Westralunio carteri*).

Other factors that have been considered during the assessment process are:

- Terrestrial environmental quality
- Terrestrial flora and vegetation
- Air quality
- Social surroundings.

2.2 Inland Waters

Table 1: Inland Waters

Factor Objective	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.		
Key Values	Lower Vasse River (LVR) and downstream Vasse Wonnerup Wetland System		
Key Impacts and Risks	• Nutrient enriched water adversely impacting the water quality of the Vasse Wonnerup Wetland System and Lower Vasse River • Localised increased turbidity from the direct impact of the dredge and return water entry point • Accidental spills of hydrocarbons or other hazardous substances.		
Management Actions	**Management Targets**	**Monitoring**	**Reporting**
Use of polymer in tubes to bind nutrients	Water quality of the LVR compliant with derived site-specific trigger levels.	As per Section 3 and ASSDMP (360 Environmental 2022)	As per Section 3 and ASSDMP (360 Environmental 2022)
Return water channel of sufficient length to facilitate denitrification prior to re-entry to the LVR	No algal blooms attributable to dredging activities	Visual observations by EMR during routine monitoring.	Report any occurrence of algal blooms to the City PM

[1] It is acknowledged that the Carter's Freshwater Mussel (*Westralunio carteri*) is aquatic fauna, not terrestrial, however given that no part of the species' life cycle occurs in the marine environment, the terrestrial fauna factor is the most applicable.

Factor Objective	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.		
Key Values	Lower Vasse River (LVR) and downstream Vasse Wonnerup Wetland System		
Key Impacts and Risks	• Nutrient enriched water adversely impacting the water quality of the Vasse Wonnerup Wetland System and Lower Vasse River • Localised increased turbidity from the direct impact of the dredge and return water entry point • Accidental spills of hydrocarbons or other hazardous substances.		
Management Actions	**Management Targets**	**Monitoring**	**Reporting**
Use of targeted micro-dredge	No visual turbidity plume remaining one hour beyond dredge moving from a designated area.	In-situ physicochemical sampling as per Section 3	As per Section 3 and ASSDMP (360 Environmental 2022)
Return water channel located in a stable section of the riverbank	No visible erosion resulting from flow of return water.	Daily visual observations by the Dredging Contractor	Report any occurrence of bank erosion to EMR/City PM
Deployment of silt curtains upstream and downstream of the dredge activity area	No visual turbidity plume beyond the staged dredge area.	Daily visual observations by the Dredging Contractor	Report turbid plume beyond silt curtain to EMR/City PM
Vehicles/equipment to be maintained to manufacturers specifications	No hydrocarbon spills impacting LVR	N / A	Minor spills (<1 L) to be recorded Major spills (>1L) to be reported to DWER within 48 hours of occurrence and works cease until source is located and rectified
Appropriate storage of hazardous materials	No spills impacting LVR	N/A	Maintain incidents register

2.2.1 Contingency

If the monitoring undertaken as per Section 3 indicates an unacceptable impact to the water quality of the LVR, the following contingency measures may be applied, as appropriate and in consultation with the relevant specialists:

- Ceasing works to reduce return water flow to the LVR.
- Extending the return water path to allow for increased denitrification of the return water prior to re-entry into the LVR. The aim of this is to reduce the bioavailable nutrients to minimise the potential for these additional nutrients to adversely impact the water quality of the receiving body and potentially cause unwanted side effects, such as algal blooms.

- Return water directed through a pad of yellow sand to reduce phosphorous levels prior to re-entry to the LVR.

2.3 Terrestrial Fauna

Table 2: Terrestrial Fauna

Factor Objective	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained		
Key Values	Terrestrial fauna and fauna habitat within the LVR		
Key Impacts and Risks	• Alteration of fauna habitat from dredging • Fauna injury / death during dredging activities.		
Management Actions	**Management Targets**	**Monitoring**	**Reporting**
Implement requirements of the Environmental Management Plan for Carter's Freshwater Mussel *Westralunio carteri* (Beatty et al. 2021) during future stages.	Successful relocation of *Westralunio carteri*, if applicable (i.e. where viable mussels are located within dredge area)	As per Environmental Management Plan for Carter's Freshwater Mussel *Westralunio carteri* (Beatty et al. 2021)	As per Environmental Management Plan for Carter's Freshwater Mussel *Westralunio carteri* (Beatty et al. 2021)
	Benthic habitat viable for colonisation of *Westralunio carteri* post-dredging		
Works to be undertaken within designated project areas	No injury or death of native and/or conservative significant fauna.	N/A	Injured fauna reported to WILDCARE (9474 9055)
			Injury or death of conservation significant fauna reported to the relevant authority under the Act in which the species is protected.

