REFERRAL OF A PROJECT FOR A DECISION ON THE NEED FOR ASSESSMENT UNDER THE *ENVIRONMENT EFFECTS ACT 1978*

REFERRAL FORM

The *Environment Effects Act 1978* provides that where proposed works may have a significant effect on the environment, either a proponent or a decision-maker may refer these works (or project) to the Minister for Planning for advice as to whether an Environment Effects Statement (EES) is required.

This Referral Form is designed to assist in the provision of relevant information in accordance with the *Ministerial Guidelines for assessment of environmental effects under the Environment Effects Act 1978* (Seventh Edition, 2006). Where a decision-maker is referring a project, they should complete a Referral Form to the best of their ability, recognising that further information may need to be obtained from the proponent.

It will generally be useful for a proponent to discuss the preparation of a Referral with the Impact Assessment Unit (IAU) at the Department of Environment, Land, Water and Planning (DELWP) before submitting the Referral.

If a proponent believes that effective measures to address environmental risks are available, sufficient information could be provided in the Referral to substantiate this view. In contrast, if a proponent considers that further detailed environmental studies will be needed as part of project investigations, a more general description of potential effects and possible mitigation measures in the Referral may suffice.

In completing a Referral Form, the following should occur:

- Mark relevant boxes by changing the font colour of the 'cross' to black and provide additional information and explanation where requested.
- As a minimum, a brief response should be provided for each item in the Referral Form, with a more detailed response provided where the item is of particular relevance. Cross-references to sections or pages in supporting documents should also be provided. Information need only be provided once in the Referral Form, although relevant cross-referencing should be included.
- Responses should honestly reflect the potential for adverse environmental effects. A Referral will only be accepted for processing once IAU is satisfied that it has been completed appropriately.
- Potentially significant effects should be described in sufficient detail for a reasonable conclusion to be drawn on whether the project could pose a significant risk to environmental assets. Responses should include:
    - a brief description of potential changes or risks to environmental assets resulting from the project;
    - available information on the likelihood and significance of such changes;
    - the sources and accuracy of this information, and associated uncertainties.
- Any attachments, maps and supporting reports should be provided in a secure folder with the Referral Form.
- A CD or DVD copy of all documents will be needed, especially if the size of electronic documents may cause email difficulties. **Individual documents should not exceed 2MB as they will be published on the Department's website.**

- A completed form would normally be between 15 and 30 pages in length. Responses should not be constrained by the size of the text boxes provided. Text boxes should be extended to allow for an appropriate level of detail.
- The form should be completed in MS Word and not handwritten.

The party referring a project should submit a covering letter to the Minister for Planning together with a completed Referral Form, attaching supporting reports and other information that may be relevant. This should be sent to:

Postal address

Minister for Planning
GPO Box 2392
MELBOURNE VIC 3001

Couriers

Minister for Planning
Level 20, 1 Spring Street
MELBOURNE VIC 3001

In addition to the submission of the hardcopy to the Minister, separate submission of an electronic copy of the Referral via email to ees.referrals@delwp.vic.gov.au is required. This will assist the timely processing of a referral.

PART 1 PROPONENT DETAILS, PROJECT DESCRIPTION & LOCATION

1. Information on proponent and person making Referral

Name of Proponent:	**Lower Murray Water Urban and Rural Water Corporation (LMW)**
Authorised person for proponent: **Position:** **Postal address:** **Email address:** **Phone number:** **Facsimile number:**	Josh White Project Director PO Box 1438, Mildura VIC 3502 Josh.White@vmfrp.vic.gov.au 0400 697 304 n/a
Person who prepared Referral: **Position:** **Organisation:** **Postal address:** **Email address:** **Phone number:** **Facsimile number:**	Josh White Project Director VMFRP PO Box 1438, Mildura VIC 3502 Josh.White@vmfrp.vic.gov.au 0400 697 304 n/a
Available industry & environmental expertise: (areas of 'in-house' expertise & consultancy firms engaged for project)	**VMFRP** The VMFRP is a regional partnership model between Lower Murray Water (LMW), Goulburn Murray Water (GMW), the Mallee Catchment Management Authority (Mallee CMA), North Central Catchment Management Authority (North Central CMA) and Parks Victoria, set up to deliver the VMFRP works on behalf of the Department of Environment, Land, Water and Planning - Water (DELWP Water). **R8** Jacobs and GHD teamed in December 2018 to form a joint venture (R8 Joint Venture) to deliver an integrated program approach across all packages of work. Both Jacobs and GHD are large consultancies who are providing a comprehensive suite of technical consulting services to support the VMFRP. These services include planning and approvals, design, cultural heritage, terrestrial and aquatic ecology, landscape and visual,

	hydrology, geotechnical, survey and spatial amongst other services.

2. Project – brief outline

Project title:

Hattah Lakes North Floodplain Restoration Project

Project location: (describe location with AMG coordinates and attach A4/A3 map(s) showing project site or investigation area, as well as its regional and local context)

The Hattah Lakes North Floodplain Restoration Project (the project) is located on the western side of the Murray River between Robinvale and Red Cliffs, approximately 75 km south of Mildura, in north west Victoria. The project involves works to support inundation of 1,130 ha of high ecological value Murray River floodplain.

Reference to the project area throughout this referral includes the proposed construction areas and the proposed inundation area. The proposed construction areas include the K10 Regulator, K10 Causeway Regulator and Bitterang Regulator, along with the Kulkyne Station Claypit and three River Track Passing Bays. The proposed or managed inundation area refers to the maximum inundation area able to be watered by the proposed works based on the current design, including private land that would only be subject to managed inundation if private flood agreements are established.

Construction areas

The main components of the project (K10 Regulator, K10 Causeway Regulator, Bitterang Regulator) are located within the Hattah-Kulkyne National Park and the Murray-Kulkyne Park, which are managed by Parks Victoria[1]. Hattah-Kulkyne National Park has an area of 49,975 ha and Murray-Kulkyne Park has an area of 4,555 ha[2]. Together, these two national parks extend from the Murray River in the east to the Calder Highway in the west.

River Track forms the boundary between Hattah-Kulkyne National Park and Murray-Kulkyne Park. As the K10 Regulator, K10 Causeway Regulator and River Track Passing Bays are located along River Track, they are partly located in both national parks. The Bitterang Regulator is entirely located within the Hattah-Kulkyne National Park. The proposed Kulkyne Station Claypit is located on private land, known as Kulkyne Station, between the River Track and the Murray River, and is surrounded by the national parks.

Inundation area

The proposed inundation area includes mostly Crown land[3] within the national parks, along with some private land including Kulkyne Station to the east and a parcel of private land adjoining the northern boundary of the national parks. Inundation of these areas of private land can be avoided through operation of the proposed works (e.g. close K10 Causeway Regulator or limit pumping

[1] For ease of reference, throughout this referral these parks will collectively be referred to as national parks having both been declared under the *National Parks Act 1975,* although it is noted that only Hattah-Kulkyne National Park is actually declared as a 'national park' under Schedule 2 of the Act, while Murray-Kulkyne Park is declared under Schedule 3 Other Parks under the Act.

[2] *National Parks Act 1975*

[3] A very small area of a small freehold land parcel within the national park boundary is also affected as described in Current Land Tenure.

over Bitterang Containment Bank) and will only be undertaken if flooding agreements can be established with the affected private landowners.

Access tracks

Access to the project will be from Boonoonar Road to the north via either Reed Road (west) or Kulkyne Way (east) to the northern national park boundary. Boonoonar Road extends between the Calder Highway (approx. 14.4 km west of Reed Road) and Kulkyne Way (approx. 0.8 km west of Reed Road). The Calder Highway is managed by Regional Roads Victoria along with Kulkyne Way north of Boonoonar Road. Boonoonar Road, Reed Road and Kulkyne Way, south of Boonoonar Road, are all local roads managed by Mildura Rural City Council.

Within the national parks, access will be via existing park access tracks such as Mournpall Track (to Bitterang Regulator) and River Track (to K10 Regulator, K10 Causeway Regulator, Kulkyne Station Claypit). River Track, south of Kulkyne Station, will also be used to provide access to an existing temporary pump facility at Sexton's, which is proposed to be used to source water for construction purposes (e.g. conditioning fill material). No construction traffic will use Raak Track and no works will be undertaken on this track as it is in an area of high cultural heritage sensitivity.

Regional and local context

The project is located entirely in the Rural City of Mildura and the Mallee Catchment Management Authority (CMA) region. The proposed construction areas are located within the Robinvale Plains bioregion, along with most of the proposed inundation area. A small portion of the proposed inundation area extends into the Lowan Mallee (to the west) and Murray Mallee (to the north) bioregions.

The project is situated in the northernmost part of the Hattah Lakes floodplain complex, which is comprised of approximately 20 lakes and surrounding woodlands that receive water from the Murray River via Chalka Creek. Twelve of the Hattah Lakes are listed under the Ramsar Convention as wetlands of international importance and on A Directory of Important Wetlands in Australia[4]. The nearest lakes included in these wetland listings are Lake Bitterang (approx. 1.0 km south of Bitterang Regulator) and Lake Cantala (approx. 3.5 km south of a River Track Passing Bay, 5.2 km south of the K10 Causeway Regulator and 6.0 km south east of the Bitterang Regulator). The project does not involve any construction works within the boundary of the Hattah-Kulkyne Lakes Ramsar site or the Hattah Lakes wetlands that are listed on A Directory of Important Wetlands in Australia. The project will not involve any discharges of managed floodwaters to these internationally and nationally important wetlands.

The location of the project area is shown in **Attachment 1 – Locality Map**. Further details of the proposed construction areas are shown in **Attachment 2 – Project Overview Maps**. **Attachment 3 – Managed Inundation Area Map** shows the location of public and private land within the proposed inundation area.

Short project description (few sentences)**:**

The project involves the construction of three regulating structures (K10 Regulator, K10 Causeway Regulator, Bitterang Regulator), and approximately 1.8 km of raised access tracks (containment banks) to facilitate managed inundation of the Chalka Creek North floodplain and the floodplain north of the existing Bitterang Containment Bank through to Lake Boolca. The proposed works will facilitate inundation of up to 1,130 ha of water-dependent floodplain habitats, including river red gum and black box forests and woodlands.

[4] Includes Lakes Arawak, Bitterang, Brockie, Bulla, Cantala, Konardin, Hattah, Kramen, Lockie, Mournpall, Yelwell and Yerang.

3. Project description

Aim/objectives of the project (what is its purpose / intended to achieve?):

The project aims to restore a more natural inundation regime and improve ecological condition across up to 1,130 ha of degraded floodplain habitats at Hattah Lakes North including:

- **Chalka North Area** - inundation of up to 420 ha of the Chalka Creek North floodplain, particularly the area north of Oatey's Regulator through construction of the K10 Regulator, K10 Causeway Regulator and a series of containment banks, which are designed to facilitate watering to a maximum inundation level of 43.5 mAHD (equivalent to flooding associated with river flows greater than 120,000 ML/day).

- **Lake Boolca Area** - inundation of up to 710 ha of floodplain north of the Bitterang Containment Bank through to Lake Boolca through construction of the Bitterang Regulator supported by temporary pumping, which is designed to facilitate watering to a maximum inundation level of 45.0 mAHD (via gravity) / 45.1 mAHD (via pumping) (equivalent to flooding associated with river flows greater than 140,000 ML/day).

The project is designed to build on the benefits of an extensive package of environmental works completed in 2013 under The Living Murray (TLM) program, which allow watering of approximately 6,000 ha of the central and southern Hattah Lakes floodplain. The project will use natural flood events and releases from the TLM works to facilitate environmental watering of flood-dependent vegetation communities on the northern Hattah Lakes floodplain. The northern Hattah Lakes, particularly the Lake Boolca Area, are at a higher elevation than the central and southern Hattah Lakes, and are among the last parts of the Hattah Lakes floodplain to be inundated during a natural event.

Three water regime classes comprised of seven ecological vegetation classes (EVCs) have been specifically identified for restoration through this project as described by Ecological Associates (2014a), including Red Gum Forest and Woodlands, Black Box Woodlands and Episodic Wetlands (see **Attachment 4 – Rationale and Outcomes Report**). Ecological Associates (2014a) developed ecological objectives for the water regime classes identified for restoration by the project based on:

- The environmental objectives set out in Chapter 5 of the Basin Plan 2012 (see **Attachment 5 – Summary of Basin Plan Environmental Objectives**)

- The expected environmental outcomes set out in the Basin-wide Environmental Watering Strategy (MDBA, 2014)[5]

- A review of TLM monitoring data (Henderson *et al*., 2012; Henderson *et al.,* 2013; Henderson *et al.,* 2014);

- The ecological values identified through desktop and field-based baseline flora and fauna surveys (Australian Ecosystems, 2014; GHD, 2014); and

- An ecological objectives workshop with an expert panel comprised of aquatic wildlife and restoration ecologists and key project stakeholders (DELWP, Mallee CMA).

[5] Expected environmental outcomes contained in the recently updated Basin-wide Environmental Watering Strategy (November 2019) (MDBA, 2019) are unchanged from the 2014 strategy.

Ecological targets have also been developed by Ecological Associates (2014a) to measure progress towards achieving the ecological objectives[6]. A summary of the ecological objectives and targets currently developed for the water regime classes identified for restoration by this project is provided in **Table 1**. The ecological objectives in **Table 1** are currently being refined as part of the VMFRP Monitoring Evaluation and Reporting (MER) Framework to provide more specific objectives against which progress can be measured and the quantification of the degree of environmental benefit expected from the project. The development of ecological objectives will use the Ecological Associates (2014a) objectives and targets as the basis. Once finalised, the ecological objectives and targets will be included in the final Hattah Lakes Environmental Water Management Plan and associated Operating Plan that will be submitted for approval by the Murray-Darling Basin Authority (MDBA) prior to environmental watering being undertaken.

Table 1. Ecological objectives and targets for the project with reference to associated water regime class and Basin Plan objectives

Specific Objective	Ecological Target	Water Regime Class	Associated Basin Plan Objective
Protect and restore floodplain productivity to maintain resident populations of vertebrate fauna including carpet python, lace monitor and bats	Total bat abundance to increase by 25% from 2015 levels by 2030.	Red Gum Forest and Woodland Black Box Woodland	1, 2, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14.
Provide occasional breeding habitat for waterbirds	Any species of waterfowl, crake, rail, waterhen or coot to breed in at least six seasons between 2025 and 2035.	Red Gum Forest and Woodland Episodic Wetlands	1, 2, 4, 6, 7, 8, 9, 10, 11, 12.
Maintain the health and age structure of red gum and black box trees	All red gum and black box stands within the project area achieve a health score of moderate or better under (Cunningham, et al., 2011) tree health monitoring for all years between 2025 and 2035.	Red Gum Forest and Woodland Black Box Woodland	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14.
Maintain a plant community of drought-tolerant wetland species in infrequently inundated areas	The drought-tolerant wetland species *Cyperus gymnocaulos* and *Elocharis acuta* are to be present in vegetative form in 75% of wetlands following any filling event.	Episodic Wetlands	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14.
Contribute to the carbon requirements of the River Murray channel ecosystem	The average annual carbon load (dissolved and particulate) to the Murray River from Hattah Lakes North for the period 2025 to 2035 in double 2015 to 202 levels.	Red Gum Forest and Woodland Black Box Woodland	2, 7.

Source: Draft Hattah Lakes Environmental Watering Plan Addendum (VMFRP, 2020a) derived from Ecological Associates (2014a).

To achieve the ecological objectives and targets, the project aims to more closely align the frequency, duration and timing of future flood events within the managed inundation area, with the natural (pre-regulation) frequency, duration and timing of flood events experienced by the targeted water regime classes within the managed inundation area. Analysis by Gippel (2014) as presented in the Business Case, compares the frequency, interval and duration of flood events

[6] The timeframes specified in these ecological targets are based on an assumed commissioning date for the proposed environmental works of 2020, and will be adjusted to reflect the actual commissioning date of the project.

based on implementation of the proposed measure (the project) with flood events under natural, baseline (current) and Basin Plan flows without the measure, and shows that the proposed works are able to facilitate a flood frequency, duration and timing within the managed inundation area that is more consistent with the natural (pre-regulation) flood frequency, duration and timing. The analysis by Gippel (2014) is presented in **Table 3** and further discussed in the background / rationale section of this referral.

The project aims to achieve this by using constructed works to harness water from natural high flow events in the Murray River and / or flows released from managed events using the previously constructed TLM works, to distribute, retain and in most cases release floodwaters[7] within the managed inundation areas. Use of constructed works enables environmental watering of targeted inundation areas to be undertaken using smaller volumes of water than would typically be needed in a general overbank flooding event (Jacobs, 2016a).

The expected ecological benefits of the project are:

- **Vegetation**: Hydrological regimes are the major factor responsible for determining the composition, structure, diversity and function of floodplain forest and wetland communities;
- **Trees**: Successful regeneration of floodplain trees usually occurs after major floods, while floods also provide an essential source of water to maintain tree canopy health;
- **Lignum**: Provides unique floodplain habitat and is dependent on floods for rapid vegetative growth and reproduction;
- **Waterbirds**: Flooding acts as the primary stimulus for breeding waterbirds, increasing reproductive performance as the flood pulse stimulates productivity in the wetlands;
- **Fish**: Flooding may trigger spawning or migration to suitable breeding habitat; and
- **Frogs**: Flooding promotes a rapid response in frog activity, including calling, spawning, and tadpole development and metamorphosis.

In addition to the expected ecological benefits, the project is also expected to contribute to the following socio-economic benefits:

- Enhanced tourism and recreational opportunities by improving the health and condition of riverine landscapes that attract visitors to the region
- Improved health of wetlands and floodplain ecosystems valued by Traditional Owners
- Reduced requirements to buyback water from consumptive users (e.g. irrigators) and associated impacts on regional communities, while still contributing to achievement of the environmental objectives set by the Murray-Darling Basin Plan.

Background/rationale of project (describe the context / basis for the proposal, eg. for siting):

Legislative and policy context

The Murray-Darling Basin Plan establishes the legal and policy framework for the use of environmental water in the Murray-Darling Basin and places a Sustainable Diversion Limit (SDL) on the water that can be extracted from the system for irrigation and other consumptive uses. The SDL is based on an assessment of the water that must be left in the system to maintain ecosystem health. To comply with the initial Basin Plan SDL, water must be purchased from existing entitlement holders and applied to environmental needs. However, the Basin Plan includes a mechanism to adjust the SDLs (i.e. the SDL may be increased if there are supply measures available that achieve an equivalent environmental benefit with less water).

[7] Managed inundation of the Lake Boolca Area will be retained on the floodplain rather than released.

Central to the SDL adjustment mechanism is a requirement that the environmental benefit of a proposed offset measure must exceed that of the base case (benchmark) scenario to justify an offset. Environmental benefit can be assessed in terms of how well the proposed measure addresses the Basin Plan's priorities for environmental water use, including, among other things, delivering benefits to ecosystems that are rare, near-natural or unique; provide vital habitat; support threatened species or communities; and support significant biodiversity.

In early 2019, the VMFRP secured funding from the Commonwealth government to progress engagement with communities and the development of detailed designs and approvals for nine projects designed to deliver water to floodplain ecosystems to directly address environmental water needs. The nine projects to be delivered are, listed in upstream to downstream order:

- Gunbower
- Guttrum and Benwell
- Vinifera
- Nyah
- Burra Creek
- Belsar-Yungera
- Hattah Lakes North
- Wallpolla Island
- Lindsay Island.

The relative location of the proposed nine projects is shown in **Attachment 6 – VMFRP Project Overview Map.**

Together, these projects aim to return a more natural inundation regime across more than 14,000 ha of high ecological value Murray River floodplain in Victoria through the construction of new infrastructure and the modification of existing infrastructure designed and operated to mimic the impact of natural flood events and improve the ecological condition of floodplain ecosystems.

Modified floodplain hydrology

Since the mid-1930s, a succession of dams, weirs and locks have been built along the Murray River to ensure reliable supply of water for irrigation and urban use, which has generally resulted in reduced peak flows, changes in the seasonality of flows and an increase in minimum flows (Ecological Associates, 2007a).

The Hattah Lakes system itself has been modified since the early 1900s when a channel was cut between Lake Lockie and Lake Hattah to improve the reliability of water supply for Victorian Railways (Ecological Associates, 2007a) and the nearby Hattah township (Jacobs, 2016a). Over time, numerous other physical alterations, including channel widening, installation of regulators and other structures, have occurred on the Hattah Lakes floodplain and were generally designed to retain water in the lakes following a Murray River flood event for the purpose of water supply and later, for maintaining significant ecosystems (Jacobs, 2016a).

A comparison of the modelled extent of flooding across the Hattah Lakes floodplain under natural (pre-regulation) and existing conditions by Jacobs (2014a) illustrates that floodplain works and river regulation have substantially reduced flooding, particularly at Lake Boolca and the surrounding floodplain (see **Attachment 7 – Natural and Existing Flood Extents Map**). A copy of the Jacobs report (2014a) further describing of the effects of river regulation on

floodplain hydrology is provided in **Attachment 8 – Hydrodynamic Modelling (Natural & Existing) Report**.

The River Red Gums Management Plan (Parks Victoria, 2018), which encompasses the Hattah-Kulkyne National Park and Murray-Kulkyne Park, recognises the diversity of natural values within the parks but also recognises that many of these natural values are under serious threat from changing patterns of water flows and use, and suggests that if insufficient flooding continues, further deterioration of the expanse and condition of wetlands and forests, already in poor condition, would have long-term impacts on the plant and animal communities and ecosystems, providing little resilience to the future impacts of climate change. For this reason, improving water regimes and delivering environmental water through the use of regulators and levees, is identified as a priority action in the River Red Gums Management Plan (Parks Victoria, 2018) to halt the decline of the parks and reserves, build resilience and lead to recovery.

Rationale

To support the Business Cases for the seven VMFRP projects located in the Mallee CMA region and to justify the SDL offset mechanism, an environmental benefits assessment was prepared by Ecological Associates (2014a) (see **Attachment 4 – Rationale and Outcomes Report**) to:

- Describe the ecological character of the floodplain systems;
- Set objectives for the use of water to promote ecosystem function and health; and
- Describe the contribution of each of the proposed SDL offset projects to achieving the ecological objectives.

Ecological Associates (2014a) established objectives to restore three specific water regime classes on the northern Hattah Lakes floodplain: Red Gum Forest and Woodlands, Black Box Woodlands and Episodic Wetlands. These ecological objectives and targets are summarised in **Table 1** of this referral.

Water regime classes identify areas of the floodplain with common water regimes and ecological characteristics; and were classified by Ecological Associates (2007a) according to the vegetation communities (EVCs) and aquatic habitat present, and their water regimes prior to river regulation (see **Attachment 9 – Hattah Lakes Options Feasibility Investigation**). The structure of floodplain plant communities strongly reflects long term flooding histories, with the duration, depth, frequency and timing of flooding influencing the plant species present, their relative abundance and their growth habit (Ecological Associates, 2007a). Plant community classifications are therefore a useful way to directly relate water regime to plant habitat and indirectly to fauna habitat, and water regime classes based on these plant community classifications provide a basis to establish hydrological objectives.

Using topographic data and information on the known spread of water on a rising hydrograph, Ecological Associates (2007a) arranged EVCs in the order in which they are likely to be flooded, and the likely frequency and relative durations of flooding, with this environmental gradient then refined by reviewing the EVC descriptions, which set out the species present during flooded and dry phases, their relative abundances and their habit. Species with known relationships to flooding were used to rank the EVCs from most-likely to least-likely to be flooded. EVCs were amalgamated into five floodplain water regime classes, with amalgamation occurring where there was no strong hydrological basis to treat the botanical differences reported in the EVC descriptions separately.

A summary of water regime classes and constituent EVCs within the proposed inundation area, as identified by Ecological Associates (2014a), is provided in **Table 2**. In the absence of the original data, spatial analysis has confirmed that the areas identified by Ecological Associates

(2014a) for each water regime class generally align with groupings of the relevant EVCs identified by DELWP's modelled 2005 EVC extents (see **Table 2**). The location of modelled 2005 EVCs and associated water regime classes occurring within the managed inundation area are shown in **Attachment 10 – Managed Inundation Areas – EVC Map** and **Attachment 11 – Managed Inundation Areas – Water Regime Class Map.**

Table 2. Summary of EVCs / water regime classes within the Hattah Lakes North managed inundation area[8]

Water Regime Class	EVCs	Modelled EVC extent within managed inundation area (ha)	Area of water regime class in Ecological Associates (2014a) (ha)
Red Gum Forest and Fringing Red Gum Woodland	EVC 106 - Grassy Riverine Forest	0.06	125
	EVC 813 - Intermittent Swampy Woodland	124.74	
	EVC 810 - Forest/Floodway Pond Herbland	--	
	Total	**124.80**	
Black Box Woodland	EVC 103 - Riverine Chenopod Woodland	519.47	883
	EVC 295 - Riverine Grassy Woodland	356.06	
	EVC 818 - Shrubby Riverine Woodland	6.09	
	Total	**881.63**	
Episodic Wetlands	EVC 107 - Lake Bed Herbland	32.53	33
	Total	**32.53**	
Mallee*	EVC 86 - Woorinen Sands Mallee	4.86	30
	EVC 91 - Loamy Sands Mallee	12.84	
	EVC 158 - Chenopod Mallee	1.86	
	EVC 824 - Woorinen Mallee	10.52	
	Total	**30.08**	
Plains Woodland and Forest*	EVC 97 - Semi-arid Woodland	30.75	31
	EVC 98 - Semi-arid Chenopod Woodland	0.01	
	Total	**30.76**	
Lignum Shrubland and Woodland**	EVC 808 - Lignum Shrubland	3.06	3
	EVC 104 - Lignum Swamp	--	
	EVC 823 - Lignum Swampy Woodland	--	
	Total	**3.06**	
N/A	Not mapped as EVC	27.14	25
	Total	**27.14**	

* Not flood-dependent.
** Minor component of proposed inundation area for which ecological objectives are not relevant.

A targeted field assessment was undertaken by R8 to ground-truth the modelled presence of non-flood-dependent EVCs in the managed inundation area and has confirmed that these EVCs are not present at the modelled locations. Rather, areas modelled as non-flood-dependent EVCs were found to contain vegetation communities consistent with the adjacent flood-dependent EVCs. For the purpose of this referral, updated EVC mapping has not been prepared for the managed inundation areas. However, a description of the fieldwork undertaken, and the key

[8] Based on spatial analysis of modelled 2005 EVCs within managed inundation area and grouping of EVCs into water regime classes as defined by Ecological Associates, 2007a.

findings is provided in **Attachment 12 – Flora and Fauna Assessment**. Further assessment and mapping of native vegetation communities occurring in the managed inundation areas is proposed to be undertaken for the project at a later stage, to inform development of ecological condition monitoring programs and a proposed native vegetation offset management plan.

The preferred frequency and duration of flooding for each water regime class targeted for restoration by the project, has been determined through a series of studies undertaken by Ecological Associates (2007a, 2014a, 2015) by analysing where each vegetation community associated with the water regime class occurred on the floodplain (mapped extent, elevation range) supported by hydrological modelling (Gippel, 2014; Jacobs, 2014a) to determine the Murray River flow threshold that would have flooded these elevation ranges under natural (pre-regulation) conditions. Mapping by Jacobs (2014a) of the modelled extents of flooding under natural conditions is provided in **Attachment 7 – Natural and Existing Flood Extents Map.**

Red Gum Forest and Woodland communities occur mainly on the floodplain terraces along Chalka Creek North and Raakjlim Creek, and comprise of species that benefit from seasonal flooding but tolerate dry conditions over summer and occasional years without any flooding (Ecological Associates, 2014a). Under natural conditions, Chalka Creek reached bank full level and overtopped onto the adjacent floodplain when river flows exceeded 60,000 ML/day and inundated Red Gum Forest and Woodland when river flows exceeded 80,000 ML/day (Ecological Associates, 2014a). Areas of Red Gum Forest and Woodland targeted for restoration by the project are located in the Chalka North Area.

Areas of Black Box Woodland targeted for restoration by the project are located mainly along the floodways and floodplains of the Lake Boolca Area, as well as at the upper limits of the Chalka North Area. Tree recruitment and productivity in Black Box Woodlands is strongly linked to flooding (Ecological Associates, 2014a). Episodic Wetlands targeted for restoration by the project are associated with Lake Boolca. Under natural conditions water spreading from Chalka Creek North reached Black Box Woodlands on the Chalka Creek North floodplain when river flows exceeded 100,000 ML/day (Ecological Associates, 2014a). Under natural conditions, significant inundation of the floodplain near Lake Boolca occurred via Raakjlim Creek when river flows exceeded 120,000 ML/day while Lake Boolca filled when river flows exceeded 140,000 ML/day (Ecological Associates, 2014a). Due to the naturally high sill level on the Bitterang floodway (44.5 mAHD) (GHD, 2012a), flows only passed northwards into the Lake Boolca Area when river flows exceeded at least 160,000 ML/day (Ecological Associates, 2014a).

The hydrological regime experienced by each water regime class identified for restoration through this project, has been compromised due to river regulation and diversions. The project has been designed to deliver the operational flexibility and maximum design water levels identified as required, through the work by Ecological Associates, to satisfy the ecosystem water requirements of the EVCs / water regime classes targeted for restoration within the Hattah Lakes North managed inundation areas.

To demonstrate this, modelling by Gippel (2014) is summarised in **Table 3** and compares the water regime that can be provided by the project (measure) with the following water regimes:

- Natural (pre-regulation)
- Baseline (current)
- Basin Plan (2750) without the measure.

Although Basin Plan flows will contribute towards addressing current deficiencies in the environmental water requirements of Hattah Lakes North compared to baseline conditions,

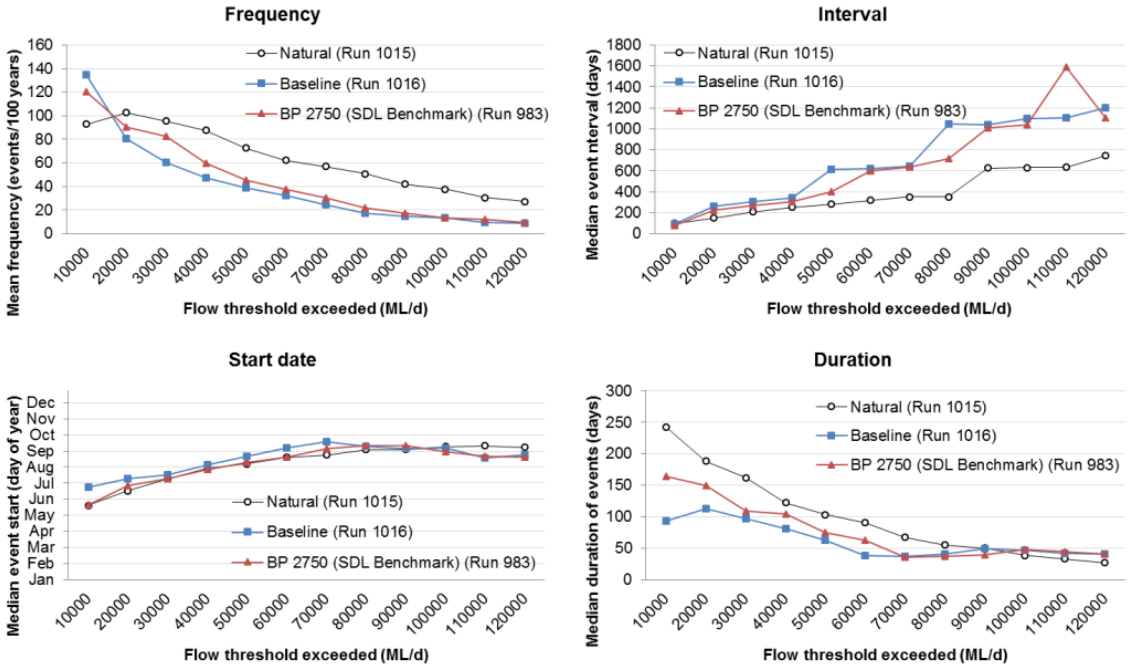
the project is required to bridge the gap between Basin Plan flows and the environmental water requirements of Hattah Lakes North.

Table 3. Comparison of water regimes provided by natural, baseline, Basin Plan and the proposed project[9]

Threshold (ML/d)	WRC	Scenario	Frequency Mean (/100 yrs)	Duration Median (days)	Event start date Median (day of year, 1 Jan = 1)	Prevalence yrs with event %
80,000	Red Gum Forest and Woodland	With Measure[1]	60	50	244	60
		Natural	50.9	55	252	46
		Baseline	17.5	40	258	15
		Basin Plan 2750 without measure	21.9	37	259	19
120,000	Black Box Woodland	With Measure[1]	25	30	244	25
		Natural	27.2	27	256	24
		Baseline	8.8	40	242	8
		Basin Plan 2750 without measure	9.6	41	237	8
140,000	Episodic Wetlands	With Measure[1]	15	30	244	15
		Natural	17.5	29	257	16
		Baseline	6.1	62	237	5
		Basin Plan 2750 without measure	7	37	236	6

[1] based upon interpretation of the preliminary operations plan adapted from Ecological Associates 2014c

Further comparison of frequency, duration, interval and start dates for the natural and baseline flow regime, and under the Basin Plan without the project as modelled by Gippel (2014) is illustrated in **Figure 1**.



[9] Natural, baseline and Basin Plan regimes derived from Gippel (2014).

Figure 1. Comparison of frequency, interval, duration and start date at Euston DS of natural, baseline and Basin Plan 2750 (without measure) flow scenarios, over a 114-year model period[10]

Main components of the project (nature, siting & approx. dimensions; attach A4/A3 plan(s) of site layout if available):

Basis of Design

Based on the investigations by Ecological Associates (2007a, 2014a, 2015), Gippel (2014) and Jacobs (2014a), the maximum design water levels for the project have been set as:

- Chalka North Area = 43.5 mAHD (equivalent to river flows of approximately 120,000 ML/day under natural conditions) (Jacobs, 2014).
- Lake Boolca Area = 45.0 mAHD (via gravity), 45.1 mAHD (with pumping) (equivalent to river flows of approximately 140,000 ML/day under natural conditions (Ecological Associates, 2015).

To achieve this, three regulating structures are proposed:

- K10 Regulator and K10 Causeway Regulator will operate to allow flows from natural floods and TLM releases (opening of Oatey's Regulator) to facilitate inundation of up to 420 ha within the Chalka North Area while also enabling flooding of private land within Kulkyne Station to be avoided if flood agreements are not established.
- Bitterang Regulator will operate to allow flows from natural floods and TLM releases to flow north from Lake Bitterang to facilitate inundation within the Lake Boolca Area of up to 300 ha via gravity and up to a further 410 ha via the use of temporary pumps to pump water over the existing Bitterang Containment Bank. Controlling the rate and duration of temporary pumping enables flooding of private land adjacent to the northern national park boundary to be avoided if flood agreements are not established.

The proposed infrastructure has been sized and positioned to:

- Pass natural events relatively unimpeded
- Allow for capture of some natural flood events and allow the residual flows to pass downstream
- Minimise potential for erosion over a broad range of flow and tailwater conditions
- Exclude water from private land during managed watering events (unless flooding agreements are established)
- Provide safe downstream fish passage at all regulators in accordance with the recommended design criteria for native fish contained in **Attachment 13 - Fish Management Plan**.
- Provide appropriate upstream fish passage without the construction of purpose built fishways in accordance with the recommended design criteria for native fish contained in **Attachment 13 - Fish Management Plan**.

Design drawings for the main components of the project are provided in **Attachment 14 – Design Drawings**. A summary description of the main components of the project is provided below.

K10 Regulator

[10] Gippel, 2014.

The K10 Regulator is located on Chalka Creek North at Raak Crossing (River Track). This location was selected (GHD 2012b) as it maximises the area of inundation on the lower floodplain; minimises breakout locations for flow back to the Murray River; is readily accessible and it is located on an existing disturbed area to reduce potential cultural heritage and vegetation impacts.

Key design features include:

- Installation of a 3-bay concrete regulator with a maximum height of 4.5 m (including 0.5 m freeboard).
- Raising an approximately 794 m long embankment along the alignment of the existing River Track.
- Construction of an invert of structure at 39.5 mAHD to match the existing creek channel invert.
- Installation of three, 2.0 m wide x 4.0 m high dual-leaf combination gates.
- Provision of a 60 m wide spillway to the south of the regulator with a crest level set 0.1 m above design water level (spillway crest at 43.6 mAHD).
- Construction of an additional containment bank approx. 80 m north west of the main structure to block a low point at 43.92 mAHD.
- Downstream fish passage will be managed by provision of:
    - overshot flow (achieved by operation of dual leaf gates)
    - a downstream plunge pool
    - a rock ramp downstream of the end sill to provide scour protection - the rock protection is designed as a rock ramp level with the end sill, and then grades downstream at 1 vertical to 20 horizontal to remove the risk of a secondary drop, although a hydraulic jump may form on the ramp in some conditions.
- Upstream fish passage to be provided by passage directly though the regulator gates by control of velocity within the regulator and when the tailwater is high enough to allow.
- Provision of hardstand area and turning circle for crane access for gate maintenance.
- Operator access to gates offset from road behind guardrail.

Access to the K10 Regulator during construction will be via River Track. Construction of the K10 Regulator will allow access for operational vehicles during a managed and natural (to an extent) flood event, which is not currently possible at Chalka Creek. Public access along this section of River Track will not be available during a managed event and will be controlled by Parks Victoria (gates will be installed as part of this project where required by Parks Victoria).

K10 Causeway Regulator

The K10 Causeway Regulator is located across an anabranch of Chalka Creek and is designed to isolate private land (Kulkyne Station) on the eastern floodplain from the managed flood event. The regulator is designed to control flow into the area isolated by the containment bank and to allow unimpeded flow through the anabranch of Chalka Creek. There are two flow paths in this area: the dominant path returns to Chalka Creek and would commence to flow at EL 45.50; while a lesser branch connects to the Murray River for water levels above EL 45.80.

Key design features include:

- Installation of a 3-bay box culvert regulator structure with a maximum height of 1.2 m (including 0.3 m freeboard).

- Installation of three, 1.8 m wide x 1.2 m high penstock gates.
- Raising an approximately 722 m long embankment along the alignment of the existing River Track (either side of the regulator).
- No specific provision for fish passage - fish passage was considered in design but does not control the structure sizing.
- Provision of hardstand area and turning circle at either end for operator parking and turning.
- Operator access to gates offset from road behind guardrail.

Access to the K10 Causeway Regulator during construction will be via River Track. Construction of the K10 Causeway Regulator will maintain two-way access for operational vehicles along River Track during the managed flood event. Public access along this section of River Track will not be available during a managed event and will be controlled by Parks Victoria (gates will be installed as part of this project where required by Parks Victoria).

Bitterang Regulator (and temporary pumping area)

The Bitterang Regulator will be installed within the existing Bitterang Containment Bank, which was constructed as part of TLM works. The site chosen for the regulator is at the lowest natural surface level along the existing containment bank alignment. The ground to the south (upstream side) is lower and grades toward a depression, which was used as a source of material in the previous containment bank construction and provides a suitable location for use as a pump suction sump.

Key design features include:

- Installation of a 5-bay box culvert regulator structure, 1.2 m high (including 0.3m freeboard).
- Installation of five, 1.2 m wide x 1.2 m high penstock gates.
- Widening of existing containment bank crest from 2.0 m to 4.0 m to allow single lane access to the regulator.
- No specific provision of fish passage is to be provided however the objective of maximising inflows (minimising velocity) is compatible with providing upstream fish passage. The gates are to be designed and operated to provide safe downstream fish passage.
- Provision for temporary pumps will include:
    - 10 m x 10 m hardstand area for float access and pump setup, located to facilitate optimal placement of suction line to minimise need for 90 degree bends in suction line.
    - Fuel for pumps will need to be brought in at the start of a managed inundation event and stored on site as there will be no access for a large fuel truck during managed inundation.
    - Pump and fuel tanks to be delivered to site will be self-bunded.
    - Provision of sump including consideration of minimum water depth of 1.5 m.
- Provision of hardstand area and turning circle for ease of operator access and temporary pump.

Access to the Bitterang Regulator during construction will be via Eagles Nest Track / Red Ochre Track off Mournpall Track only as Eagles Nest Track extending east from the structure is not recommended for access purposes. Eagles Nest Track is already not open to the public (management vehicles only) and will not be made accessible to the public as part of the project. As such, there is no provision for operator access to be offset from the road. Access from the north via Mournpall Track will be closed during a managed event.

Containment Banks

Approximately 1.8 km of containment banks are proposed to operate in conjunction with the proposed regulating structures to facilitate managed flood events by enabling water to be retained within the proposed inundation areas up to the maximum design water levels. These containment banks will be constructed by raising existing tracks, which will provide all weather access to the proposed regulator sites during managed flood events. The containment bank associated with the K10 Causeway Regulator will also function to prevent inundation of private land within Kulkyne Station during managed flood events when the K10 Causeway Regulator is closed. These containment banks / raised access tracks are included in the construction areas for the K10 Regulator, K10 Causeway Regulator and Bitterang Regulator and are the only track upgrade works proposed as part of this project.

The containment bank associated with the Bitterang Regulator is located along Eagles Nest Track and was constructed as part of TLM works and will require only minor augmentation as part of this project. This will include widening the top of the existing bank by about 2.0 m width and raising the existing bank by less than about 0.5 m. The containment bank associated with the K10 Regulator is located along the alignment of River Track and will involve raising the existing track surface level by up to about 3.5-4.0 m (where the track crosses the current Chalka Creek channel) with the majority of track raising being less than about 2.0 m above the existing track surface level. The containment bank associated with the K10 Causeway Regulator is also constructed along the alignment of River Track and will involve raising the existing track surface level by up to about 1.0-1.5 m.

The design for access along the containment banks / raised access tracks, has adopted a 3.5 m lane width with 1 m shoulders, giving a total carriageway width of 5.5 m. The total track crest width is 6.5 m, which allows for a 0.5 m verge. This generally matches the design adopted for the “breakout levee” on River Track as part of TLM works. The design has a 3:1 batter for the containment banks / raised access tracks as this is the minimum slope required to be traversable by cars, while also minimising the disturbance footprint. Guard rails are included in the higher risk areas around the K10 Regulator. Refer to **Attachment 14 – Design Drawings** for further details of proposed containment banks / raised access tracks.

Ancillary components of the project (eg. upgraded access roads, new high-pressure gas pipeline; off-site resource processing):

Kulkyne Station Claypit

It is estimated that approximately 18,475 m^3 of fill material will be required for construction of the project. It is proposed that fill material for construction of containment banks and regulators will be sourced from a claypit having a surface area of approximately 3.5 ha and a depth of approximately 2 m on private land at Kulkyne Station. The proposed claypit will be located immediately north of the pit used for the supply of fill and disposal of spoil during construction of the TLM works in 2012/13.

Geotechnical investigations by Jacobs (2016b) (see **Attachment 15 – Geotechnical Report**) determined that soils within the proposed claypit generally comprise dark brown and dark grey, low to intermediate plasticity silty clay; overlying light brown and orange-brown low plasticity silty clay; overlying pale brown fine-grained sand with some silt. These soils were found to be moderately dispersive (Emerson class 2 or 3) but otherwise suitable as general impermeable fill for regulator and containment bank construction, assuming it is adequately moisture conditioned and compacted. Testing within the previously disturbed and backfilled pit used for TLM works

confirmed the presence of fill material that is generally considered to be unsuitable for reuse in regulator or containment bank construction and is likely to comprise waste spoil excavated from TLM work sites. The proposed claypit for this project is therefore located outside but immediately adjacent to the backfilled TLM pit. No groundwater was encountered in test pits at the proposed Kulkyne Station Claypit site during the 2016 geotechnical investigations.

Attachment 12 - Flora and Fauna Assessment contains an assessment of potential impacts on flora and fauna within the proposed Kulkyne Station Claypit. Construction of the claypit will require the removal of native vegetation, which has been accounted for in the estimated area of native vegetation removal and discussion of other potential flora and fauna impacts provided in Section 12 (Native vegetation, flora and fauna) of this referral.

The proposed Kulkyne Station Claypit was included in the activity area assessed as part of cultural heritage investigations undertaken to inform the draft CHMP for the project and has been located to avoid direct impacts on Aboriginal Places recorded in the vicinity. The Kulkyne Station Claypit has also been located to avoid direct impacts on a historical grave site located within Kulkyne Station, which is believed to comprise the site of the Kulkyne Grave (B2628) that is listed on the Register of the National Trust.

Access Tracks

Within the national parks, access will be via existing park access tracks such as Mournpall Track (to Bitterang Regulator) and River Track (to K10 Regulator, K10 Causeway Regulator and Kulkyne Station Claypit). River Track south of Kulkyne Station will also be used to provide access to an existing temporary pump facility at Sexton's, which is proposed to be used to source water for construction purposes (e.g. conditioning fill material). Three small passing bays are proposed to be constructed along this southern section of River Track.

No other upgrade or widening works are proposed along the proposed construction access tracks as these tracks are considered suitable for use by construction traffic having previously been used for construction of TLM works. Some minor track maintenance works, such as grading and applying additional road base to the surface (pothole filling), may be required during construction of the project. However, maintenance works will not extend outside the current track width.