2.4 Terrestrial Environmental Quality

Table 3: Terrestrial Environmental Quality

Factor Objective	To maintain the quality of land and soils so that environmental values are protected		
Key Values	Land within and adjacent to the laydown areas		
Key Impacts and Risks	• Sediment or return water discharged to land • Hydrocarbon or hazardous materials spill to land.		
Management Actions	**Management Targets**	**Monitoring**	**Reporting**
Lined and bunded laydown area	No discharge of sediment to land beyond bunded areas	Visual observations by Dredging Contractor	Maintain incident register

Site vehicles to be maintained to manufacturers specifications	No hydrocarbon spills impacting ground	Inspection of vehicle maintenance logs prior to works commencing	Minor spills to be recorded onsite Major spills (>20L) to be reported to DWER within 48 hours of occurrence

2.5 Terrestrial Flora and Vegetation

Table 4: Terrestrial Flora and Vegetation

Factor Objective	To protect flora and vegetation so that biological diversity and ecological integrity are maintained		
Key Values	Riparian vegetation along the riverbank and within laydown areas.		
Key Impacts and Risks	• Loss of vegetation from site clearing.		
Management Actions	**Management Targets**	**Monitoring**	**Reporting**
Considered placement of laydown area and return water channel	No clearing of native vegetation	N/A	Maintain incidents register

2.5.1 Contingency

Should any vegetation be damaged or destroyed by the Dredging Contractor, the incident will be reported to the City as soon as practicable and vegetation will be reinstated at the completion of the project to the satisfaction of the City.

2.6 Air quality

Table 5: Air Quality

Factor Objective	To maintain air quality and minimise emissions so that environmental values are protected		
Key Values	Neighbouring properties and community		
Key Impacts and Risks	• Odour impact to local users • Dust impact to local users.		
Management Actions	**Management Targets**	**Monitoring**	**Reporting**
Sediments contained within geotextile tubes	Nil complaints related to odour	Daily olfactory monitoring by Dredging Contractor	Maintain complaints register
Erection of informative signage on perimeter fencing		N/A	
Sediments not allowed to dry following removal from geotextile tubes	Nil dust emissions beyond site boundary	Visual observations undertaken following removal of sediments from geotextile tubes	Maintain incidents register

2.7 Social Surroundings

Table 6: Social Surroundings

Factor Objective	To protect social surroundings from significant harm		
Key Values	• Heritage sites • Local industry and residential areas.		
Key Impacts and Risks	• Disturbance of heritage listed sites/properties • Inappropriate disposal of waste impacting local environment • Noise impact to local users.		
Management Actions	**Management Targets**	**Monitoring**	**Reporting**
Vehicles and equipment to be maintained to manufacturers specifications	Nil noise complaints	N/A	Maintain complaints register
Dredging activities undertaken in accordance with *EP (Noise) Regulations 1997*	Nil noise complaints	N/A	Maintain complaints register
No disposal of waste to surrounding land or LVR	Adequate waste receptacles onsite Appropriate waste disposal	N/A	Maintain incidents/complaints register
Cultural importance of the LVR conveyed in site induction and training	Nil disturbance of artefacts/sites	N/A	Maintain incidents register Report any unexpected finds to DAA within 24 hours of discovery

3 Monitoring

Monitoring of dredging activities will occur throughout the project. Monitoring of sediment and water quality will be undertaken in three main phases: pre dredging, during dredging and post dredging.

The detailed water quality monitoring schedule for implementation pre-, during- and post-dredging is included in the ASSDMP (360 Environmental 2022) with an overview provided below.