Although Raak Track provides the most direct route between the Kulkyne Station Claypit and the Bitterang Regulator construction area, no construction traffic will use Raak Track and no works will be undertaken on this track as it is in an area of high cultural heritage sensitivity. Transport of fill material from the Kulkyne Station Claypit to the Bitterang Regulator construction area, and return spoil transfer, will therefore utilise River Track, Kulkyne Way, Boonoonar Road, Reed Road and Mournpall Track. Based on the estimated volumes of fill and spoil associated with the Bitterang Regulator works, it is anticipated that up to 70 trips using truck and dog will be required to transport material to and from the Kulkyne Station Claypit along this route. Due to the width of existing tracks and proposed closures of River Track and Mournpall Track to public access during peak haulage periods, no additional passing provision is required along this haulage route.

Key construction activities:

The following construction activities will be undertaken in the proposed construction areas:

- Establishment of construction sites, including removal of vegetation, stripping and stockpiling of topsoil, establishing temporary parking and truck turnaround areas, laydown and stockpiling areas

- Establishment of the claypit, including removal of vegetation, stripping and stockpiling of topsoil and overburden,
- Construction / installation of new structures.

A coffer dam will be constructed in Chalka Creek North on the northern side of the K10 Regulator site. The proposed coffer dam location is included within the K10 Regulator construction area. The proposed coffer dam will be established to minimise the potential for inundation of work areas from the north in the event of flows in the Murray River backing up into Chalka Creek North. The potential for flows coming from the south along Chalka Creek North to enter work areas at the K10 Regulator site can be managed to a greater extent through operation of Oatey's Regulator and therefore no upstream coffer dam is considered necessary at this stage. No coffer dams are proposed at the other construction areas as these sites are typically dry and located outside of the creek channel.

Approximately 10-15 pieces of plant will likely be required on site during construction, including excavators, truck and trailers, graders, rollers and forklifts.

Importation of construction materials, including regulators and imported soils, will comply with Parks Victoria consent under Section 27 of the *National Parks Act 1975* and the future *Environment Protection Act 2017* (due to commence on 1 July 2020).

In accordance with the draft EMF, the contractor will be required to prepare a CEMP that will detail measures to avoid and minimise impacts during construction. Once construction of regulators, containment banks and all associated works are complete, all waste and spoil will be removed from the sites and disposed of as required by the CEMP.

Following completion of works, rehabilitation of construction areas will be undertaken in accordance with Parks Victoria consent under Section 27 of the *National Parks Act 1975*. General principles for site rehabilitation in the project design criteria include:

- use of local indigenous plant species
- placement of habitat logs
- retention and reuse of topsoil
- rock beaching using materials consistent with the local geological settings, where practicable.

Key operational activities:

A summary of proposed operating scenarios for the Chalka North Area and Lake Boolca Area works is provided in **Table 4** and **Table 5** respectively.

Table 4. Chalka North Area Works - Operating Scenarios

Scenario	Description	Structure Operation
Natural flood	• Infrastructure to allow natural floods to pass unhindered.	• K10 and K10 causeway regulators to be fully opened.
Flood capture	• Capture can occur when discharge at Euston Weir exceeds 60,000 ML/d. • Peaks at Euston Weir up to 120,000 ML/d may be captured.	• K10 regulator is to be operated to maintain design water level (maximum) when the flood peak starts to recede. • K10 causeway regulator is to be operated in accordance with the agreement with the private landowner of Kulkyne Station. • Water is released from the K10 regulator when the flood duration target is met.
Retain releases from TLM Area	• Releases from Oatey's regulator occur when TLM inundation level is between 42.5 and 45.0 m AHD.	• K10 and K10 Causeway regulators are closed and water is released from Oateys Regulator. • When target inundation level is achieved gates on K10 regulator are operated to maintain level for duration of inundation period. • At completion of managed event, release occurs through the K10 regulator gates at a predefined flow rate (not exceeding 825ML/d). • Release of water though K10 Causeway regulator in an environmental flow event can only occur if there is agreement from the landholder to the east who owns this area of floodplain. If the land is inundated then the K10 Causeway regulator will need to remain open to drain by backflow via K10 regulator.

Table 5. Lake Boolca Area Works - Operating Scenarios

Scenario	Description	Structure Operation
Natural flood	• Infrastructure to allow natural floods to pass unhindered.	• Bitterang Levee regulator to be fully opened
Flood capture	• Capture can occur when flood levels in Lake Bitterang exceed 45 m AHD (equates to a River Murray flow of approximately 140,000 ML/d)	• Bitterang Levee regulator is to be closed when the flood peak starts to recede. • Water may be detained in the Lake Boolca area indefinitely.
Environmental watering – gravity release	• The TLM inundation needs to be at 45.0 m AHD.	• The Bitterang Levee regulator should be open as long as flow is required to the Lake Boolca Area. • It is expected the peak flow rate will be approximately 100 ML/d and will inundate approximately 300 ha.
Environmental watering – pumped releases	• The TLM inundation needs to be at 45.0 m AHD.	• A temporary pump will be installed at the Bitterang Levee regulator. • The Bitterang Levee regulator will be closed. • Water will be pumped from Lake Bitterang to the northern side of the levee at a rate of up to 300 ML/d.

Further details on the proposed operating scenarios, including preferred frequency, duration, timing and water regime classes targeted, as derived from Ecological Associates (2015) is provided in **Attachment 16 – Proposed Operating Scenarios.**

Attachment 17 – Indicative Managed Flood Event Depth Map illustrates flood depths within the Chalka North Area and Lake Boolca Area for operating scenarios that most closely represent the maximum inundation extents for the project.

To replicate a more natural flood regime, the project must have the flexibility to operate under a range of flow conditions. This flexibility is also required to enable the operational regime to trigger a range of ecological responses across a representative area of flood-dependent ecosystems. The Hattah Lakes Environmental Water Management (MDBA, 2012) and Hattah Lakes Operating Plan (MDBA, 2016) establish the decision-making frameworks to enable adaptive management of environmental watering within the Hattah Lakes Icon Site. Prior to commencing operations, these documents will be amended to incorporate the proposed works. Draft addenda to the Hattah Lakes Environmental Water Management (MDBA, 2012) and Hattah Lakes Operating Plan (MDBA, 2016) have been prepared for the project by VMFRP and are included in **Attachment 18 – Draft Environmental Water Management Plans** and **Attachment 19 – Draft Operating Plan**.

Key decommissioning activities (if applicable):

The design life of the structures is 100 years. If the structures are no longer required at the end of life, all structures will be removed to a practical extent from the site by the operator, and the area rehabilitated to the satisfaction of the public land manager (i.e. Parks Victoria).

Is the project an element or stage in a larger project?

☐ No ☒ Yes If yes, please describe: the overall project strategy for delivery of all stages and components; the concept design for the overall project; and the intended scheduling of the design and development of project stages).

The project builds on the Stage 1 Hattah Lakes works, implemented under TLM program, by extending the flood management area to the northern Hattah Lakes floodplain. The Hattah Lakes TLM works were referred under the *Environment Effects Act 1978* in 2010 (Referral No. 2010-

05) and were determined not to require an Environment Effects Statement subject to a condition requiring the preparation of an Environmental Management Plan to the satisfaction of the Secretary of the Department of Sustainability and Environment (now DELWP). The Hattah Lakes TLM works were also referred in 2010 under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC 2010/5662) and were determined to not be a controlled action if undertaken in a particular manner.

The Hattah Lakes TLM works were completed in 2013. Ecological monitoring of the Hattah Lakes TLM works has shown a trend of increasing ecological condition (Bloink *et al*, 2019) (see **Attachment 20 – Hattah Lakes TLM Condition Monitoring Report 2018-2019**). These results provide confidence that implementation of the proposed supply measures under this project and its associated watering regime will provide the expected benefits.

No further stages of works are currently proposed at Hattah Lakes beyond the current project.

Is the project related to any other past, current or mooted proposals in the region?

☐ No ☒ Yes If yes, please identify related proposals.

The Hattah Lakes North Floodplain Restoration Project is one of nine discrete environmental works projects being undertaken as part of the VMFRP, which is being implemented as part of Victoria's obligations under the Murray Darling Basin Plan. The VMFRP aims to return a more natural inundation regime across more than 14,000 ha of high ecological value Murray River floodplain in Victoria through the construction of new infrastructure and modification of existing infrastructure.

A summary of the nine VMFRP projects in order from east (upstream) to west (downstream) along the Murray River floodplain is provided in **Table 6**.

Table 6. Summary of VMFRP projects

Project	Proposed Floodplain Inundation Area*	CMA	LGA	Implementing Authority	Bioregion
Gunbower	500 ha	North Central	Campaspe Gannawarra	GMW	Murray Fans
Guttrum and Benwell	1,270 ha 660 ha	North Central	Gannawarra	GMW	Murray Fans
Vinifera	340 ha	Mallee	Swan Hill	LMW	Murray Fans
Nyah	440 ha	Mallee	Swan Hill	LMW	Murray Fans
Burra Creek	325 ha	Mallee	Swan Hill	LMW	Murray Fans (small area of Murray Mallee)
Belsar-Yungera	2,370 ha	Mallee	Swan Hill	LMW	Robinvale Plains (small area of Murray Mallee)
Hattah Lakes North	1,130 ha	Mallee	Mildura	LMW	Robinvale Plains (small area of Lowan Mallee & Murray Mallee)
Wallpolla Island	2,651 ha	Mallee	Mildura	LMW	Murray Scroll Belt

Lindsay Island	5,365 ha	Mallee	Mildura	LMW	Murray Scroll Belt

* Proposed floodplain inundation areas may vary subject to the processes of design development and obtaining land owner / manager agreements.

The location of the VMFRP projects is shown in **Attachment 6 – VMFRP Project Overview Map**.

The VMFRP is being implemented in partnership between LMW, GMW, Mallee CMA, North Central CMA, Parks Victoria and the DELWP, and is funded by the Commonwealth Department of Agriculture and Water Resources. LMW is the project proponent.

Further details of these projects are available at: https://www.vmfrp.com.au/

Separate referrals are being prepared for these projects under the Victorian *Environment Effects Act 1978* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

4. Project alternatives

Brief description of key alternatives considered to date (eg. locational, scale or design alternatives. If relevant, attach A4/A3 plans):

Planning and design of the project has considered a range of alternatives to achieve the ecological objectives described in Section 3 (Project description: Aims/objectives of the project) of this referral. This has involved numerous studies over the last decade to evaluate and refine water management options to identify the most effective and efficient design for environmental watering of the Hattah Lakes North floodplain. A list of key investigations in the categories of environmental, technical, risks and consultation is provided in **Attachment 21 - List of Project Investigations**.

2007 Water Management Feasibility Investigations

Three water management options for the Dry Lakes, Lake Boolca and adjacent floodplain were initially investigated by Ecological Associates (2007b) and generally involved facilitated inundation via the northern, Raakjlim Creek flow path into these lakes (see **Table 7**). These options were ruled out due to high cost, and/or low environmental benefit and/or high risk and were considered even less favourable following approval of TLM works, which enabled consideration of alternative, more efficient watering options for the Dry Lakes and Lake Boolca via the southern, Bitterang floodway flow path.

Table 7. Summary of options investigated by Ecological Associates (2007b)

Option	Description	Evaluation
1	Removal of existing levees in Raakjlim Creek	Least expensive of Options 1-3. Relies completely on flows in the Murray River of at least 120,000 ML/day to provide lake inflows – no inflow reliability and no immediate solution to declining ecological condition in Dry Lakes and Lake Boolca (unable to predict when next suitable scale flood would occur). Removal of levees would allow free-draining of the system on flood recession – optimum period of inundation to achieve

		ecological objectives would not be achieved for shallower lake and floodplain areas.
2	Pump water directly into Dry Lakes through existing irrigation mains	More expensive but more flexible operation than Option 1. Dependent on spare capacity being available in irrigation mains. Would require significant excavation (potential heritage impacts) and vegetation clearance (floodplain and mallee vegetation) for pipe works and channels to enable inflows to multiple lakes and facilitate inundation of a sufficiently large area. Sub-option 2d considered best option as it addressed the water requirements of the highest priority area (Lake Boolca) and inundated a substantial floodplain area relatively efficiently.
3	Pump water from Murray River into Chalka Creek North, then re-lift into Raakjlim Creek to deliver water to Dry Lakes and Lake Boolca - regulating structures in Raakjlim Creek, Chalka Creek and two locations near Lake Boolca, plus two pumps and an artificial channel.	Would achieve a larger inundation area than Option 1 or 2 (more floodplain, less lakes) but the infrastructure and water allocation required would also be significantly larger. Unfeasible pumping requirement (over 5 years of pumping to achieve inundation area). Significant excavation (potential heritage impacts) and vegetation clearance. High operating cost.

2012 Water Management Options Assessment and Concept Design

A further investigation of water management options, including consideration of opportunities provided by TLM works, was undertaken by GHD (2012a) to investigate the following areas (see **Figure 2**):

- Area 1: Additional inundation of Chalka Creek North floodplain, particularly the area north of Oatey's Regulator.
- Area 2: Additional inundation of the floodplain north of Bitterang Containment Bank (TLM works), potentially through to Lake Boolca and the Dry Lakes.
- Area 3: Options for an additional regulator on the offtake from Chalka Creek North to Lake Bitterang for water management, flexibility and control (specifically, isolation of Lake Bitterang).
- Area 4: Options for additional regulators in the central lakes area for water management, flexibility and control (specifically, isolation of Lakes Lockie, Roonki and Hattah or isolation of the Lakes Mournpall, Konardin, Yelwell and Yerang Complex).

GHD (2012a) developed a range of sub-options for works in each of these areas, with each sub-option consisting of one or more environmental regulator structures and levees or causeways, and consideration of temporary pumping. Evaluation of each sub-option was informed by a series of high-level desktop studies considering cultural heritage, geology, groundwater and salinity, acid sulphate soils, planning and ecology, with consideration of criteria for total capital cost, cost per hectare inundated, potential water savings and performance against the ecological objectives.

Based on the options assessment, the preferred works in each area were determined (see **Table 8**) and an overall works package was identified based on prioritisation against a range of criteria developed in consultation with relevant stakeholders, including the Mallee CMA, Murray-

Darling Basin Authority, Parks Victoria, GMW and the Department of Sustainability and Environment (now DELWP).

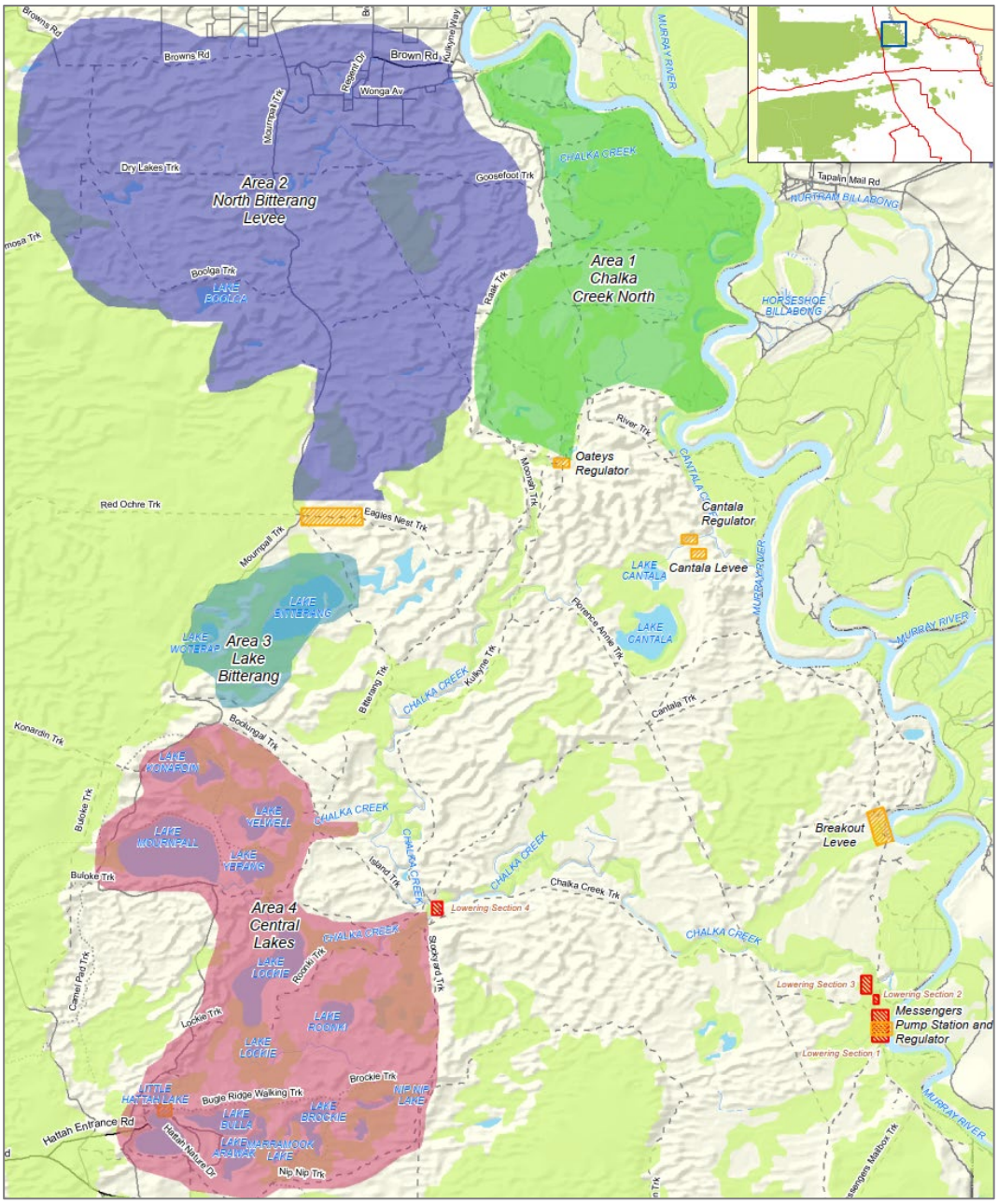


Figure 2. Location of four areas investigated by GHD (2012a)

Table 8. Summary evaluation of preferred works to facilitate watering of four investigation areas by GHD (2012a)

Area	Description of works	Evaluation
1	Regulator north of Oatey's Regulator on Chalka Creek North (Option 1b)	• Targets reasonable area outside of current TLM works; • Cost effective; • Provides high level of visual appeal to Park visitors; and • May improve access throughout this section of the Park.
2	Regulators on Bitterang Levee and on Raakjlim Creek (Option 2d)	• Targets large area outside of current TLM works; • Significant area of black box could be inundated, for lowest cost per hectare;

		• Opportunities exist to "value engineer" structures to reduce costs; • Ability to re-use water ponded by Oatey's Regulator for a secondary application; • Ability to manage operational risks through adaptive management; and • Regulator on Raakjlim Creek located on private land.
3	Regulator on Chalka Creek entrance to Lake Bitterang (Option 3)	• Provides better operational flexibility by maintaining appropriate watering regime and protecting existing ecological values; • May improve overall water use (and cost) efficiency; and • Lower urgency than Options 2d and 1b within next 5-10 years, while initial priority for operation of current TLM works is to reinstate wetting regimes.
4	Regulators at four sites within central lakes to increase operational flexibility (Option 4)	• Provides better operational flexibility during years when environmental water allocations (to Hattah) are low, or ability to manage ecological threats; • May improve overall water use (and cost) efficiency; and • Further operational experience of current TLM works required to better understand future threats and the benefits of the proposed works in this area.

Concepts for the preferred options (Options 1b, 2d and 3) in each area were further developed and evaluated by GHD (2012b) as summarised in **Table 9**. None of the sub-options for Area 4 were progressed to concept design as it was determined that further operational experience of the TLM works was required to better understand future threats and the benefits of the proposed works in Area 4.

Table 9. Summary of options subject to detailed analysis by GHD (2012b)

Options	Description	Area Inundated	Cost ($/ha)
Option 1: Chalka Creek North Regulator	• Targets an inundation level of 43.5 mAHD • Comprises a main regulating structure (K10 Regulator) located on Chalka Creek North • K10 River Track causeway – containment bank with box culverts and stop logs • K10 containment bank with box culverts and stop logs.	420 ha	$12,000
Option 2: Bitterang Regulator[11]	• Targets an inundation level of 45.1 mAHD • Comprises a main regulating structure within the Bitterang Containment Bank north of Lake Bitterang and along Eagles Nest Track	300 ha (710 ha with pumping)	$1,300
Option 3: Lake Bitterang Regulator	• Maximum operating level of 44.0 mAHD • Comprises a main regulating structure on the branch of Chalka Creek to Lake Bitterang to allow flows to be excluded from Lake Bitterang during watering events targeting the central lakes area.	393 ha	$1,000 (one off)

[11] Due to uncertainties about the actual inundation extents and flow rates achievable with a regulator on Raakjlim Creek, GHD (2012a) recommended a test pumping program to improve understanding of this option, however the test pumping program was determined to be unfeasible by the Mallee CMA and so this part of sub-option 2d was not progress to concept design.

	• Includes minor track works to provide access to the regulator.		

Options 1 and 2 were considered to offer the greatest ecological benefits and the optimum mix for the following reasons (GHD, 2012b):

- Option 1 inundates the largest area and maximises inundation of the lower floodplain area. It also minimises flow back to the Murray River during inundation events and this retains water on the floodplain to enable the depth and duration of inundation to be varied to target specific ecological outcomes. Additional benefits include maintaining access to the national parks, minimising disturbance of culturally sensitive areas and minimising disturbance to vegetation.
- Option 2 inundates the second largest area, provides the most operational flexibility and extends the area of inundation to the most northern and water depleted part of the floodplain[12].

2014 Advanced Concept Design

An advanced concept design was developed by GHD (2014a) and determined the inundation extents and water usage for the preferred options mix as summarised in **Table 10**.

Table 10. Inundation extents and water usage for the preferred option (GHD, 2014a)

Description	Total area of inundation (ha)	Volume (GL)[13]
Area 1 - Chalka Creek North Regulator	420	6.8
Area 2 - Bitterang Regulator	300	9
Temporary pumping at Bitterang North	410	-
Total	1,130	15.8

No project alternative

The other alternative is to not undertake the project. However, this alternative is not being considered further as it would:

- Lead to ongoing deterioration of floodplain ecosystems in the targeted inundation area. The targeted inundation area is displaying evidence of ecological stress caused primarily by river regulation, which has significantly reduced the frequency, depth and duration of flood events entering these areas.
- Mean foregoing an opportunity to deliver long-term positive impacts to areas that are significant at a local, regional, national, and international level, including parts of the Hattah-Kulkyne National Park, Murray-Kulkyne Park and the nearby Ramsar-listed wetlands.

Brief description of key alternatives to be further investigated (if known)**:**

No alternatives to the project are being further investigated. Both the Feasibility Assessment (Phase 1) and Business Case (Phase 2) submitted to and approved by the Commonwealth Government included extensive documentation of the alternatives investigated. These documents drew upon investigations carried out through the development of the TLM works at Hattah Lakes beginning in 2002 through to a revised detailed options analysis conducted in 2012 for the feasibility assessment and beyond into the design decisions documented in subsequent concept

[12] See Attachment 7 – Natural and Existing Flood Extents Map for an illustration of the significant reduction in flooding across this part of the floodplain since river regulation.

[13] Volumes were derived from scenario modelling to determine the extent of flooding, and depth/area relationships with stage height for each of the regulators. The volumes therefore refer to void space and assumes no losses or return flows. This information, together with the proposed operating regime, will enable the MDBA to model return flows for the full range of operational scenarios during the assessment process.

and detailed design work. These assessments were undertaken with a view to minimising impacts on the ecology and heritage values of the sites whilst maximising the area to receive benefit from watering.

5. Proposed exclusions

Statement of reasons for the proposed exclusion of any ancillary activities or further project stages from the scope of the project for assessment:

No ancillary activities or further project stages have been excluded from this assessment.

6. Project implementation

Implementing organisation (ultimately responsible for project, ie. not contractor)**:**

LMW will be the implementing organisation responsible for managing construction of the project.

LMW will also be primarily responsible for operation and maintenance of the environmental watering infrastructure, although it is likely that Parks Victoria staff will assist with operation as required.

In order to minimise potential adverse environmental effects and maximise environmental benefits across the nine projects being undertaken as part of the VMFRP, existing frameworks for collaborative and adaptive environmental water management will be used. The Victorian Environmental Water Holder (VEWH) is the independent statutory body responsible for holding and managing environmental water entitlements on behalf of the State. VEWH administers the ongoing collaborative management of water available under environmental entitlements, which are used to improve the health of Victoria's rivers and wetlands and the native plants and animals that depend on them, through regulation of the river systems.

VEWH works collaboratively with a range of partners to plan the release and delivery of environmental water, including:

- Commonwealth Environmental Water Holder and the Murray–Darling Basin Authority to access water held on behalf of the Commonwealth Government.
- Water authorities (e.g. LMW, GMW) and waterway managers (e.g. Mallee CMA, North Central CMA) which oversee investigations to determine water requirements, undertake water planning and coordinate the delivery of water and monitoring programs that support a process of learning and adaptation.

An overview of water management responsibilities illustrating how scientific investigations, monitoring and evaluation feedback into decision-making on environmental watering proposals is provided below.

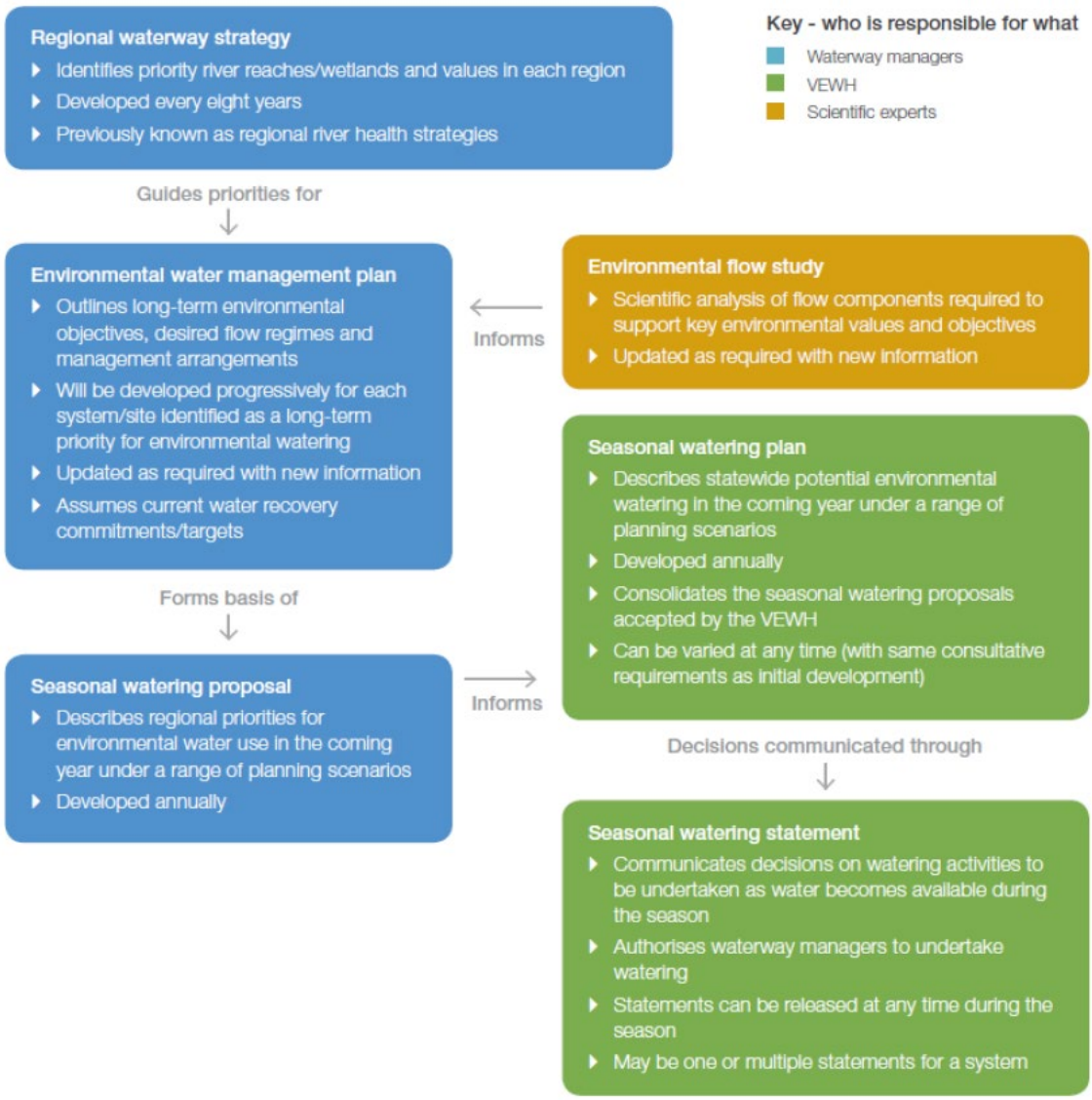


Figure 3. Overview of water management responsibilities[14]

Implementation timeframe:

Contract award is proposed in December 2021, with construction anticipated to commence in February 2022. Construction will take approximately 6-9 months and is anticipated to be completed by November 2022.

Proposed staging (if applicable):

Not applicable.

7. Description of proposed site or area of investigation

Has a preferred site for the project been selected?

☐ No ☒ Yes If no, please describe area for investigation.

If yes, please describe the preferred site in the next items (if practicable).

[14] Source: Parks Victoria, 2018 from VEWH, 2016.

General description of preferred site (including aspects such as topography/landform, soil types/degradation, drainage/ waterways, native/exotic vegetation cover, physical features, built structures, road frontages; attach ground-level photographs of site, as well as A4/A3 aerial/satellite image(s) and/or map(s) of site & surrounds, showing project footprint):

General

The project is located on the western side of the Murray River between Robinvale and Red Cliffs, approximately 75 km south of Mildura, in north west Victoria (see **Attachment 1 – Locality Map**). The project area is mostly situated within the Hattah-Kulkyne National Park and the Murray-Kulkyne Park, except for the proposed Kulkyne Station Claypit and approximately 125 ha of the proposed inundation area, which are located on private land adjoining the eastern and northern boundaries of the national parks.

Topography / landform

According to Geomorphology of Victoria, the Chalka North Area is predominantly located within the geomorphic region of the Northern Riverine Plain (specifically the meander belt below plain level, sometimes source-bordering dunes (Mooroopna, Wangaratta)), while the Lake Boolca Area is located within the geomorphic region of the North Western Dunefields and Plains (specifically the modern floodplains with co-dominant calcareous linear dunefields (see **Attachment 22 – Geomorphology Map**).

The Murray River exhibits prominent meander features along its course adjacent to the Hattah-Kulkyne National Park. Heavy erosion effects are evident along the outer part of the meanders, with slower flows, concentrated around the inner side of the meanders resulting in the deposition of coarse sediments, resulting in the formation of areas of shallow water and sandy beaches or point bars (GHD, 2012a). Being located on the floodplain of the Murray River, the topography of the project area and surrounds is influenced by flooding events and is generally flat or gently undulating.

Geology and soils

The Geological Survey of Victoria, Mildura Map Sheet (1:250 000 scale) describes the surface geology of the area as overlain by various Quaternary aged deposits, namely:

- Coonambidgal Formation (Qc): Fluvial, lacustrine deposits, clay, sand and sandy clays
- Woorinen Formation and Lowan Sands (Qw and Ql): Aeolian: dune sand, fine to medium grained
- Blanchetown Clay (Qb): Fluvial: clayey sand, sandstone and sand.

The basement geology of the area is generally unclear and relatively little is known of the pre-Cretaceous geology of the Mildura Map area, although it is likely that folded and metamorphosed sediments of the Cambrian Period underlie the entire area (GHD, 2012a). Cambrian sediments are typically overlain by a sequence of Quaternary and flat-lying Tertiary formations including: Upper Tertiary shallow and deep marine sediments (including the Parilla Sand) and Lower Tertiary terrestrial and marine sediments.

Wetlands, waterways and drainage

The project is situated on the northernmost part of the Hattah Lakes floodplain complex, which is comprised of approximately 20 lakes and surrounding woodlands that receive water from the Murray River via Chalka Creek. Twelve of the Hattah Lakes are listed under the Ramsar

Convention as wetlands of international importance and on A Directory of Important Wetlands[15]. The project area is not located within the boundary of the Hattah-Kulkyne Lakes Ramsar site or the Hattah Lakes wetlands that are listed on A Directory of Important Wetlands in Australia (see **Attachment 23 – Waterways and Wetlands Map**).

Lake Boolca and a number of unnamed wetlands on the Victorian Wetland Inventory are located within the project area. While most of the central and southern Hattah Lakes are classified as semi-permanent or persistent temporary wetlands, Lake Boolca is classified as an episodic wetland, which requires very high flows in the Murray River to be flooded and, along with the Dry Lakes, is among the last lakes in the Hattah Lakes system to receive water as the river level rises. At an elevation of 42 mAHD, it has a surface area of approximately 40 ha and a maximum depth of 4 m (Ecological Associates, 2007b).

The Hattah Lakes are located approximately 69 km downstream of the Euston Weir (Lock 15) and are on a section of the Murray River not influenced by the backwater effects of weir pools. Murray River flows in this reach are influenced by the Murray, Edward-Wakool, Murrumbidgee and Goulburn tributaries and are typically highest from late winter to early summer (Mallee CMA & DEPI, 2014).

Chalka Creek is a tributary of the Murray River, diverging at the southern end of the Hattah-Kulkyne National Park and re-joining in the north of the Park. The creek is ephemeral and comprises two main reaches, Chalka Creek South which traverses an east-west direction, flowing into the central and southern lakes area, and Chalka Creek north, a branch which is progressively engaged as the flow in Chalka Creek South increases, filling the northern lakes (Mallee CMA & DEPI, 2014). **Figure 4** illustrates typical flow paths entering and leaving the Hattah Lakes floodplain under natural conditions**. Figure 5** illustrates flows paths entering and leaving the Hattah Lakes floodplain during operation of TLM works. **Figure 6** illustrates flows paths entering and leaving the Hattah Lakes floodplain during operation of the proposed works.

The TLM works allow water to enter the southern branch of Chalka Creek when Murray River flows exceed 20,000 ML/day at Euston Weir. When Murray River flows exceed 33,000 ML/day, flows also enter the floodplain via Chalka Creek North. The Chalka Creek North bank full level of 42.5 mAHD is exceeded when Murray River flows at Euston exceed 60,000 ML/day. The proposed design water level for the Chalka North Area of 43.5 mAHD is equivalent to a river discharge of approximately 120,000 ML/day under natural conditions (Jacobs, 2014).

The Lake Boolca Area is among the last parts of the Hattah Lakes floodplain to be inundated under natural conditions. Two floodways connect the area to the broader Hattah Lakes floodplain, including Raakjlim Creek, which conveys water from Chalka Creek North in a southerly direction to the Lake Boolca Area, and the Bitterang floodway, which conveys water in a northerly direction from Lake Bitterang. The Bitterang floodway has a naturally high sill level and only passes water northwards at flows greater than 160,000 ML/day[16] (Jacobs, 2014). There are substantial losses to evaporation and seepage on the flow paths to the Lake Boolca Area.

Under natural conditions, water began to spread into Raakjlim Creek when Murray River flows exceeded 100,000 ML/day and created significant inundation of lakes at flows exceeding 120,000 ML/day, with Lake Boolca being filled when Murray River flows exceeded 140,000 ML/day (Ecological Associates, 2015). However, containment banks historically constructed across Raakjlim Creek now block flows of up to at least 160,000 ML/d from entering the area (Jacobs, 2014). Interpolation from Colignan flow gauge reading estimate that a

[15] Includes Lakes Arawak, Bitterang, Brockie, Bulla, Cantala, Konardin, Hattah, Kramen, Lockie, Mournpall, Yelwell and Yerang.

[16] Flows greater than 160,000 ML/day in magnitude have not been assessed by modelling.

Colignan flow rate in excess of 180,000 ML/d would be required to exceed the elevation of the highest levee (i.e. 44.11 mAHD) in Raakjlim Creek (Ecological Associates, 2007b). This has substantially reduced the frequency and duration of inflow events into Lake Boolca as illustrated in **Attachment 7 – Natural and Existing Flood Extents Map**.

Chalka Creek North is the main flow path for water leaving the floodplain during a flood recession. After the recession of a flood event, water flows from Chalka Creek North back into the Murray River until the water level recedes to the level of the natural sandbars at the mouth of Chalka Creek North and water is left to pool in the channel and floodplain (Ecological Associates, 2007b). A similar process is thought to occur in Raakjlim Creek, with excess water within the creek draining quickly into Chalka Creek North upon flood recession, but the irregular invert of the creek and floodplain means that large pools are left behind and water can be retained in Dry Lakes and Lake Boolca for a significant period of time (Ecological Associates, 2007b).

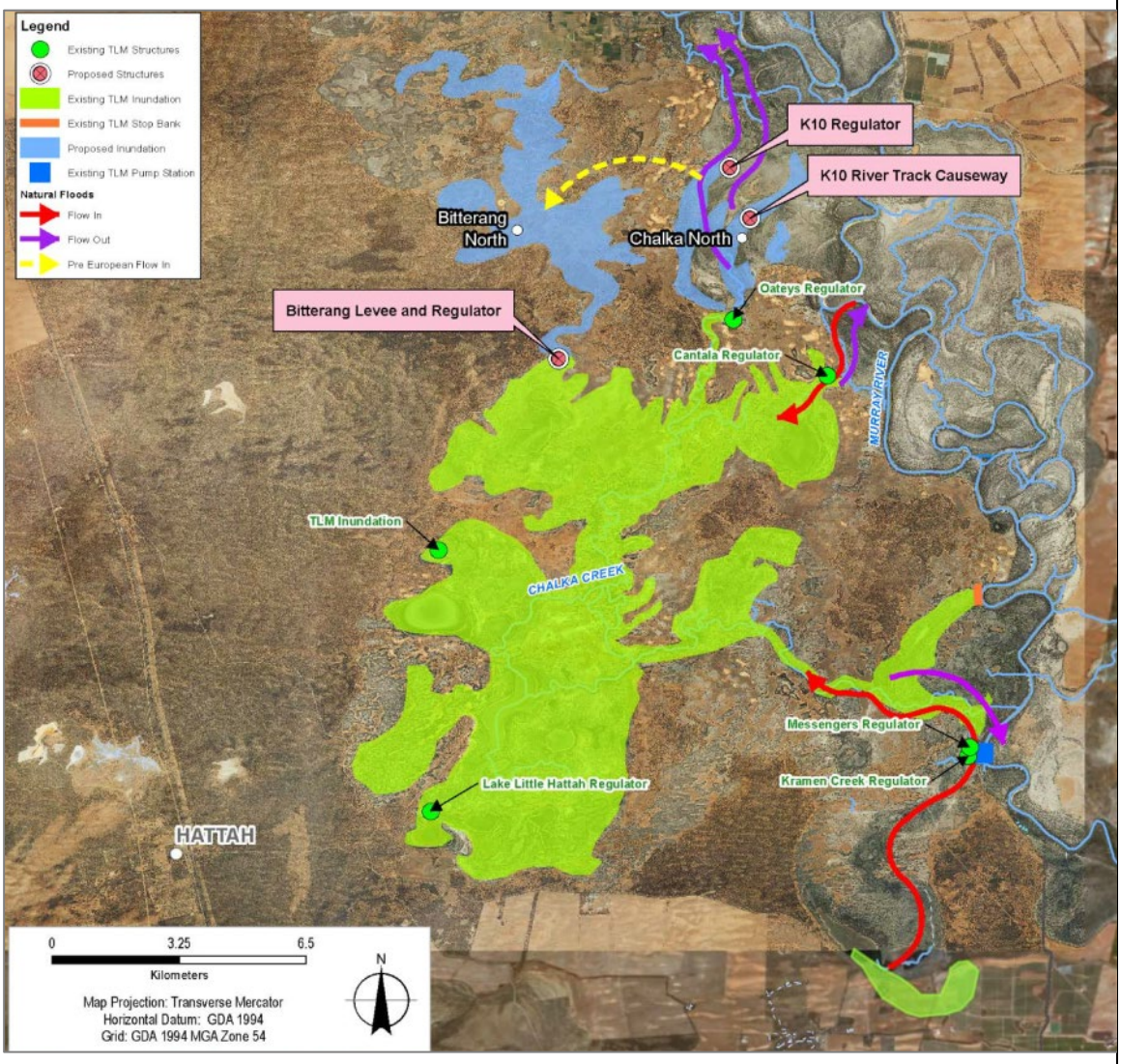


Figure 4. Indicative flow paths during a natural flood event[17]

[17] Source: Figure 4, page 17 of the SDL Fish Management Plan – Hattah Lakes (ARI, 2018).

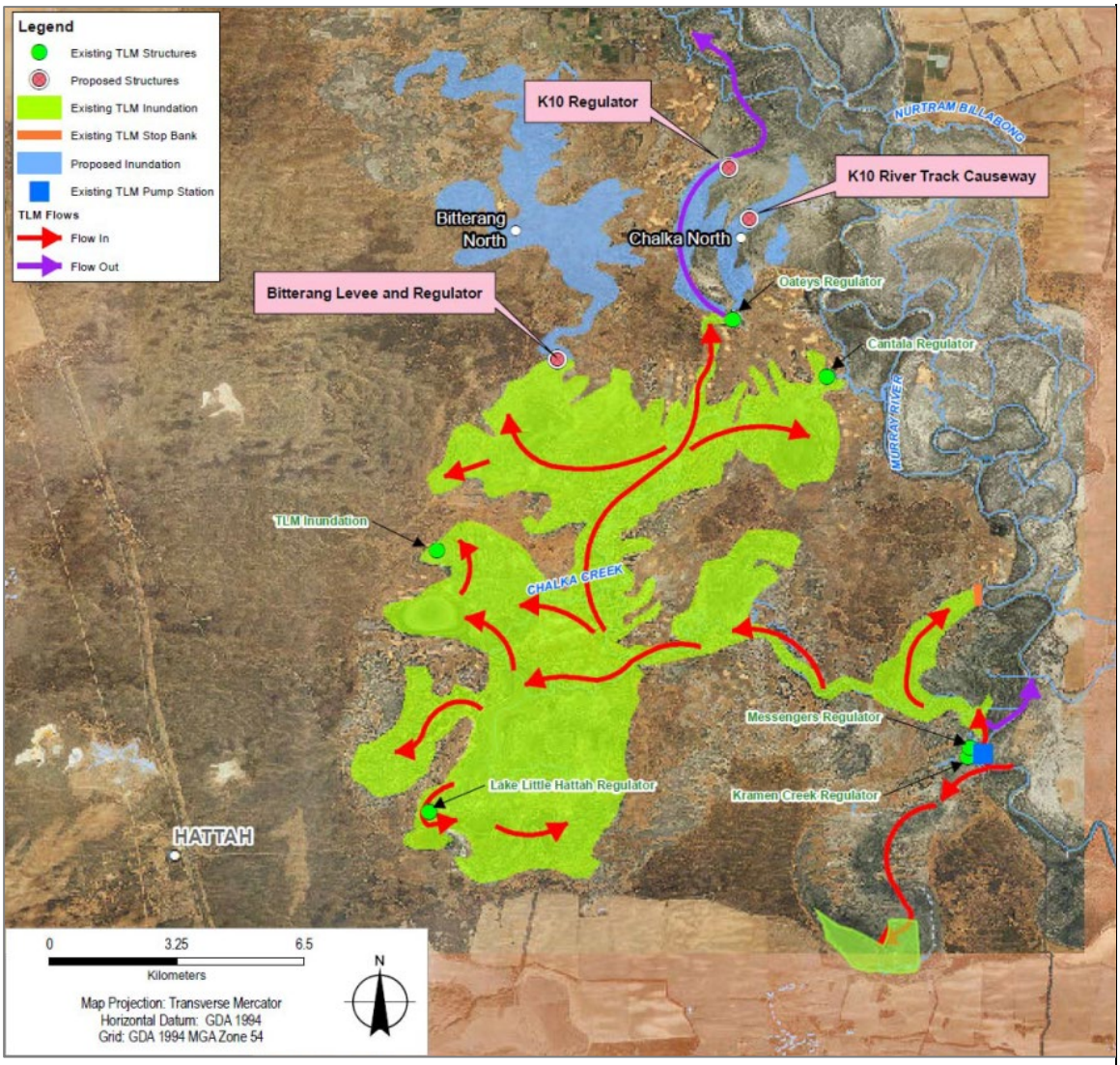


Figure 5. Flow paths during operation of TLM works[18]

[18] Source: Figure 5, page 21 of the SDL Fish Management Plan – Hattah Lakes (ARI, 2018).