3.1 Pre-dredging monitoring

A baseline investigation will be undertaken to determine the status of the sediment and water quality in the Lower Vasse River prior to the commencement of dredging. The analytical suite will be based on the outcomes of an assessment undertaken on the potential options for sediment disposal post-dewatering (360 Environmental 2021) and shall include in-situ physicochemical parameters collected with a calibrated multi-parameter sonde, and a suite of chemical analytes, including nutrients, heavy metals, and hydrocarbons, to be analysed at a National Association of Testing Authorities (NATA) accredited laboratory.

The results of this baseline event will be reviewed against relevant guidelines and existing site data, then used to determine appropriate trigger levels for assessment of the “during dredging” monitoring data.

The baseline event will also assess the extent of nutrients release from the sediment during dredging and dewatering activities by elutriate analysis, and the bioavailability of heavy metals if they exceed the adopted guideline values.

3.2 During dredging monitoring

3.2.1 Lower Vasse River

Physical parameters (pH, turbidity, dissolved oxygen [DO]) will be undertaken daily for the first week of dredging. Water samples will be collected twice during the first week and scheduled on expedited turnaround time, primarily to indicate levels of dissolved nutrients. If possible, in-situ nutrients will be measured daily in the first week using a spectrophotometer. If a spectrophotometer is used, one water sample will be sent to the lab for nutrient testing to confirm the in-situ nutrient monitoring.

As the dredging is scheduled to commence in March/April 2022, the Lower Vasse River is unlikely to be flowing, therefore, two (2) river water samples will be collected downstream and one (1) upstream of the return water area and outside of the silt curtains to determine if there is sufficient dilution of nutrients following return of dewater into the river. The return water and the river water samples will be compared against each other and the pre dredging monitoring (surface water and elutriate) results to ascertain any potential impact to water quality directly from the dredging tubes.

In addition, the Department of Water and Environmental Regulation (DWER) will provide the continuous measurements from the in-situ probe recently installed within the project area.

After the first week, if the water quality results are deemed acceptable (i.e. no significant adverse impact to the receiving environment), physical parameters within the river will be sampled once per week and one water sample will be sent to the lab for nutrient analysis.

If the water quality of the Lower Vasse River is determined to be significantly impacted by dredging activities, all works will cease and discussions regarding management measures will be undertaken with DWER and the City.

3.2.2 Return Water

Return water from the geotextile bags will be monitored daily for pH for the duration of the dredging works to determine the potential for metals release through acidification. The Environmental Management Representative will provide training to the Dredging Contractor to ensure daily readings can be undertaken during initial stages of dredging each day. If the pH is recorded below the trigger value (as detailed in the ASSDMP), then in-situ nutrient testing will occur, or a water sample will be scheduled for analysis at the nominated NATA accredited laboratory.

During dredging as the sediment is pumped into the geotextile bags, twice weekly sampling and laboratory analysis (nutrients and metals) of the return water will occur. Where possible, dissolved nutrients will be measured daily during the first week using a spectrophotometer.

If the nutrient concentrations of the return water are excessive (>10% above the baseline elutriate nutrients), the return water drain system will be extended to increase opportunity for denitrification prior to the water re-entering the river. This will decrease nitrogen concentrations in the return water. Yellow sand may also be applied to the return water system to capture and therefore reduce phosphorus loads returning to the river.

3.3 Post-dredging monitoring

3.3.1 Lower Vasse River

Water samples will be collected from the three nominated LVR sampling locations once per week during the post-dredging phase as dewater continues to be returned to the river. The samples will be scheduled for nutrient and metal analysis at the nominated NATA accredited laboratory.

A final round of sampling will occur within one week of the completion of return water activities to determine if there are any resultant impacts to the water quality of the receiving environment. If there are deemed to be related water quality impacts, then further monitoring will be required until levels are commensurate with baseline levels.

3.3.2 Return Water

Following the completion of dredging, return water will continue to flow back to the river until the flow diminishes and can be allowed to infiltrate to ground beneath the tube laydown area.

If the monitoring program during dredging activities confirmed that return water quality was acceptable (i.e. the pH remained above the adopted criteria, ASS indicators such as metals were not exceeding the adopted criteria, and nutrients were not elevated enough to result in a significant impact to the water quality of the LVR) then no further monitoring of the return water will be required.

If the monitoring program during dredging activities indicated an adverse impact to the LVR from the return water, monitoring shall continue until the water flow to the LVR ceases and may include continued in-situ pH monitoring and weekly laboratory analysis of nutrients and metals.