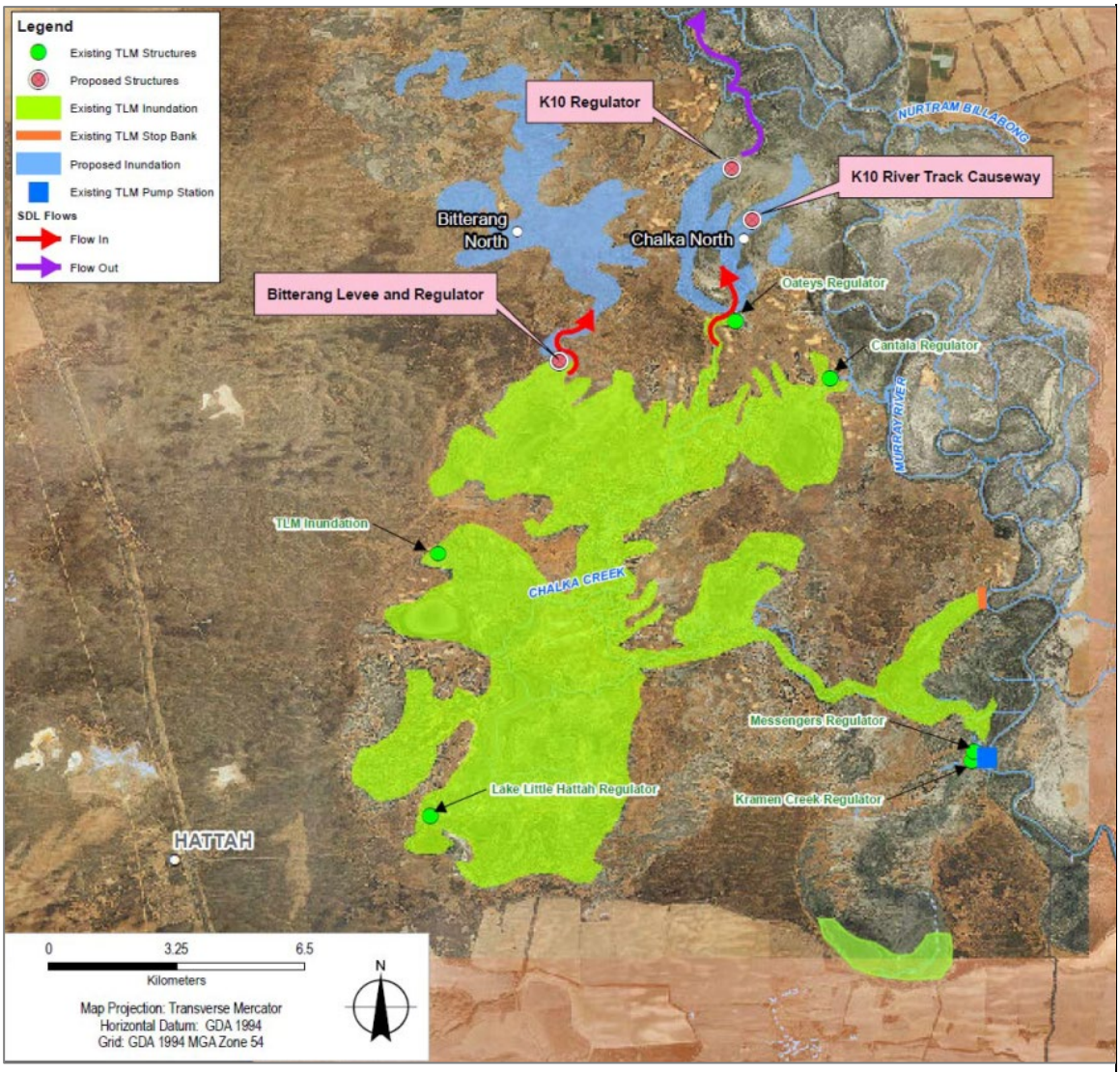


Figure 6. Flow paths during operation of proposed works[19]

Vegetation

The project area is situated within a continuous tract of intact floodplain and terrestrial vegetation encompassing over 633,000 ha that extends more than 125 km from the Murray River in the east to the South Australian border in the west through the Murray-Kulkyne Park, Hattah-Kulkyne National Park and the Murray-Sunset National Park. The area represents an important biodiversity corridor that enables movement and migration of biota and provides resilience to climate change (Ecological Associates, 2014a).

The northern Hattah Lakes floodplain comprises a mosaic of creeks, floodplain woodlands and wetlands (e.g. Lake Boolca and the Dry Lakes) set within dunefields of the Woorinen Sands Formation and the Lowan Sands Formation. The system is rarely inundated and alternates between a mature 'dryland' ecosystem between inundation events and a mature 'wetland' ecosystem when flooded (Ecological Associates, 2007b).

The landscape of the northern Hattah Lakes includes mostly higher floodplain terraces dominated by *Eucalyptus largiflorens* (Black Box) or chenopod shrublands, in mosaic with infrequently flooded terraces and creeklines mostly dominated by *Eucalyptus camaldulensis*

[19] Source: Figure 6, page 23 of the SDL Fish Management Plan – Hattah Lakes (ARI, 2018).

(River Red Gum), along with limited areas of deep siliceous sands (Lowan Sands) dominated by semi-arid woodland and shrubland (Ecological Associates, 2007b).

Intermittent flooding maintains the distinctive habitat features of the Lake Boolca Area, where flood-dependent woodland and grassland communities, contrast with the surrounding mallee landscape providing complementary habitat components supporting threatened species such as Regent Parrot and Major Mitchell's Cockatoo, which feed in mallee vegetation and nest in hollow-bearing trees on the floodplain (Ecological Associates, 2014a). The close proximity of contrasting mallee and floodplain vegetation also contributes to the high floristic diversity of the Hattah Lakes (Ecological Associates, 2014a).

Ground-truthing has confirmed that the majority of the proposed inundation area (approximately 883 ha) contains Black Box Woodlands (i.e. EVC 102, EVC 103, EVC 295 and EVC 818), along with approximately 125 ha of Red Gum Forest and Fringing Red Gum Woodland (i.e. EVC 106, EVC 813) and approximately 33 ha of Episodic Wetlands (i.e. EVC 107).

VBA and PMST searches by R8 (2020) identified 109 FFG Act, DELWP advisory and/or EPBC Act listed flora species and 69 FFG Act, DELWP advisory and/or EPBC Act listed fauna species that have been recorded or have the potential to occur within the proposed inundation area. VBA and PMST searches identified by R8 (2020) identified 22 FFG Act and/or EPBC Act listed flora species and 34 FFG Act and/or EPBC Act listed fauna species that have been recorded or have the potential to occur within the proposed construction areas. The likelihood of their occurrences and potential to be impacted are assessed in Appendix E of **Attachment 12 – Flora and Fauna Assessment**. Further details are provided in Section 12.

Table 11 summarises the vegetation communities that have been identified in the proposed construction areas, which will be impacted by proposed construction works. Further details are provided in Section 12.

Table 11. Summary of EVCs impacted by proposed construction works

EVC	Conservation significance
Riverine chenopod woodland	Depleted
Alluvial plains semi-arid woodland	Vulnerable
Lignum shrubland	Least Concern
Intermittent swampy woodland	Depleted
Sub-saline depression shrubland	Depleted
Floodway pond herbland	Depleted
Riverine grassy forest	Vulnerable
Low chenopod shrubland	Depleted
Semi-arid woodland	Vulnerable

Site area (if known):

The proposed construction areas have a total area of approximately 19.30 ha, with the area of native vegetation removal required in these being up to approximately 18.94 ha as summarised in **Table 12**.

Table 12. Extent of proposed construction areas and estimated native vegetation removal

Construction Area	Total Construction Area (ha)	Native Vegetation Removal Area (ha)
Bitterang Regulator	3.62	3.313
K10 Regulator	8.41	8.419
K10 Causeway Regulator	3.67	3.653
Claypit	3.52	3.527
Passing Bay Central	0.02	0.005
Passing Bay North	0.03	0.005
Passing Bay South	0.03	0.018
Total	**19.30**	**18.939**

The proposed inundation area is estimated to be approximately 1,130 ha, including private land outside the national parks.

If flood agreements are not established with private land owners, the managed inundation area will be limited to approximately 947 ha, not including private land and any public land downstream of private land (see **Attachment 3 – Managed Inundation Area Map)**.

Route length (for linear infrastructure) ……N/A……. (km) **and width** ……N/A……. (m)

N/A

Current land use and development:

The project is located primarily in the Hattah-Kulkyne National Park and Murray-Kulkyne Park. Both parks are managed by Parks Victoria in accordance with the objectives of the *National Parks Act 1975* and the *River Red Gum Parks Management Plan (July 2018)*. Hattah–Kulkyne National Park was reserved in 1960 and is the oldest national park in the region. Hattah–Kulkyne National Park and Murray–Kulkyne Park were declared a biosphere reserve in 1981 under UNESCO's Man and the Biosphere program, which aims to establish a scientific basis for the improvement of relationships between people and their environments.

The proposed construction areas for the main regulating structures are located mainly within the Conservation and Recreation Zone, and the Visitor Experience Area under the River Red Gum Parks Management Plan (see **Attachment 24 – Park Management Zones Map**). Part of the Bitterang Regulator construction area extends into the Conservation Zone. Within the national parks, the proposed inundation areas affect land within the Conservation and Recreation Zone and the Conservation Zone. The Conservation and Recreation Zone encompasses areas where the management emphasis is on protecting environmental and cultural values while allowing for low-impact recreation, and encouraging dispersed recreation and nature-based tourism activities. The Conservation Zone encompasses areas of high conservation value, where a very

strong management emphasis is on protection of the environment, although recreation and nature-based tourism are permitted subject to close management.

The Hattah-Kulkyne National Park and the Murray-Kulkyne Park support a range of recreational activities, receiving more than 70,000 visitors per year. Popular activities include canoeing, kayaking, swimming, picnicking, birdwatching, nature study, educational activities, walking and camping. Canoeing is particularly popular when the park is inundated, providing recreational access to the northern parts of the floodplain (Parks Victoria, 2014). A map showing the location of existing access tracks and visitor facilities within the Hattah-Kulkyne National Park and Murray-Kulkyne Park is provided in **Attachment 25 – National Parks Visitor Map**.

Campgrounds at the central lakes, including Lake Mournpall and Lake Hattah, provide basic facilities such as toilets and picnic tables, along with a number of walking tracks, while dispersed campsites are also available along the Murray River. Camping opportunities in Hattah–Kulkyne National Park are affected by current environmental watering programs, with Lake Hattah campground regularly inundated in recent years and typically remaining under water for months at a time (Parks Victoria, 2018). Lake Mournpall campground is situated above the highest water levels likely to occur through managed watering (current TLM and proposed project). However, Mournpall Track which provides two-wheel drive access to the campground from both Mildura and the park visitor centre, is cut by water during managed watering by TLM works, making the campground only accessible by four-wheel drive vehicle (Parks Victoria, 2018). Both campgrounds are therefore already largely inaccessible during environmental watering.

Other land use activities undertaken in the national parks include bee-keeping. A number of licenced apiary sites are located within the national parks as shown on **Attachment 26 – Other Land Use Features Map**. No apiary sites are located within the proposed construction areas or proposed inundation areas, although the buffers around some apiary sites do overlap with the project area.

The proposed works have the potential to inundate approximately 125 ha of private land outside the national park when operated to achieve the maximum design water levels (refer to **Attachment 3 – Managed Inundation Area Map**. This includes:

- Private land on the eastern floodplain within Kulkyne Station, which is zoned for farming purposes
- Private land on the northern floodplain, within a parcel of land adjacent to the northern boundary of the national parks, which is also zoned for farming purposes but not used for this purpose as it is subject to a conservation covenant.

Inundation of private land can be avoided by operating the works at less than maximum design level (e.g. closure of K10 Causeway Regulator and limit duration of pumping over Bitterang Containment Bank). VMFRP is consulting with these private landholders in relation to obtaining the necessary flood agreements. Obtaining flood agreements with the affected private landholders is not considered critical to the feasibility of the project given the ability to manage inundation events through operational controls to avoid inundation of private land. However, it is noted that if private flood agreements are not obtained, the area of floodplain potentially benefited by the proposed environmental watering would be less than the maximum 1,130 ha able to be achieved by the proposed works.

As part of the project, a claypit is also proposed within the privately owned Kulkyne Station. This claypit will be established adjacent to the pit used for construction of the TLM works and will be used to source fill for construction of regulators and containment banks, and for disposal of spoil from construction works as backfill. VMFRP is consulting with the owners of Kulkyne Station to establish the necessary agreements to enable use of this land for the project. The proposed

location of the claypit has been determined in consultation with the landowner to minimise disruption to existing land uses.

Description of local setting (eg. adjoining land uses, road access, infrastructure, proximity to residences & urban centres):

The project is located within the Mallee Catchment, which covers an area of 43,000 km^2. The primary land uses in the catchment are dryland and irrigated agriculture and conservation. Much of the region's remaining vegetation has been reserved in large parks such as Murray-Sunset, Big Desert, Wyperfeld and Hattah-Kulkyne National Parks, along with extensive tracts of riverine and dryland state forests, and over 500 small reserves scattered throughout the agricultural area (Mallee CMA, 2018). These areas of public land are particularly significant given the largely cleared and fragmented agricultural landscape in which they occur.

The project is located mainly in the Hattah-Kulkyne National Park and Murray-Kulkyne Park, which together, extend from the Murray River in the east to the Calder Highway in the west, and south to Hattah-Robinvale Road. The parks are surrounded by private land which has been largely cleared for agriculture, including dryland farming and irrigated horticulture (e.g. within the Colig-Karadoc Irrigation District located north of the national parks) (see **Attachment 26 – Other Land Use Features Map)**.

There are estimated to be fewer than 10 houses within a 5 km radius of the proposed construction areas. The nearest townships are Hattah (located at the south west corner of the national parks) and Nowingi (located at the north west corner of national parks) along the Calder Highway. The closest urban centres are Ouyen (40 km south) and Mildura (70 km north).

A major electricity transmission line (220kV) traverses the Hattah-Kulkyne National Park from north-west to south east. The Ballarat to Mildura rail line runs along the western side of the Calder Highway along the western boundary of Hattah-Kulkyne National Park, with stations at Hattah and Red Cliffs (Nowingi).

Planning context (eg. strategic planning, zoning & overlays, management plans):

Mildura Planning Scheme

The project is situated entirely within the Rural City of Mildura and is therefore subject to the provisions of the Mildura Planning Scheme.

Planning Policy Framework

The following clauses of the Planning Policy Framework are relevant:

Table 13. Summary of relevant clauses of the Planning Policy Framework

Clause 12 Environmental and Landscape Values	12.01 Biodiversity	12.01-1S – Protection of Biodiversity[20] 12.01-2S Native Vegetation Management
	12.03 Water Bodies and Wetlands	12.03-1S River Corridors, Waterways, Lakes and Wetland
	12.05 Significant Environments and Landscapes	12.05-2S Landscapes

[20] Including relevant policy documents specified in this clause such as: Protecting Victoria's Environment – Biodiversity 2037 (DELWP, 2017) and the Guidelines for the removal, destruction or lopping of native vegetation (DELWP, 2017).

Clause 13 Environmental Risks and Amenity	13.01 Climate Change Impacts	13.01-1S Natural Hazards and Climate Change
	13.02 Bushfire	13.02-1S Bushfire Planning
	13.03 Floodplains	13.03-1S Floodplain Management
	13.04 Soil Degradation	13.04-3S Salinity
	13.05 Noise	13.05-1S Noise Abatement
	13.07 Amenity and Safety	13.07-1S Land Use Compatibility
Clause 14 Natural Resource Management	14.01 Agriculture	14.01-3S Forestry and Timber Production
	14.02 Water	14.02-1S Catchment Planning and Management 14.02-2S Water Quality
	14.03 Earth and Energy Resources	14.03-1S Resource Exploration and Extraction
Clause 15 Built Environment and Heritage	15.01 Built Environment	15.01-1S Urban Design 15.01-2S Building Design 15.01-6S Design for Rural Areas
	15.02 Sustainable Development	15.02-1S Energy and Resource Efficiency
	15.03 Heritage	15.03-1S Heritage Conservation 15.03-2S Aboriginal Cultural Heritage
Clause 17 Employment	17.04 Tourism	17.04-1S Facilitating Tourism 17.04-1R Tourism - Loddon Mallee North
Clause 19 Infrastructure	19.02 Community Infrastructure	
Local Planning Policy		
Municipal Strategic Statement		
Clause 21.01 Municipal Profile		
Clause 21.02 Key Influences and Issues	21.02-1 Key influences and issues	<u>Built form and amenity</u> The municipality's cultural, natural heritage and environmental values, which can be easily and irreparably damaged by inappropriate development. The need to manage and protect the many significant Aboriginal and non-Aboriginal cultural heritage values and historic places that can be found within the municipality. <u>Environment</u> The Murray River, which forms Mildura Rural City's northern and eastern municipal boundary, represents a significant environmental, economic and social asset and underpins the vitality of the region. The municipality contains habitats sensitive to disturbance and unique flora and fauna communities. Public parks, reserves and forests play an important role in protecting significant landscape, flora, fauna, cultural and scientific values. There is a need to manage issues associated with the interface between public and private land

Clause 21.03 Vision and Strategic Framework		The natural resources of the municipality and surrounding region will be protected and maintained to provide a diversity of species and development that is ecologically sustainable. Land and water systems will be well managed, meeting the community's needs and expectations. Remnant vegetation and habitat on both private and public land will be preserved and enhanced. Public land in the municipality and surrounding region will be recognised, protected, and promoted for its significant environmental, cultural and economic value.
Clause 21.05 Environment	21.05-1 River and wetland health	Objective 1 - To improve river and wetland health within the Rural City of Mildura.
	21.05-2 Flora and fauna	Objective 2 - To protect flora and fauna within the Rural City of Mildura.
	21.05-3 Flooding	Objective 3 - To reduce the impacts of flooding within the Rural City of Mildura.
	21.05-4 Public land	Objective 4 - To protect the environmental, landscape, cultural heritage and archaeological value of public land Objective 5 - To improve the interface between public and private lands.
Clause 21.07 Built Environment and Heritage	21.07-2 Heritage	Objective 2 - To conserve and enhance those buildings, areas and other places which are of aesthetic, archaeological, architectural, cultural, historical, scientific, or social significance, or otherwise of special cultural or natural value. Objective 3 - To acknowledge, respect, protect and appropriately manage Aboriginal places, objects and human remains.
Clause 21.08 Economic Development	21.08-2 Tourism	Objective 2 - To increase visitor numbers and length of stay

Zones and Overlays

Table 14 identifies the planning scheme zones and overlays that apply to the proposed construction and inundation areas.

Table 14. Summary of relevant planning scheme zones and overlays for each project component

Zone / Overlay	Project component
Public Conservation and Resource Zone	K10 Regulator K10 Causeway Regulator Bitterang Regulator River Track Passing Bays Proposed Inundation Area
Farming Zone	Kulkyne Station Claypit Proposed Inundation Area
Environmental Significance Overlay (Schedule 1 – Murray River Corridor)	K10 Regulator

	K10 Causeway Regulator Bitterang Regulator River Track Passing Bays Kulkyne Station Claypit Proposed Inundation Area
Land Subject to Inundation Overlay	K10 Regulator K10 Causeway Regulator Bitterang Regulator River Track Passing Bays (except Passing Bay South) Kulkyne Station Claypit Proposed Inundation Area
Bushfire Management Overlay	K10 Regulator K10 Causeway Regulator Bitterang Regulator River Track Passing Bays Kulkyne Station Claypit Proposed Inundation Area
Heritage Overlay (HO117 - Brighton's Block Crown Land, Hattah Kulkyne National Park, Hattah (Map 46HO), HO118 - Brighton's Bridge Crown Land, Hattah Kulkyne National Park, Hattah (Map 46HO))	Proposed Inundation Area

A small section of the access track (River Track) to the Sexton's temporary pump location also passes through an area of Township Zone, however no construction work or managed inundation is proposed within this zone.

Refer to **Attachment 27 – Planning Zones & Overlays Maps**.

Particular Provisions

The following particular provisions may be relevant to the project:

- Clause 52.08 (Earth and Energy Resources Industry) - A permit is required to use or develop land for earth and energy resources industry, including stone extraction, unless it complies with Section 77T of the *Mineral Resources (Sustainable Development) Act 1990* (i.e. unless an EES is prepared).
- Clause 52.09 (Stone Extraction and Extractive Industry Interest Areas) – A permit is required to use or develop land for stone extraction, unless it complies with Section 77T of the *Mineral Resources (Sustainable Development) Act 1990* (i.e. unless an EES is prepared).
- Clause 52.17 (Native Vegetation) – A permit is required to remove, destroy or lop native vegetation, including dead vegetation, that is not subject to an exemption specified in Clause 52.17-7 (Table of Exemptions) or the Schedule to Clause 52.17.
- Clause 52.29 (Land adjacent to a Road Zone, Category 1, or a Public Acquisition Overlay) - A permit is required to create or alter access to a road in a Road Zone, Category 1 (RDZ1). Roads within RDZ1 providing access to the project area include the Calder Highway and Kulkyne Way (north of Boonoonar Road).

Referral authorities

Table 15 summarises the referral authorities that may be triggered under the planning scheme for the project.

Table 15. Summary of potential referral authorities

Referral trigger	Referral authority	Referral authority type
To remove, destroy or lop native vegetation in the Detailed Assessment Pathway as defined in the Guidelines for the removal, destruction or lopping of native vegetation (DELWP, 2017) (Clause 66.02-2).	Secretary to the DELWP (as constituted under Part 2 of the *Conservation, Forests and Lands Act 1987*)	Recommending referral authority
To construct a building or construct or carry out works on land within 60 metres of a major electricity transmission line (220 kilovolts or more) or an electricity transmission easement (Clause 66.02-4).	The relevant electricity transmission authority	Determining referral authority
To use or develop land for stone extraction (Clause 66.02-8).	Secretary to the Department administering the *Heritage Act 2017*. Secretary to the Department administering the *Mineral Resources (Sustainable Development) Act 1990.*	Determining referral authority
To use or develop land for stone extraction on Crown land or land abutting Crown land, other than a government road (Clause 66.02-8).	Secretary to the Department administering the *Land Act 1958, Crown Land (Reserves) Act 1978, National Parks Act 1975* and *Forests Act 1958.*	Determining referral authority
To use or develop land for stone extraction: In areas with communities or taxa listed or critical habitat determined under the *Flora and Fauna Guarantee Act 1988* (Clause 66.02-8).	Secretary to the Department administering the *Flora and Fauna Guarantee Act 1988*	Determining referral authority
To use or develop land for stone extraction on land which has been identified in this scheme as flood prone (Clause 66.02-8).	Secretary to the Department administering Section 201 of the *Water Act 1989*.	Determining referral authority
Clause 44.04-7 (LSIO) - An application under the overlay outside the waterway management district of Melbourne Water Corporation (Clause 66.03).	Relevant floodplain management authority	Recommending referral authority
Clause 52.29 - An application to create or alter access to, or to subdivide land adjacent to, a road declared as a freeway or an arterial road Clause 52.29 under the Road Management Act 2004, land owned by the Roads Corporation for the purpose of a road, or land in a PAO if the Roads Corporation is the acquiring authority for the land, subject to exemptions specified in the clause.	Roads Corporation	Determining referral authority

Proposed Planning Scheme Amendment

To facilitate the project, a planning scheme amendment is proposed. The recommended approach is via the introduction of a Specific Controls Overlay identifying the project area at

Clause 45.12 (Specific Controls Overlay) and an Incorporated Document in the Schedule to Clause 72.04 (Documents incorporated in this planning scheme).

The Incorporated Document will override the provisions of the existing planning scheme, including allowing, subject to certain controls to be specified in the Incorporated Document:

- The use and development of land for the project within the Public Conservation and Resource Zone and the Farming Zone;
- Buildings and works, including earthworks, in the Land Subject to Inundation Overlay and the Environmental Significance Overlay (Schedule 1 – Murray River Corridor);
- The removal of vegetation under Clause 52.17 (Native Vegetation) and possibly the Environmental Significance Overlay (Schedule 1 – Murray River Corridor)[21];
- The use and development of land within Kulkyne Station (Farming Zone) for stone extraction under Clause 52.08 and Clause 52.09 (if no EES is prepared); and
- The creation and / or alteration of access to the RDZ1 (if required).

Relevant strategies and management plans

The following Mallee CMA strategies and plans are relevant to the project:

- Mallee Regional Catchment Strategy 2013-2019 (Mallee CMA, 2013)
- Mallee Waterway Strategy 2014-2022 (Mallee CMA, 2014)
- Mallee Natural Resource Management Plan for Climate Change (Mallee CMA, 2016)
- Mallee Native Vegetation Plan 2008 (Mallee CMA, 2008).

The following management plans are also relevant to the planning, design, construction and operation of the project:

- Hattah Lakes Environmental Water Management Plan (February 2012) (MDBA, 2012)[22]
- River Red Gum Parks Management Plan (July 2018) (Parks Victoria, 2018) - the project is located in the Hattah-Kulkyne National Park and Murray-Kulkyne Park
- Hattah-Kulkyne Lakes Ramsar Site Strategic Management Plan (DSE, 2003) - the project is located in the vicinity of the Hattah-Kulkyne Lakes Ramsar site.

Local government area(s):

Rural City of Mildura

8. Existing environment

Overview of key environmental assets/sensitivities in project area and vicinity (cf. general description of project site/study area under section 7)**:**

The key environmental assets and sensitivities in the project area and vicinity, include:

- The project area is located on land declared under the *National Parks Act 1975* and recognised for its significant scenic, archaeological, ecological, geological, historic and scientific values, including Hattah-Kulkyne National Park and Murray-Kulkyne Park.

[21] Schedule 1 of the ESO contains an exemption for 'the removal, destruction or lopping of vegetation for public works, including public roads and water authority works' which is likely to apply to this project based on LMW being the implementing authority.

[22] Murray-Darling Basin Authority, 2012.

- The proposed construction areas contain approximately 18.94 ha of native vegetation, including 27 large trees, associated with nine EVCs having a conservation status of depleted, least concern and small areas of vulnerable EVCs, but not including any endangered EVCs.
- No EPBC Act or FFG Act listed threatened vegetation communities have been recorded in the project area. A patch of Semi-arid Woodland (EVC 107) adjacent to (but not within) the River Track Passing Bay South construction area has been assessed as meeting condition thresholds for EPBC Act listed Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions and FFG Act listed Semi-arid Shrubby Pine-Buloke Woodland Community.
- One FFG Act listed fauna community (Victorian Temperate Woodland Bird Community) is likely to occur in the project area.
- Only one EPBC Act listed flora species was assessed as having the potential to occur in the proposed construction areas: Winged Peppercress (*Lepidium monoplocoides*), which is listed as Endangered. This species has not been recorded in the proposed construction areas during three rounds of targeted surveys in 2015, 2017 and 2019.
- Three FFG Act listed threatened flora species have been recorded in the proposed construction areas: Umbrella Wattle (*Acacia oswaldii*), Dwarf Swainson-pea (*Swainsona phacoides*) and Spotted Emu-bush (*Eremophila maculata subsp. maculata*). One additional FFG Act listed species: Buloke (*Allocasuarina luehmannii*), was recorded adjacent to the River Track Passing Bay South construction area.
- Two EPBC Act listed threatened fauna species are known to occur or are likely to occur in the proposed construction areas: Regent Parrot (*Polytelus anthopeplus monarchoides*) and Painted Honeyeater (*Grantiella picta*), with the Regent Parrot being well known from the Hattah-Kulkyne National Park. The nearest likely Regent Parrot nest tree identified during 2019 surveys was at least 350 m from the proposed construction area.
- Eight FFG Act listed fauna species have been assessed as present, possible or likely to occur in the proposed construction areas, these being:
    - Regent Parrot (*Polytelus anthopeplus monarchoides*) (FFG Act - Listed, VicAdv – vulnerable)
    - Painted Honeyeater (*Grantiella picta*) (FFG Act - Listed, VicAdv – vulnerable)
    - Apostlebird (*Struthidea cinerea*) (FFG Act - Listed, VicAdv – N/A)
    - Black Falcon (*Falco subniger*) (FFG Act - Listed, VicAdv – vulnerable)
    - Diamond Dove (*Geopelia cuneata*) (FFG Act - Listed, VicAdv – near threatened)
    - Hooded Robin (*Melanodryas cucullata*) (FFG Act - Listed, VicAdv – near threatened)
    - Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) (FFG Act - Listed, VicAdv – vulnerable)
    - Carpet Python (*Morelia spilota metcalfei*) (FFG Act - Listed, VicAdv – endangered).
- Fourteen listed migratory species have been identified as potentially occurring in the project area (Fork-tailed Swift, Cattle Egret, Eastern Great Egret, Latham's Snipe, Australian Painted Snipe, Black-eared Miner, Malleefowl, Rainbow Bee-eater, White-throated Needletail, White-bellied Sea-eagle, Clamorous Reed Warbler, Glossy Ibis, Curlew Sandpiper, Eastern Curlew) although the proposed construction areas are not considered to support habitat that would be considered important for migratory species foraging or breeding activity.
- The project area, specifically the proposed inundation area, includes an area of private land subject to a Trust for Nature conservation covenant.
- The project area is located in an area of Cultural Heritage Sensitivity. Based on complex assessments undertaken for the draft CHMP, 21 recorded Aboriginal Places have been

identified within 50 m of the proposed activity area, of which 11 recorded Aboriginal Places are identified within the proposed activity area[23].

- The project area is located in proximity to (but not within) wetlands of international and national importance, including Hattah-Kulkyne Lakes listed under the Ramsar Convention and the Hattah Lakes listed on A Directory of Important Wetlands in Australia.
- The project area is identified by the management plans for Hattah-Kulkyne National Park and Murray-Kulkyne Park, and the Environmental Significance Overlay (Schedule 1 – Murray River Corridor) as having landscape values of state and regional importance.
- The project area is included in the Public Conservation and Resource Zone, and is subject to an Environmental Significance Overlay (Schedule 1 – Murray River Corridor), Land Subject to Inundation Overlay, Bushfire Management Overlay and Heritage Overlay (HO117, HO118) (proposed inundation areas only) of the Mildura Planning Scheme.
- The project will involve an increase in the frequency and duration of inundation (increased from current to more closely align with natural flood regime) in an area containing shallow, saline, alluvial aquifer as described in Section 13 (Water environments).
- The project will involve construction works in areas containing potentially erosive soils as described in Section 14 (Soils).

9. Land availability and control

Is the proposal on, or partly on, Crown land?

☐ No ☒ Yes If yes, please provide details.

The proposed construction areas (except for Kulkyne Station Claypit) are located on Crown land within the Hattah-Kulkyne National Park and the Murray-Kulkyne Park. The proposed inundation areas also affect Crown land within the Hattah-Kulkyne National Park and the Murray-Kulkyne Park.

Hattah-Kulkyne National Park has a total area of 49,975 ha and is declared as a Schedule 2 – National Park under the *National Parks Act 1975*. Parks Victoria is responsible for the control and management of the National Park and in accordance with section 17(2)(a) of the *National Parks Act 1975*, must ensure it is controlled and managed to:

- *preserve and protect the park in its natural condition for the use, enjoyment and education of the public;*
- *preserve and protect indigenous flora and fauna in the park;*
- *exterminate or control exotic fauna in the park;*
- *eradicate or control exotic flora in the park; and*
- *preserve and protect wilderness areas in the park and features in the park of scenic, archaeological, ecological, geological, historic or other scientific interest;*

Murray-Kulkyne Park has a total area of 4,555 ha and is declared as a Schedule 3 – Other Park under the *National Parks Act 1975*. Parks Victoria is responsible for the control and management of the Murray-Kulkyne Park and in accordance with section 18(2)(a) of *National Parks Act 1975*, must ensure it is controlled and managed to:

- *preserve, protect and re-establish indigenous flora and fauna in the park;*
- *preserve and protect features in the park of scenic, archaeological, ecological, geological, historic or other scientific interest;*

[23] The proposed activity area encompasses the Investigation Area mapped in this referral and falls entirely within but is smaller than, the activity area assessed in the draft CHMP No. 14330.

- *enable the park to be used by the public for the enjoyment, observation and study of the countryside and its pursuits, its flora and fauna, its ecology and geology and other features; and*
- *control exotic flora and fauna in the park;*

Existing access roads and access tracks to be used by the project are located on Crown land comprised of either National Park or Government Road. Some, mostly unconstructed, sections of Government Road within the National Park may also be affected by managed inundation events.

The location of Crown land affected by the project is shown in **Attachment 28 – Land Tenure Map**.

Current land tenure (provide plan, if practicable):

A summary of land parcels affected by proposed construction and inundation areas is provided in **Table 16.**

Table 16. Summary of land parcels affected by proposed construction and inundation areas

SPI	Tenure	Description	Land Manager/ Owner	Project component
2003\PP3986	Crown Land	Schedule 2 – National Parks under *National Parks Act 1975* (Hattah-Kulkyne Park)	Parks Victoria	Bitterang Regulator Managed inundation area (Chalka North Area, Lake Boolca Area)
2004\PP3986	Crown Land	Schedule 2 – National Parks under *National Parks Act 1975* (Hattah-Kulkyne Park)	Parks Victoria	Managed inundation area (Chalka North Area, Lake Boolca Area)
2005\PP3986	Crown Land	Schedule 3 - Other Parks under National Parks Act 1975 (Murray-Kulkyne Park)	Parks Victoria	K10 Regulator Managed inundation area (Chalka North Area)
2006\PP3986	Crown Land	Schedule 2 – National Parks under National Parks Act 1975 (Hattah-Kulkyne Park)	Parks Victoria	K10 Regulator Managed inundation area (Chalka North Area, Lake Boolca Area)
2008\PP2939	Crown Land	Schedule 3 - Other Parks under *National Parks Act 1975* (Murray-Kulkyne Park)	Parks Victoria	Managed inundation area (Chalka North Area)[24]
2013\PP2939	Crown Land	Schedule 2 – National Parks under *National Parks Act 1975* (Hattah-Kulkyne Park)	Parks Victoria	Managed inundation area (Chalka North Area)
2018\PP2939	Crown Land	Schedule 3 - Other Parks under *National Parks Act*	Parks Victoria	K10 Causeway Regulator

[24] This parcel of Crown land within Murray-Kulkyne Park will only be affected by managed inundation if flooding agreements are obtained from private landowners of Kulkyne Station to allow for maximum design inundation extents to be achieved.

		1975 (Murray-Kulkyne Park)		Passing Bay (North, Central) Managed inundation area (Chalka North Area)
2019\PP2939	Crown Land	Schedule 2 – National Parks under *National Parks Act 1975* (Hattah-Kulkyne Park)	Parks Victoria	K10 Causeway Regulator Passing Bay (North, Central, South) Managed inundation area (Chalka North Area)
2020\PP2939	Crown Land	Schedule 3 - Other Parks under *National Parks Act 1975* (Murray-Kulkyne Park)	Parks Victoria	Passing Bay (South)
2021\PP2939	Crown Land	Schedule 3 - Other Parks under National Parks Act 1975 (Murray-Kulkyne Park)	Parks Victoria	K10 Regulator Managed inundation area (Chalka North Area)
2022\PP2939	Crown Land	Schedule 2 – National Parks under National Parks Act 1975 (Hattah-Kulkyne Park)	Parks Victoria	K10 Regulator Managed inundation area (Chalka North Area)
2023\PP2939	Crown Land	Schedule 3 - Other Parks under *National Parks Act 1975* (Murray-Kulkyne Park)	Parks Victoria	Managed inundation area (Chalka North Area)[25]
2001\PP2410	Crown Land	Schedule 2 – National Parks under *National Parks Act 1975* (Hattah-Kulkyne Park)	Parks Victoria	Managed inundation area (Lake Boolca Area)[26]
4\PP2939	Freehold	Kulkyne Station – Kulkyne Way, Hattah	Private Land	Managed inundation area (Chalka North Area)
5\PP2939	Freehold	Kulkyne Station – Kulkyne Way, Hattah	Private Land	Managed inundation area (Chalka North Area)
6\PP2939	Freehold	Kulkyne Station – Kulkyne Way, Hattah	Private Land	Managed inundation area (Chalka North Area)
7\PP2939	Freehold	Kulkyne Station – Kulkyne Way, Hattah	Private Land	Kulkyne Station Claypit
1\LP78357	Freehold	Address: 2 Wonga Avenue, Colignan Covenant AG194510Q (with Trust for Nature (Victoria)) applies under section 3A of the Victorian	Private Land	Managed inundation area (Lake Boolca Area)

[25] This parcel of Crown land within Murray-Kulkyne Park will only be affected by managed inundation if flooding agreements are obtained from private landowners of Kulkyne Station to allow for maximum design inundation extents to be achieved.
[26] This parcel of Crown land will only be affected by managed inundation if a flood agreement is established with the owner of private land parcel 1\LP78357.

		Conservation Trust Act 1972. Easement (State Electricity Department of Victoria)		
1\PP3986	Freehold	Kulkyne Way, Hattah	Private Land	Managed inundation area (Chalka North Area)
Government Road	Crown Land			Passing Bay (South) Managed inundation area (Chalka North Area, Lake Boolca Area)

In addition to the above, a parcel of privately-owned freehold land (3\PP2939) at 2016 River Track, Hattah is traversed by the access track to the Sexton's temporary pump site, which is proposed to be used to access water for construction purposes.

The location of land parcels affected by the project and associated tenure is shown in **Attachment 28 – Land Tenure Map**.

Intended land tenure (tenure over or access to project land):

The project does not propose any changes to current land tenure.

Other interests in affected land (eg. easements, native title claims):

Native Title

A search of the National Native Title Tribunal online register and maps[27] indicates that:

- No current native title applications under the *Native Title Act 1993* apply over the project area. Land on the western side of the Calder Highway adjacent to the western boundary of Hattah-Kulkyne National Park is subject to a current application (VC2015/001) lodged by the First Peoples of the Millewa-Mallee on 8 October 2015 and accepted for registration of native title claim on 13 May 2016.
- No previous native title claims have been determined under the *Native Title Act 1993* (Cwth) in relation to land within or adjacent to the project area.
- No Indigenous Land Use Agreements under the *Native Title Act 1993* affect land within or adjacent to the project area.

No current applications or registered agreements under the *Traditional Owner Settlement Act 2010* (Vic) apply over land within the project area. Land on the western side of the Calder Highway adjacent to the western boundary of Hattah-Kulkyne National Park is subject to an application by the First Peoples of the Millewa-Mallee seeking to negotiate a Recognition and Settlement Agreement with the State of Victoria under the *Traditional Owner Settlement Act 2010*.

Other Interests

No easements, covenants or other encumbrances are registered on the freehold titles for Kulkyne Station (4\PP2939, 5\PP2939, 6\PP2939, 7\PP2939). Lots 4, 5 and 6 are subject to a

[27] Source: National Native Title Tribunal, Native Title Vision (https://data-nntt.opendata.arcgis.com/), accessed September 2019.

depth limitation (Crown reserves right to minerals) of 15.24 m below surface, while Lot 7 is not subject to a depth limitation and title therefore extends to the centre of the earth.

No easements, covenants or other encumbrances are registered on the freehold title for 3\PP2939 other than a depth limitation of 15.24 m below surface.

Freehold parcel 1\LP8357 is subject to an electricity easement in favour of the State Electricity Department of Victoria and Covenant AG194510Q. The Covenant is between the landowners and Trust for Nature (Victoria) under section 3A of the *Victorian Conservation Trust Act 1972*. Trust for Nature (Victoria) has advised that written approval is not required for environmental watering of land subject to this covenant.

10. Required approvals

State and Commonwealth approvals required for project components (if known):

The following State and Commonwealth approvals are likely to be required for the project:

Commonwealth

- Referral to the Minister for the Environment under the EPBC Act to determine whether the project is a controlled action requiring formal assessment and approval under the Act.
- Notification of a 'future act' under the *Native Title Act 1993* for activities on Crown land that may affect native title rights and interests.

Victoria

- Referral (this document) to the Minister for Planning (via DELWP) under the *Environment Effects Act 1978* to determine whether or not an Environment Effects Statement is required for the project.
- A planning scheme amendment or planning permit under the Mildura Planning Scheme.
- A Cultural Heritage Management Plan approved by Aboriginal Victoria (there is no Registered Aboriginal Party) under the *Aboriginal Heritage Act 2006* and *Aboriginal Heritage Regulations 2018*.
- Approval from Parks Victoria / Minister for Environment, Energy and Climate Change under section 27 of the *National Parks Act 1975*.
- Work authority and work plan (for Kulkyne Station Claypit) authorised by Earth Resources Regulation (Department of Jobs, Precincts and Regions) under the *Mineral Resources (Sustainable Development) Act 1990*.
- Licence to take and use water (s51) and licence to construct works (s67) to take water from Lower Murray Water under section 51 of the *Water Act 1989*.
- Works on waterways permit from Mallee CMA of the *Water Act 1989*.
- Permit to take protected flora on Crown land from DELWP under the *Flora and Fauna Guarantee Act 1988*.
- Consent from Heritage Victoria to remove, disturb or destroy an archaeological site (whether recorded on the Victorian Heritage Inventory or not) under *Heritage Act 2017.*

Other legislation of potential relevance to the project includes:

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth)*
- *Water Act 2007 (Cth)*
- *Land Act 1958*

- *Environment Protection Act 1970 (or Environment Protection Act 2017 post 1 July 2020).*
- *Catchment and Land Protection Act 1994*
- *Wildlife Act 1975*
- *Fisheries Act 1995.*

Have any applications for approval been lodged?

☒ No ☒ Yes If yes, please provide details.

No applications for approval of the project have been lodged to date.

Approval agency consultation (agencies with whom the proposal has been discussed):

The VMFRP is managed by a partnership team comprised of LMW, GMW, North Central CMA, Mallee CMA and Parks Victoria. Each of these agencies are represented on the VMFRP Program Control Group, but also have a separate regulatory approvals function for the VMFRP projects. DELWP Water is the Program Owner. DELWP also has a separate regulatory approvals function for the VMFRP projects.

The VMFRP has established a Technical Advisory Group – Regulatory Approvals Committee (Approvals TAG) to advise on regulatory approval requirements through the planning and design of the project. In addition to the partnership agencies, regulatory approval agencies currently represented on the Technical Advisory Group include:

- DELWP (Impact Assessment Unit, Planning, Regional)
- Parks Victoria
- Aboriginal Victoria
- Commonwealth Department of the Agriculture, Water and Environment.

An overview of the Project was presented to the TAG at a meeting held on 8 August 2019.

As part of broad stakeholder engagement activities undertaken between 2012 and 2014 to support the Hattah Lakes North Supply Measure Business Case, Mallee CMA also consulted with Mildura Rural City Council, GMW and Parks Victoria.

During 2015 to 2016, engagement activities were undertaken in the form of monthly Steering Committee meetings with Mallee CMA, Murray-Darling Basin Authority, Parks Victoria, SA Water, GMW and DELWP.

The Approvals TAG meets regularly to discuss the project / program. In addition, a Design TAG operates concurrently which has representation from the following:

- VMFRP
- GMW
- Parks Victoria
- North Central CMA
- Murray-Darling Basin Authority
- DELWP
- LMW
- SA Water
- Mallee CMA.

PART 2 POTENTIAL ENVIRONMENTAL EFFECTS

11. Potentially significant environmental effects

Overview of potentially significant environmental effects (identify key potential effects and comment on their significance and likelihood, as well as key uncertainties):

An assessment of the potential construction and operational impacts of the project has been undertaken and is detailed in Parts 12 – 16 of this referral. **Table 17** provides a summary of these potential impacts against the referral criteria for potentially significant effects as outlined under *Ministerial guidelines for assessment of environment effects under the Environment Effects Act 1978* (Department of Sustainability and Environment, 2006).

As outlined in **Table 17**, the project has potential for significant effects on the following environmental values:

- The project is proposing to clear 18.94 ha of native vegetation which is not under an approved Forest Management Plan or Fire Protection Plan.
- Potential major and long-term effects on the health and biodiversity of aquatic ecosystems associated with the project. These are expected to be mostly positive as defined through the ecological objectives and targets for the project.