3.3.3 Dewatered Sediment

After the sediment is sufficiently dewatered, the geotubes will be opened and the sediment sampled and analysed to determine if any treatment is required prior to removal from site. The sampling effort and analytical suite will be reflective of the intended disposal location of the sediment (i.e. waste characterisation for landfill disposal etc.).

4 Plan Implementation

This DDMP will be implemented during all pre-dredging, dredging and post-dredging activities related to the sediment removal in the Lower Vasse River.

4.1 Roles and Responsibilities

Table 7: Roles and Responsibilities

Role	Responsibilities
City of Busselton Project Manager	• Overall responsibility to ensure the implementation of the DDMP • Appointment of an Environmental Management Representative • Oversee the water quality monitoring program • Liaise with the dredging contractor to ensure they understand the requirements of this DDMP • Formal reporting to regulatory authorities related to environmental incidents and/or approvals
Dredging Contractor	• Implement the management measures detailed in this DDMP • Reporting of complaints and incidents to the City Project Manager
Environmental Management Representative	• Ensure the implementation of the DDMP • Manage the dredge water quality monitoring • Liaise with dredging contractor to ensure management measures are implemented in accordance with DDMP • Reporting of water quality related non-compliances to the City Project Manager.

4.2 Inductions and Training

All personnel working on the project shall be appropriately qualified and trained for the specific task they are undertaking. All personnel will undergo a site induction specific to the task they are to complete.

4.3 Incidents

Environmental incidents shall be reported in writing to the relevant authority and accompanied by a remedial action plan to rectify any resultant environmental impacts.

4.4 Complaints

If a complaint is received during the dredging activities, the details of the complaint will be reviewed and validated by the City and appropriate remedial actions implemented, as required. Depending on the nature of the complaint, the City will respond to the complainant with the outcome of altered activities, or remedial works, as applicable.

5 Adaptive Management

Adaptive management is a systematic approach to improving environmental results and management practices during project implementation through the application of learning from monitoring of outcomes and management actions.

This document has been developed based on the best available information at the time of preparation and will be reviewed in the following scenarios:

- Dredge methodology variations
- Where a new risk or potential impact to the environment is identified
- New information relating to the water, sediment, or biota quality is likely to alter potential impacts
- Following the completion of Stage 1
- As required by a regulatory authority.

6 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data and analyses ("client's information") provided by the client and other individuals and entities. In most cases where client's information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client's information is accurate, exhaustive or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client's information is contingent upon the accuracy, exhaustiveness and currency of the client's information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client's information was not accurate, exhaustive and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

7 References

360 Environmental 2022, Acid Sulfate Soils and Dewatering Management Plan (in prep), prepared for the City of Busselton, December 2021.

360 Environmental 2021, Sediment Disposal and Reuse Options Assessment, prepared for the City of Busselton, April 2021.

Beatty S, Cottingham A, Lymbery A, Paice R, Environmental Management Plan for Carter's Freshwater Mussel *Westralunio carteri*, prepared for the City of Busselton, August 2021.

City of Busselton 2019, Lower Vasse River Waterway Management Plan. Accessible at: https://rgw.dwer.wa.gov.au/wp-content/uploads/2019/07/Lower-Vasse-River-Water-Management-Plan-FINAL.pdf

Figures

Legend

- Development Footprint
- Proposed Dredge Area
- Proposed Laydown Areas for the temporary storage of Geomembrane bags

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2021
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2021
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

360 environmental

a 10 Bermondsey Street
West Leederville WA 6007
t (+618) 9388 8360
w www.360environmental.com.au

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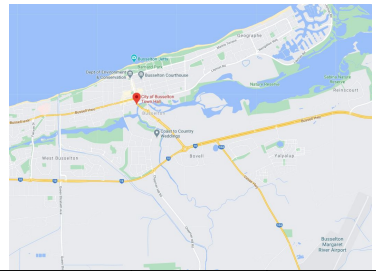
Meters

LOCALITY MAP



PROJECT NO	DATE	REVISION
4602	11/01/2022	1
CREATED	CHECKED	APPROVED
VM	AW	JP

City of Busselton, Lower Vasse River

Lower Vasse River Sediment Removal Project (EPBC2021/9051)

Figure 1

Site Location