Table 17. Summary of review of project impacts against the EE Act referral criteria

<table>
<tr><th>EE Act referral criteria</th><th>Extent and description of impact</th></tr>
<tr><td colspan="2">Individual potential environmental effects</td></tr>
<tr><td>Potential clearing of 10 ha or more of native vegetation from an area that:
is of an Ecological Vegetation Class identified as endangered by the Department of Environment, Land, Water and Planning; or
is, or is likely to be, of very high conservation significance; and
is not authorised under an approved Forest Management Plan or Fire Protection Plan.</td><td>The project will involve the removal of vegetation with a conservation status of depleted (14.625 ha) or vulnerable (0.48 ha) or least concern (3.835 ha) and will not involve removal of vegetation with a conservation status of endangered.
<table>
<tr><th>Construction Area</th><th>EVC</th><th>Conservation Significance</th><th>Area (ha)</th></tr>
<tr><td>Bitterang Regulator</td><td>103 - Riverine Chenopod Woodland</td><td>Depleted</td><td>2.963</td></tr>
<tr><td>Bitterang Regulator</td><td>806 - Alluvial Plains Semi-arid Grassland</td><td>Vulnerable</td><td>0.350</td></tr>
<tr><td>Clay Pit</td><td>103 - Riverine Chenopod Woodland</td><td>Depleted</td><td>0.026</td></tr>
<tr><td>Clay Pit</td><td>808 - Lignum Shrubland</td><td>Least Concern</td><td>3.501</td></tr>
<tr><td>K10 Causeway Regulator</td><td>103 - Riverine Chenopod Woodland</td><td>Depleted</td><td>2.575</td></tr>
<tr><td>K10 Causeway Regulator</td><td>813 - Intermittent Swampy Woodland</td><td>Depleted</td><td>1.070</td></tr>
<tr><td>K10 Causeway Regulator</td><td>820 - Sub-saline Depression Shrubland</td><td>Depleted</td><td>0.008</td></tr>
<tr><td>K10 Regulator</td><td>103 - Riverine Chenopod Woodland</td><td>Depleted</td><td>3.432</td></tr>
<tr><td>K10 Regulator</td><td>808 - Lignum Shrubland</td><td>Least Concern</td><td>0.334</td></tr>
<tr><td>K10 Regulator</td><td>810 - Floodway Pond Herbland</td><td>Depleted</td><td>0.893</td></tr>
<tr><td>K10 Regulator</td><td>813 - Intermittent Swampy Woodland</td><td>Depleted</td><td>3.648</td></tr>
<tr><td>K10 Regulator</td><td>295 - Riverine Grassy Forest</td><td>Vulnerable</td><td>0.112</td></tr>
<tr><td>Passing Bay Central</td><td>102 - Low Chenopod Shrubland</td><td>Depleted</td><td>0.005</td></tr>
<tr><td>Passing Bay North</td><td>103 - Riverine Chenopod Woodland</td><td>Depleted</td><td>0.005</td></tr>
<tr><td>Passing Bay South</td><td>097 - Semi-arid Woodland</td><td>Vulnerable</td><td>0.018</td></tr>
<tr><td></td><td>TOTAL</td><td></td><td>18.939</td></tr>
</table></td></tr>
<tr><td>Potential long-term loss of a significant proportion (e.g. 1 to 5 per cent depending on the conservation status of the species) of known remaining habitat or population of a threatened species within Victoria.</td><td>The project will not involve the removal of known remaining habitat or a population of a threatened species within Victoria.</td></tr>
<tr><td>Potential long-term change to the ecological character of a wetland listed under the Ramsar</td><td>The project is not likely to have a significant adverse effect on any wetlands listed under the Ramsar Convention or A Directory of Important Wetlands in Australia.</td></tr>
</table>

EE Act referral criteria	Extent and description of impact
Convention or in 'A Directory of Important Wetlands in Australia'	The project will not involve any construction works within the boundary of the Hattah-Kulkyne Lakes Ramsar site or the Hattah Lakes wetlands that are listed on A Directory of Important Wetlands in Australia. The nearest lakes included in these wetland listings are: • Lake Bitterang - approx. 1.0 km south of Bitterang Regulator • Lake Cantala - approx. 3.5 km south of Passing Bay South, 5.2 km south of the K10 Causeway Regulator and 6.0 km south east of the Bitterang Regulator. With the exception of the Bitterang Regulator construction area, all other construction areas are located downstream and will therefore not adversely affect these internationally and nationally important wetlands. The Bitterang Regulator construction area is typically dry and not connected by flows to the downstream Lake Bitterang except during managed flood events controlled by TLM and very large natural flood events. The project will not involve any discharges of managed floodwaters to any internationally and nationally important wetlands, given that the Chalka North Area is located downstream of these wetlands and no release of managed floodwaters from the Lake Boolca Area is proposed.
Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term.	Potential major and long-term effects on the health and biodiversity of aquatic ecosystems associated with the project are expected to be mostly positive as defined through the ecological objectives and targets for the project set out in **Table 1** of this referral. The project aims to reinstate a more natural hydrological regime to the northern Hattah Lakes floodplain, which is expected to deliver a range of ecological benefits to floodplain and wetland communities. The project is designed to have the operational flexibility to vary the timing, depth, duration and extent of inundation so that individual managed events are able to target specific ecological outcomes. Ecological monitoring of the Hattah Lakes TLM works has shown a trend of increasing ecological condition (see **Attachment 20 – Hattah Lakes TLM Condition Monitoring Report 2018-2019**), which provides confidence that implementation of the proposed supply measures under this project and its associated watering regime will provide the expected benefits.
Potential extensive or major effects on the health, safety or well-being of a human community, due to emissions to air or water or chemical hazards or displacement of residences.	The nearest dwellings to the proposed construction areas are located on farming properties between the northern national park boundary and Boonoonar Road and are separated by at least 3.5 km from the proposed construction areas. A small number (approximately. 10-15) of dwellings located adjacent to the proposed access roads may experience some additional noise, dust and traffic during construction. However, these effects will be temporary, limited to the construction period, and are not likely to be significant. There will be no hazardous emissions created during the construction or implementation of the project.

EE Act referral criteria	Extent and description of impact
	Potential extensive or major effects on the health, safety or well-being of a human community, due to emissions to air or water or chemical hazards or displacement of residences are not expected.
Potential greenhouse gas emissions exceeding 200,000 tonnes of carbon dioxide equivalent per annum, directly attributable to the facility.	Neither the construction or operation of the project will produce greenhouse gas emissions exceeding 200,000 tonnes of carbon dioxide equivalent per annum.
A combination of potential environmental effects	
Potential clearing of 10 ha or more of native vegetation, unless authorised under an approved Forest Management Plan or Fire Protection Plan	The project is proposing to remove up to 18.94 ha of native vegetation, including 27 large trees, which is not under an approved Forest Management Plan or Fire Protection Plan.
Matters listed under the *Flora and Fauna Guarantee Act 1988*: • Potential loss of a significant area of a listed ecological community • Potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing), including as a result of loss or fragmentation of habitats; or • Potential loss of critical habitat; • Potential significant effects on habitat values of a wetland supporting migratory bird species.	One FFG Act listed fauna community (Victorian Temperate Woodland Bird Community) has been identified as likely to occur in the project area but is not likely to be adversely impacted by construction or operation of the project. One FFG Act listed flora vegetation community (Semi-arid Shrubby Pine-Buloke Woodland Community), has been identified in proximity to River Track Passing Bay South (in patches of Semi-arid Woodland, mapped as Habitat Zone 2). Construction of this passing bay on the southern side of River Track as proposed, will avoid impacts to patches of this FFG Act listed community. There is no potential loss of genetically important populations or critical habitat.
Potential extensive or major effects on landscape values of regional importance, especially where recognised by a planning scheme overlay or within or adjoining land reserved under the *National Parks Act 1975*.	The project will involve some removal of native vegetation and alteration of landforms within areas supporting state and regional landscape values, specifically the Hattah-Kulkyne National Park. However, the extent of vegetation removal and landform alteration, which will be limited to less than 19.30 ha of construction areas, in the context of the 1,130 ha of floodplain vegetation communities expected to benefit from the project and the 55,000 ha of the Hattah-Kulkyne National Park and Murray-Kulkyne Park, is not expected to have a significant adverse effect on landscape values of state or regional importance.
Potential extensive or major effects on land stability, acid sulfate soils or highly erodible soils over the short or long term.	The project is not likely to have significant adverse effects on land stability, acid sulphate soils or highly erodible soils. Some potential exists for works to involve disturbance of highly erodible soils (e.g. Parilla Sands) and dispersive soils, and possibly potential ASS, as described in Section 14 (Soils).

EE Act referral criteria	Extent and description of impact
	Potential adverse effects on soils are able to be managed through standard design and construction measures to avoid significant, long term effects. Recommendations for design of structures in response to geotechnical conditions identified at the site, including design of scour protection, conditioning of dispersive fill material, seepage barriers etc, are contained in **Attachment 15 – Geotechnical Report** and were considered in the detailed design of the project. Prior to commencing works the contractor will be required to prepare a CEMP outlining measures to identify and avoid or manage disturbance of highly erosive soils and potential ASS (if required).
Potential extensive or major effects on beneficial uses of waterbodies over the long term due to changes in water quality, streamflows or regional groundwater levels.	Operation of the proposed works to reinstate a more natural inundation regime to the northern Hattah Lakes floodplain in accordance with the hydrological targets established by Ecological Associates (2014a, 2015) is expected to have a beneficial impact on waterbodies. A draft Environmental Water Management Plan, Operating Plan, Monitoring, Evaluation and Reporting Plan is being developed for the project to facilitate timely identification of potential water quality issues and to establish decision-making frameworks to adaptively manage such events to mitigate potential impacts on beneficial uses.
Potential extensive or major effects on social or economic well-being due to direct or indirect displacement of non-residential land use activities.	Non-residential land use activities will not be directly or indirectly displaced.
Potential for extensive displacement of residences or severance of residential access to community resources due to infrastructure development.	The project will not displace any residences or sever residential access to community resources as the works are located within discrete sites within national parks. Although public access along River Track will be temporarily closed from the northern national park boundary to south of Kulkyne Station during construction, provision will be made for private landowners of Kulkyne Station and Sexton's to access their properties during the construction period.
Potential significant effects on the amenity of a substantial number of residents, due to extensive or major, long-term changes in visual, noise and traffic conditions.	Significant impacts on views and landscape values are not expected. The nearest dwellings to the proposed construction areas are located on farming properties between the northern national park boundary and Boonoonar Road and are separated by at least 3.5 km from the proposed construction areas. A small number (approximately. 10-15) of dwellings located adjacent to the proposed access roads may experience some additional noise, dust and traffic during construction. However, these effects will be temporary, limited to the construction period, and are not likely to be significant.
Potential exposure of a human community to severe or chronic health or safety hazards over the short or long term, due to emissions to air or water or noise or chemical hazards or associated transport.	No emissions are anticipated to be generated during construction or operation the project that will expose the community to hazards.

EE Act referral criteria	Extent and description of impact
Potential extensive or major effects on Aboriginal cultural heritage.	A complex assessment confirmed 31 Aboriginal Places are located within the activity area assessed for the draft CHMP, which determined that the activity will not impact upon 25 of these 31 Aboriginal Places, with harm to these 25 Aboriginal Places to be avoided through the application of buffering fencing (where required). Specific management recommendations for the six Aboriginal Places identified as being impacted are contained in the draft CHMP. Further details regarding Aboriginal Places identified during the desktop, standard and complex assessment, along with stakeholder engagement, impact assessment and specific management recommendations relating to these places are contained in Draft CHMP No. 14330[28]. Since preparation of the draft CHMP, the proposed activity area has been refined and reduced within the previously assessed activity area. Further assessments will be undertaken as part of finalising the CHMP to determine impacts on Aboriginal Places. However, as the revised activity area is reduced, it is anticipated that impacts on Aboriginal Places will not be any greater than those determined in the draft CHMP. Further detail is provided in Section 15.
Potential extensive or major effects on cultural heritage places listed on the Heritage Register or the Archaeological Inventory under the *Heritage Act 1995*.	An assessment of cultural heritage places has been undertaken. There are no places listed on the Victorian Heritage Register (VHR) located within or adjoining the proposed construction areas or proposed inundation areas. No places listed on the Victorian Heritage Inventory (VHI) or the Heritage Overlay in the Mildura Planning Scheme are located within the proposed construction areas. Further detail is provided in Section 15.

[28] Due to the cultural sensitivity of information contained in draft CHMP, this document has not been attached to this referral.

12. Native vegetation, flora and fauna

Native vegetation

Is any native vegetation likely to be cleared or otherwise affected by the project?

☐ NYD ☐ No ☒ Yes If yes, answer the following questions and attach details.

What investigation of native vegetation in the project area has been done? (briefly describe)

The following studies have included surveys and assessment of native vegetation within the proposed construction areas:

- Hattah North SDL Project Flora and Fauna Assessment, Detailed Design Stage, Final Report (Australian Ecosystems, 2015)
- SDL Targeted Flora and Fauna Surveys, Hattah North, Ecological Assessment (GHD, 2018).

In addition, the Flora and Fauna Assessment – Hattah Lakes Floodplain Restoration Project (R8, 2020) included in **Attachment 12 – Flora and Fauna Assessment**, consolidates native vegetation and threatened species information complied through these previous ecological studies, and also describes the methods and results of the following previously unreported investigations:

- Targeted surveys for FFG Act and EPBC Act listed threatened species conducted at the K10 Regulator, K10 Causeway Regulator and Bitterang Regulator construction areas in August / September 2019
- Habitat hectare assessments and threatened species habitat assessments conducted at the River Track Passing Bays in January 2020
- Targeted ground-truthing of EVCs within parts of the proposed inundation area modelled by DELWP (2005) as containing not flood-dependent EVCs (i.e. Mallee vegetation or Semi-arid woodland).

What is the maximum area of native vegetation that may need to be cleared?

☐ NYD Estimated area ……18.94……(hectares)

How much of this clearing would be authorised under a Forest Management Plan or Fire Protection Plan?

☒ N/A…… approx. percent (if applicable)

Which Ecological Vegetation Classes may be affected? (if not authorised as above)

☐ NYD ☒ Detailed assessment completed. If assessed, please list.

Table 18. Summary of EVCs potentially impacted by proposed construction works

Construction Area	EVC	Conservation Significance	Area (ha)
Bitterang Regulator	103 - Riverine Chenopod Woodland	Depleted	2.963
Bitterang Regulator	806 - Alluvial Plains Semi-arid Grassland	Vulnerable	0.350

Clay Pit	103 - Riverine Chenopod Woodland	Depleted	0.026
Clay Pit	808 - Lignum Shrubland	Least Concern	3.501
K10 Causeway Regulator	103 - Riverine Chenopod Woodland	Depleted	2.575
K10 Causeway Regulator	813 - Intermittent Swampy Woodland	Depleted	1.070
K10 Causeway Regulator	820 - Sub-saline Depression Shrubland	Depleted	0.008
K10 Regulator	103 - Riverine Chenopod Woodland	Depleted	3.432
K10 Regulator	808 - Lignum Shrubland	Least Concern	0.334
K10 Regulator	810 - Floodway Pond Herbland	Depleted	0.893
K10 Regulator	813 - Intermittent Swampy Woodland	Depleted	3.648
K10 Regulator	295 - Riverine Grassy Forest	Vulnerable	0.112
Passing Bay Central	102 - Low Chenopod Shrubland	Depleted	0.005
Passing Bay North	103 - Riverine Chenopod Woodland	Depleted	0.005
Passing Bay South	097 - Semi-arid Woodland	Vulnerable	0.018
TOTAL			**18.939**

Have potential vegetation offsets been identified as yet?

☒ NYD ☐ Yes If yes, please briefly describe.

Offsets have been calculated for the project based on the proposed removal of up to approximately 18.94 ha of native vegetation, including 27 large trees, and are described in the Native Vegetation Removal Report contained in Appendix R of **Attachment 12 – Flora and Fauna Assessment**.

Offsets will be sought in accordance with the requirements of the *Guidelines for removal, destruction or lopping of native vegetation* (DELWP 2017) or through an alternate arrangement agreed with the Secretary to DELWP. The loss of native vegetation due to construction activities is proposed to be offset, at least in part, by the expected improvement in native vegetation quality in the inundation area resulting from environmental watering. The method for confirming this offset will be developed in consultation with DELWP. Any offset requirements that cannot be met through environmental watering will be purchased by the project.

Other information/comments? (eg. accuracy of information)

NYD = not yet determined

Flora and fauna

What investigations of flora and fauna in the project area have been done?
(provide overview here and attach details of method and results of any surveys for the project & describe their accuracy)

The following flora and fauna investigations have been undertaken for the project:

- *SDL Offsets - Fauna Survey - Hattah North and Belsar Yungera 2013* (GHD, 2014):

  In 2013, GHD was engaged by Mallee CMA to undertake baseline fauna surveys across the northern Hattah Lakes floodplain following preparation of concept designs for the project in 2012.

- *Hattah North and Belsar Yungera Islands Flora Census 2013* (Australian Ecosystems, 2014):

  In 2013, Australian Ecosystems was engaged by Mallee CMA to undertake baseline flora surveys across the northern Hattah Lakes floodplain following preparation of concept designs for the project in 2012.

- *Hattah North SDL Project Flora and Fauna Assessment – Detailed Design Stage Final Report* (Australian Ecosystems, 2015):

  In 2015, Australian Ecosystems was engaged by Mallee CMA to undertake ecological surveys assessing the native vegetation and fauna habitat within the proposed construction areas, along with a rapid assessment of a network of 25-30 km of roads and tracks. The construction areas assessed in this study were based on an advanced concept design developed for the project in 2014.

- *SDL Targeted Flora and Fauna Surveys, Hattah North Ecological Assessment* (GHD, 2018):

  In 2017, GHD was engaged by Mallee CMA to undertake additional surveys to identify ecological values within extended buffers around the construction areas, and to conduct targeted surveys for threatened flora and fauna. The construction areas assessed in this study were based on detailed designs developed for the project in 2016, with the extended buffers surveyed to enhance understanding of ecological values surrounding the construction areas that may require management during construction of the project.

- In August 2019, R8 was engaged by VMFRP to conduct targeted surveys for threatened flora and fauna in accordance with recommendations by GHD (2018) within reduced construction areas for the K10 Regulator, K10 Causeway Regulator and Bitterang Regulator. The results of these surveys were compiled into a draft report, which was used as the basis for the report contained in **Attachment 12 – Flora and Fauna Assessment**.

- In January 2020, R8 was engaged by VMFRP to undertake additional surveys for the project to assess the vegetation and fauna habitat in the proposed River Track Passing Bay construction areas (not previously assessed). Ground-truthing of vegetation was also undertaken in parts of the proposed inundation areas shown on modelled extant EVC mapping (DELWP, 2005) as containing not flood-dependent EVCs (i.e. Mallee vegetation or Semi-arid woodland). The results of these surveys are included in the report contained in **Attachment 12 – Flora and Fauna Assessment**.

A summary of the methods, key findings and recommendations associated with the pre-2019 flora and fauna investigations listed above is presented in Appendix A of the report contained in **Attachment 12 – Flora and Fauna Assessment**.

Have any threatened or migratory species or listed communities been recorded from the local area?

☒ NYD ☒ No ☒ Yes If yes, please:

- List species/communities recorded in recent surveys and/or past observations.
- Indicate which of these have been recorded from the project site or nearby.

Listed threatened communities

One FFG Act listed vegetation community, *Semi-arid Shrubby Pine-Buloke Woodland Community*, was identified in the vicinity of Passing Bay South, in patches of Semi-arid Woodland (EVC 97) mapped as Habitat Zone 2 (see **Attachment 12 – Flora and Fauna Assessment**). Vegetation mapped as Habitat Zone 2 was also assessed as meeting the condition thresholds for the EPBC Act listed threatened ecological community, *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions,* which is listed as Endangered under the EPBC Act. Habitat Zone 2 is located on the northern side of River Track.

As such, it is proposed to construct Passing Bay South on the southern side of River Track so as to avoid impacts on Habitat Zone 2.

Based on a desktop assessment and targeted ground-truthing of vegetation communities in the proposed inundation areas, it is considered unlikely that any EPBC Act or FFG Act listed flora communities occur in the proposed inundation areas.

Two FFG Act listed fauna communities were identified as potentially occurring within the project area:

- Victorian Temperate Woodland Bird Community (VTWBC)
- Victorian Mallee Bird Community (VMBC).

The VTWBC is potentially present within the project area given that species such as Apostlebird and Hooded Robin are known to occur in the project area. However, impacts to this community are likely to be negligible as the northern Hattah Lakes floodplain is comprised largely of intact vegetation, and as such, the proposed removal of up to 18.94 ha of native vegetation in the context of more than 55,000 ha of native vegetation within the national parks is unlikely to impact on habitat connectivity or remove important habitat for the VTWBC.

The VMBC is defined by a suite of 20 bird species that are almost completely restricted to habitat that is dominated by Mallee vegetation, which distinctly characterises their distribution within Victoria. It is unlikely that this community is present within the project area given that no Mallee vegetation communities have been identified in the proposed construction or inundation areas.

Listed threatened fauna species

VBA and PMST searches by R8 (2020) identified 69 FFG Act, DELWP advisory and/or EPBC Act listed fauna species that have been recorded or have the potential to occur within the proposed inundation areas and 34 FFG Act and / or EPBC Act listed fauna species that have been recorded or have the potential to occur within the proposed construction areas. The likelihood of their occurrences and potential to be impacted are assessed in Appendix G and Appendix H of **Attachment 12 – Flora and Fauna Assessment**.

No listed threatened fauna species that were assessed as present, possible or likely to occur in the proposed inundation areas were considered likely to be adversely impacted by the proposed works.

Two EPBC Act listed threatened fauna species were assessed as present, possible or likely to occur in the proposed construction areas, these being:

- Regent Parrot (*Polytelus anthopeplus monarchoides*) – Vulnerable
- Painted Honeyeater (*Grantiella picta*) – Vulnerable.

The Regent Parrot (*Polytelus anthopeplus monarchoides*) has been regularly observed in the vicinity of the K10 Regulator and is well known in Hattah-Kulkyne National Park.

The Painted Honeyeater (*Grantiella picta*) has the potential to utilise habitats within the proposed construction area (e.g. occasional foraging in mistletoe within these woodland areas), although this species was last recorded within 10 km of the proposed construction areas in 1985.

Eight FFG Act listed fauna species were assessed as present, possible or likely to occur in the proposed construction areas, these being:

- Regent Parrot (*Polytelus anthopeplus monarchoides*) (FFG Act - Listed, VicAdv – vulnerable)
- Painted Honeyeater (*Grantiella picta*) (FFG Act - Listed, VicAdv – vulnerable)
- Apostlebird (*Struthidea cinerea*) (FFG Act - Listed, VicAdv – N/A)
- Black Falcon (*Falco subniger*) (FFG Act - Listed, VicAdv – vulnerable)
- Diamond Dove (*Geopelia cuneata*) (FFG Act - Listed, VicAdv – near threatened)
- Hooded Robin (*Melanodryas cucullata*) (FFG Act - Listed, VicAdv – near threatened)
- Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) (FFG Act - Listed, VicAdv – vulnerable)
- Carpet Python (*Morelia spilota metcalfei*) (FFG Act - Listed, VicAdv – endangered).

Each of these species have been recorded within 10 km of one or more of the proposed construction areas, and utilise habitats such as those found within the proposed construction areas.

In addition to the above, the Lace Monitor (*Varanus varius*) listed as endangered on the Victorian Advisory List has previously been recorded at the K10 Causeway Regulator.

Listed threatened flora species

VBA and PMST searches by R8 (2020) identified 109 FFG Act, DELWP advisory and/or EPBC Act listed flora species that have been recorded or have the potential to occur within the proposed inundation areas and 22 FFG Act and / or EPBC Act listed flora species that have been recorded or have the potential to occur within the proposed construction areas. The likelihood of their occurrences and potential to be impacted are assessed in Appendix E and Appendix F of **Attachment 12 – Flora and Fauna Assessment**.

Twenty-one listed threatened flora species (including three FFG Act listed and no EPBC Act listed) were assessed as present, possible or likely to occur in the proposed inundation areas, with one FFG Act listed species (Pop Saltbush (*Atriplex holocarpa*)) and one species listed as rare on the Victorian Advisory List (*Maireana triptera* (Three-winged Bluebush)) recorded as present through incidental observations made during the targeted EVC ground-truthing surveys (see **Attachment 12 – Flora and Fauna Assessment**).

No listed threatened flora species that were assessed as present, possible or likely to occur in the proposed inundation areas were considered likely to be adversely impacted by the proposed works.

Of the 22 FFG Act and / or EPBC Act listed flora species identified as potentially occurring in the proposed construction areas, 14 listed flora species were assessed as present, possible or likely to occur in the proposed construction areas based on habitat requirements, and number and timing of nearby records (see **Table 19**).

Table 19. Summary of FFG Act and/or EPBC Act listed threatened flora potentially occurring within proposed construction areas

Species Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Likelihood of Occurrence / Impact
Abutilon malvifolium	Mallow-leaf Lantern Flower		L	En	**Possible.** This species was present at the K10 Regulator in 2015 surveys. **Impact unlikely.** Not recorded in subsequent 2017 and 2019 surveys at exact location of 2015 survey record or elsewhere in proposed construction areas.
Acacia oswaldii	Umbrella Wattle		L	Vu	**Present.** Present at K10 Causeway Regulator in 2017 surveys. Present at K10 Regulator and K10 Causeway Regulator in 2019 surveys. **Impact possible.** Recorded on very southern edge of K10 Regulator construction area as well as outside the western side of the K10 Causeway Regulator.
Allocasuarina luehmannii	Buloke		L	En	**Present.** Identified adjacent to the River Track Passing Bay South construction area. **Impact unlikely.** The proposed construction area avoids impacts to this species.
Cullen cinereum	Hoary Scurf-pea		L	En	**Possible.** Favourable habitat in proposed construction areas but only one 1980 record nearby. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.
Cullen pallidum	Woolly Scurf-pea		L	En	**Possible.** Construction areas have suboptimal habitat, but several records in search area, including recent records. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.
Cullen patens	Spreading Scurf-pea		L	En	**Possible.** Some habitat in proposed construction areas and records in search area. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.
Cullen tenax	Tough Scurf-pea		L	En	**Possible.** Some habitat in proposed construction areas and records in search area, including recent records. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.
Eremophila bignoniiflora	Bignonia Emu-bush		L	Vu	**Possible.** Suitable habitat in proposed construction areas, but low number of nearby records. **Impact unlikely.** Not recorded in 2015. 2017 or 2019 surveys.
Eremophila maculata subsp. *maculata*	Spotted Emu-bush		L	R	**Present.** Present at K10 Causeway Regulator in 2015 and 2019. **Impact likely:** Recorded several metres inside the proposed construction area on the eastern side of K10 Causeway Regulator.
Glycine canescens	Silky Glycine		L	En	**Possible.** Most habitat in proposed construction areas is unsuitable, but several records nearby, including recent records. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.

Isolepis congrua	Slender Club-sedge		L	Vu	**Possible.** Some habitat in proposed construction areas, but only one 1986 record nearby. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.
Lepidium monoplocoides	Winged Pepper-cress	EN	L	En	**Possible.** Suitable habitat in proposed construction areas, but no records nearby. Not recorded in three rounds of threatened flora surveys. **Impact unlikely.** Not recorded in 2015. 2017 or 2019 surveys.
Swainsona phacoides	Dwarf Swainson-pea		L	En	**Present.** Recorded at Bitterang Regulator in 2019 surveys. **Impact likely.** Recorded near the western edge of the Bitterang Regulator construction area, in between the existing track and fence.
Swainsona sericea	Silky Swainson-pea		L	Vu	**Possible.** Suboptimal habitat in proposed construction areas, but one record nearby. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.

Six flora species listed as rare or threatened in Victoria on the Victorian Advisory List but not listed under the FFG Act or EPBC Act were recorded in the proposed construction areas during the 2019 surveys. Two flora species listed as rare or threatened in Victoria on the Victorian Advisory List but not listed under the FFG Act or EPBC Act were recorded in the proposed River Track Passing Bay construction areas during the 2020 surveys. Refer to **Attachment 12 – Flora and Fauna Assessment** for further details.

Listed migratory species

A search of the PMST identified 14 listed migratory species as having the potential to occur at the project area (see Table 21).

Table 21. Summary of EPBC Act listed migratory species potentially occurring within proposed construction areas

Scientific Name	Common Name
Apus pacificus	Fork-tailed Swift
Ardea ibis	Cattle Egret
Ardea modesta	Eastern Great Egret
Gallinago hardwickii	Latham's Snipe
Rostratula australis	Australian Painted Snipe
Manorina melanotis	Black-eared Miner
Leipoa ocellata	Malleefowl
Merops ornatus	Rainbow Bee-eater
Hirundapus caudacutus	White-throated Needletail
Haliaeetus leucogaster	White-bellied Sea-eagle
Acrocephalus stentoreus	Clamorous Reed Warbler
Plegadis falcinellus	Glossy Ibis
Calidris ferruginea	Curlew Sandpiper
Numenius madagascariensis	Eastern Curlew

Five species (Eastern Great Egret, Rainbow Bee-eater, White-bellied Sea-eagle, Clamorous Reed Warbler, Glossy Ibis) have been recorded during fauna surveys for the project. Five species (Australian Painted Snipe, Latham's Snipe, Eastern Great Egret, Glossy Ibis) have been recorded during monitoring undertaken for the Hattah Lakes TLM works. Further details are provided in **Attachment 12 – Flora and Fauna Assessment**.

If known, what threatening processes affecting these species or communities may be exacerbated by the project? (e.g. loss or fragmentation of habitats). Please describe briefly.

A number of threatening processes have the potential to be exacerbated by either the construction or operation of the project:

Construction Phase:

- Loss of hollow-bearing trees from Victorian native forests.
- The spread of *Phytophthora cinnamomi* from infected sites into parks and reserves, including roadsides, under the control of a state or local government authority.

Operation Phase:

- Predation of native wildlife by the cat, *Felis catus*.
- Predation of native wildlife by the introduced Red Fox *Vulpes vulpes*.
- Soil degradation and reduction of biodiversity through browsing and competition by feral goats (*Capra hircus*).

Further information can be found in **Attachment 12 - Flora and Fauna Assessment**.

Are any threatened or migratory species, other species of conservation significance or listed communities potentially affected by the project?

☒ NYD ☒ No ☒ Yes If yes, please:

- List these species/communities:
- Indicate which species or communities could be subject to a major or extensive impact (including the loss of a genetically important population of a species listed or nominated for listing) Comment on likelihood of effects and associated uncertainties, if practicable.

Listed threatened communities

No EPBC Act or FFG Act listed threatened flora communities are likely to be impacted by construction or operation of the project, with no listed flora communities identified as occurring in the project area. The patch of Semi-arid Woodland (EVC 97) mapped as Habitat Zone 2 on the northern side of River Track adjacent to Passing Bay South, which was assessed as meeting the condition thresholds for the FFG Act listed vegetation community, *Semi-arid Shrubby Pine-Buloke Woodland Community*, and the EPBC Act listed threatened ecological community, *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions,* will be avoided by constructing Passing Bay South on the southern side of River Track.

One FFG Act listed fauna community (i.e. VTWBC) is potentially present within the project area, however impacts to this community are likely to be negligible as the northern Hattah Lakes floodplain is comprised largely of intact vegetation, and as such, the proposed removal of up to 18.94 ha of native vegetation in the context of more than 55,000 ha of native vegetation within

the national parks is unlikely to impact on habitat connectivity or remove important habitat for the VTWBC.

Listed threatened flora species

No listed threatened flora species that were assessed as present, possible or likely to occur in the proposed inundation areas were considered likely to be adversely impacted by the proposed works. The following discussion relates to potential impacts on listed threatened species identified as present, possible or likely to occur in the proposed construction areas.

EPBC Act

The only EPBC Act listed flora species conservatively considered to have the potential to occur in the proposed construction areas was Winged Peppercress (*Lepidium monoplocoides*), which is listed as Endangered. This species was not recorded in the 2019 targeted surveys in the proposed construction areas, nor was it recorded in any prior threatened species surveys of the construction areas (Australian Ecosystems, 2015; GHD, 2018).

A significant impact assessment was undertaken for this species in accordance with the EPBC Act Matters of National Environmental Significance (MNES): Significant impact guidelines 1.1 (DOTE, 2013) (see **Attachment 12 – Flora and Fauna Assessment**) and indicates that the proposed works are unlikely to adversely impact this species.

FFG Act

Three FFG Act listed flora species identified as present, possible or likely to occur in the proposed construction areas were considered to be potentially impacted by the proposed works, these being:

- Umbrella Wattle *(Acacia oswaldii)*
- Spotted Emu-bush *(Eremophila maculata* subsp. *maculata)*
- Dwarf Swainson-pea (*Swainsona phacoides).*

The majority of individuals of these species occur close to the edges of the proposed construction areas and may therefore be able to be avoided through micro-siting and flagging of no-zones during the construction phase of the project. However, for the purpose of this referral, it is anticipated that some removal of these listed flora species may be required.

Impacts to the FFG listed Buloke (*Allocasuarina luehmannii*) identified adjacent to the River Track Passing Bay South during the 2020 surveys can be avoided by locating the passing bay on the southern side of River Track.

Listed threatened fauna species

No listed threatened fauna species that were assessed as present, possible or likely to occur in the proposed inundation areas were considered likely to be adversely impacted by the proposed works. The following discussion relates to potential impacts on listed threatened species identified as present, possible or likely to occur in the proposed construction areas.

EPBC Act

Regent Parrot (*Polytelus anthopeplus monarchoides*)

EPBC Act – Vulnerable, FFG Act - Listed, VicAdv – vulnerable

The Regent Parrot is well known and frequently recorded throughout Hattah-Kulkyne National Park, with a number of breeding populations known to occur along the Murray River including near the Messengers and Oateys Regulators, which were constructed under the Hattah Lakes TLM works.

Targeted surveys by R8 in August / September 2019 (see **Attachment 12 – Flora and Fauna Assessment**) have found that the proposed construction areas are not used directly for breeding or foraging by this species. The nearest likely Regent Parrot nest trees identified during 2019 surveys were at least 350 m from the proposed construction area, and represented a limited area of suitable nesting habitat for this mobile species. No potential nesting habitat is proposed to be removed as part of the project as habitats within the proposed construction areas are unsuitable for Regent Parrot nesting.

Furthermore, the proposed construction areas represent less than 0.05% of the potential habitat for this species (18.94 ha within more than 55,000 ha of high-quality native vegetation within the surrounding national parks), and are centred on existing tracks and other degraded areas. The proposed removal of native vegetation for construction of the project therefore represents very small, isolated and discrete areas of potential habitat within an extensive area of suitable habitat for this highly mobile species and will not fragment the existing population or significantly reduce the area of occupancy of this population.

Regent Parrot breeding behaviour is not likely to be affected by the project. Previous construction of the Messengers and Oateys Regulators during the Hattah Lakes TLM works involved vegetation clearing, large hollow-bearing tree removal and construction of two large regulators and a 1,000 ML/day pump station in an area known to be used by the Regent Parrot. Monitoring conducted over the five years since construction of the Hattah Lakes TLM works has demonstrated that breeding populations have not been adversely impacted by the construction and subsequent operation of the TLM works. Regent Parrots continued to nest at both sites during and after construction, and no decline in nesting success has been recorded during the five years of post-construction monitoring.

As the project is designed to deliver environmental watering benefits to the northern Hattah Lakes floodplain, including improving the health and condition of large old trees within about 125 ha of river red gum forest and woodland, and 883 ha of black box woodland, this species is more likely to benefit than be adversely impacted by the overall project.

A significant impact assessment was undertaken for this species in accordance with the EPBC Act Matters of National Environmental Significance (MNES): Significant impact guidelines 1.1 (DOTE, 2013) (see **Attachment 12 – Flora and Fauna Assessment**) and indicates that the proposed works are unlikely to adversely impact this species.

Painted Honeyeater (*Grantiella picta*)

EPBC Act – Vulnerable, FFG Act - Listed, VicAdv – vulnerable

Although this species has previously been recorded on the Hattah Lakes floodplain, VBA records searched by R8 (2020) indicate there are no records of this species within 10 km of the proposed construction areas within the last 30 years. This species was last recorded within 10 km of the proposed construction areas in 1985. Nevertheless, this species has the potential to utilise habitats within the proposed construction areas and may occasionally forage in mistletoe within these woodland areas.

This species has not been detected during fauna surveys undertaken for this project by GHD (2014), Australian Ecosystems (2015), GHD (2018) and R8 (2020). The proposed construction areas represent less than 0.05% of the potential habitat for this species (18.94 ha within more than 55,000 ha of high-quality native vegetation within the surrounding national parks), and are centred on existing tracks and other degraded areas. The proposed removal of native vegetation for construction of the project therefore represents very small, isolated and discrete areas of potential habitat within an extensive area of suitable habitat for this highly mobile species and will not fragment the existing population or significantly reduce the area of occupancy of this population. The proposed works are not likely to significantly impact areas of habitat important to this extremely mobile nomadic species, which forages widely over large areas in pursuit of mistletoe and flowering eucalypts.

As the project is designed to deliver environmental watering benefits to the northern Hattah Lakes floodplain, including improving the health and condition of large old trees within about 125 ha of river red gum forest and woodland, and 883 ha of black box woodland, this species is more likely to benefit than be adversely impacted by the overall project.

FFG Act

In addition to the two EPBC Act listed threatened fauna species described above, the following six additional FFG Act listed species have been identified as present, possible or likely to occur in the proposed construction areas:

- Apostlebird (*Struthidea cinerea*) (FFG Act - Listed, VicAdv – N/A)
- Black Falcon (*Falco subniger*) (FFG Act - Listed, VicAdv – vulnerable)
- Diamond Dove (*Geopelia cuneata*) (FFG Act - Listed, VicAdv – near threatened)
- Hooded Robin (*Melanodryas cucullata*) (FFG Act - Listed, VicAdv – near threatened)
- Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) (FFG Act - Listed, VicAdv – vulnerable)
- Carpet Python (*Morelia spilota metcalfei*) (FFG Act - Listed, VicAdv – endangered).

None of these species is considered likely to be significantly impacted by the proposed construction, although localised impacts on hollow-dependent species such as Carpet Python are possible. The Carpet Python is an extremely cryptic and difficult to detect species where it occurs and is likely to occur in very low densities across the landscape. Carpet Pythons prefer complex habitat of hollow-bearing trees and logs, plus thick litter or shrub cover (Action Statement No. 175 Inland Carpet Python *Morelia spilota metcalfei*). Habitat within the construction areas does not meet all of the habitat requirements for Carpet Python with higher quality habitat available (e.g. 300 m upstream along the Chalka Creek (rabbit warrens also present here which are potential shelter and foraging habitat for the pythons) at K10 Regulator).

Most potential FFG Act listed threatened species are highly mobile bird species, and all have access to large areas of suitable habitat in the immediate surrounding areas in which to disperse. From a landscape perspective, the proposed construction areas represent a relatively small area of around 18.94 ha, within a very large intact area of over 55,000 ha of high-quality native vegetation within the surrounding national parks. All structures are proposed to be centred on and adjacent to existing vehicle tracks and areas of previous disturbance. With many trees already in poor health, these areas generally represent lower quality areas of habitats to those

which surround them. For these reasons, construction of the project is considered unlikely to significantly impact these FFG Act listed threatened fauna species.

Listed migratory species

Some of the listed migratory species modelled by the PMST search as having the potential to occur in the project area are either highly unlikely to occur (e.g. Black-eared Miner, Malleefowl) due to habitat unsuitability or would very rarely use airspace over these footprints (e.g. Fork-tailed Swift, White-throated Needletail). It is highly unlikely that the proposed construction areas support habitat that would be considered important for migratory species foraging or breeding activity, or support an ecologically significant proportion of a population of migratory species, given the relatively low quality of habitat in the proposed construction areas in the context of surrounding habitats within the national parks.

Species of migratory shorebird such as the Australian Painted Snipe and Latham's Snipe and species of migratory waterbirds such as Eastern Great Egret (*Ardea modesta*) and Glossy Ibis (*Plegadis falcinellus*) are known to respond to environmental watering at the Hattah Lakes having been recorded in previous surveys (Cook *et al.,* 2011 and Wood *et al.* 2018). Wood *et al.* (2018) also reported nesting White-bellied Sea-eagle and several other individual animals following environmental watering at the Hattah Lakes. It likely that proposed inundation of episodic wetlands and floodplains at Hattah Lakes North will provide periodic habitat for migratory species, particularly species that favour wetland habitats.

Construction works have the potential to introduce invasive species that might be harmful to migratory species, however implementation of vehicle hygiene protocols and other standard weed and pest management measures are expected to mitigate the potential spread of weeds. There is potential for the introduction of environmental water to lead to an increase in abundance of feral predators (cats, foxes), herbivores (e.g. goats) and omnivores (e.g. pigs) due to the associated increase in productivity. Some of these species, such as feral cats, could potentially prey on migratory waterbirds. The Mallee CMA will work with Parks Victoria to implement feral animal management and control programs to mitigate potential impacts on listed migratory species due to pest species.

A significant impact assessment was undertaken for listed migratory species in accordance with the EPBC Act Matters of National Environmental Significance (MNES): Significant impact guidelines 1.1 (DOTE, 2013) (see **Attachment 12 – Flora and Fauna Assessment**) and indicates that the proposed works are unlikely to adversely impact these species.

Is mitigation of potential effects on indigenous flora and fauna proposed?

☐ NYD ☐ No ☒ Yes If yes, please briefly describe.

Refer to Section 9 of **Attachment 12 – Flora and Fauna Assessment**.

Other information/comments? (eg. accuracy of information)

13. Water environments

Will the project require significant volumes of fresh water (e.g. > 1 Gl/yr)?

☐ NYD ☐ No ☒ Yes If yes, indicate approximate volume and likely source.

The volume of water required to fill the Chalka North Area floodplain to the maximum design water level of 43.5 mAHD is 6.8 GL, assuming floodplain losses of 25% (GHD, 2014a). The

volume of water required to fill the Lake Boolca Area floodplain to the maximum design water level of 45.1 mAHD is 9.0 GL (Mallee CMA & DEPI, 2014). This water will be sourced from existing environmental water entitlements[29] via the Victorian Environmental Water Holder. Water use will vary from year to year depending on natural inflows and previous flooding history.

Inflows and outflows to the Hattah Lakes North floodplain will be measured during managed flood events when the proposed works are utilised. This may be achieved using flow sensors installed at each of the regulators to measure natural inflows and outflows. These measurements are important to inform calculation of the volume of environmental water used in each event and enable accuracy of water accounting.

Will the project discharge waste water or runoff to water environments?

☒ NYD ☒ No ☒ Yes If yes, specify types of discharges and which environments.

During a natural flood event, water from both the Chalka Creek North and Lake Boolca Area will return to the Murray River, via Chalka Creek, as the flood recedes, and water will be retained only within low points within the creek and wetlands / lakes.

Within the Chalka North Area, managed flood events will operate in a similar manner: once the floodplain has been inundated for the duration needed to meet the water requirements of vegetation and associated biota, regulators (i.e. the K10 Regulator) will be opened to allow water to return to the Murray River, via Chalka Creek North.

Within the Lake Boolca Area, managed floodwaters will be retained on the floodplain rather than released back through the Bitterang Regulator and Containment Bank. It is anticipated that once the targeted inundation level for the managed flood event is reached and the pumps are switched off, anticipated seepage and evaporation losses at that site will mean that retention of water above the natural sill level of 44.5 mAHD is unlikely to extend longer than ecological thresholds (Mallee CMA *pers comm*). This approach is consistent with the approach currently applied at a large number of environmental watering sites managed by Mallee CMA.

Although recession of managed floodwaters from the Chalka Creek Area is not inconsistent with natural conditions, consideration has been given to potential water quality issues associated with waters released after managed inundation events as follows.

Floodplain inundation may result in blackwater events, which are a natural process, that occur due to breakdown of leaf litter and terrestrial vegetation by bacteria, which releases nutrients into water and can contribute to algal blooms, low dissolved oxygen, and can impact on ecosystem health. Compliance monitoring will be undertaken during watering events to monitor water quality such as blackwater and algal blooms. Any outbreaks of these conditions will be managed should they occur, and water may be retained if it poses a risk to the Murray River.

An increased frequency and duration of inundation events associated with the project has the potential to increase salt loads moving to the Murray River. Schedule B of the *Water Act 2007* (Cth) requires that any action that causes a significant salinity effect be treated as an accountable action; triggering a detailed assessment and possible entry on either of the Salinity Registers. A preliminary assessment (in contrast to the detailed assessment) was undertaken for the project by SKM (2014) (see **Attachment 29 – Preliminary Salinity Assessment**), including consideration of Basin Salinity Management Strategy (BSMS) requirements and real time salinity impacts. The assessment estimated salt loads to the river system using a combination of approaches (semi-quantitative and qualitative) based on an initial desktop assessment of hydrogeological and

[29] Includes environmental water entitlements already held by the Murray Darling Basin Authority, The Living Murray Program, the Commonwealth Environmental Water Holder and the Victorian Environmental Water Holder.

salinity information and methods including mass balance, flow nets and groundwater mound calculations.

The preliminary salinity impact estimated for the project is less than 0.10 EC at Morgan for the nominated frequencies of inundation (SKM, 2014). This would not be an accountable action under BSMS. The real-time salinity impact immediately downstream of Hattah Lakes North was modelled (over the 25-year benchmark period) and salinity targets at Lock 6 or Morgan were not exceeded (SKM, 2014). The rise in river salinity was minor and estimated to last for less than a week. It was noted that the background Murray River salinities also exceeded the salinity operation target at Morgan and Lock 6 for many days during the benchmark period. In conjunction with groundwater monitoring described below, a program of surface water monitoring (including salinity) for the project will be integrated with current Mallee CMA monitoring activities to assist in verifying modelled salinity impacts and to provide timely advice for management of water quality issues arising during operation of the works

The main effect associated with groundwater is likely to be short duration shallow groundwater levels, which may result in small areas of saline intrusion to the river and anabranches. This is not an accountable action under Schedule B, as is expected to be below the threshold of significance to the river.

Are any waterways, wetlands, estuaries or marine environments likely to be affected?

☒ NYD ☒ No ☒ Yes If yes, specify which water environments, answer the following questions and attach any relevant details.

The project will not involve any construction works within the boundary of the Hattah-Kulkyne Lakes Ramsar site or the Hattah Lakes wetlands that are listed on A Directory of Important Wetlands in Australia. The nearest lakes included in these wetland listings are Lake Bitterang (approx. 1.0 km south of Bitterang Regulator) and Lake Cantala (approx. 3.5 km south of a River Track Passing Bay, 5.2 km south of the K10 Causeway Regulator and 6.0 km south east of the Bitterang Regulator). With the exception of the Bitterang Regulator construction area, all other construction areas are located downstream of the internationally and nationally important wetlands in the vicinity.

During construction, the removal of vegetation has the potential to expose soils to increased erosion risk, which if not effectively managed, has the potential to affect downstream water bodies, including Lake Bitterang and Chalka Creek (and the Murray River further downstream) if flow connectivity occurs during the works. Other construction activities such as dewatering (e.g. if shallow groundwater is encountered) or storage of fuels and oils for construction machinery, also have the potential to affect downstream water environments if not effectively managed.

Potential effects on water environments during construction are not expected to be significant however, as each of the construction areas are typically dry except during managed flood events controlled by TLM works and during large natural flood events. As such, it is proposed that construction works will be undertaken during periods of low likelihood of natural flooding and not during managed TLM events so as to reduce the potential for flow connectivity between construction areas and downstream waterways. In addition, the contractor will be required to prepare a CEMP in accordance with the draft EMF, which will contain, management controls relating to vegetation removal, erosion and sedimentation, dewatering, waste management, and hazardous substance storage.

During operation, the project will affect Chalka Creek and Lake Boolca, along with various unnamed DELWP mapped wetlands on the floodplain through modifications to the current hydrological regime to more closely align the frequency and duration of flooding with the natural hydrological regime. Drainage of managed floodwaters from the Chalka North Area on completion

of an event also has the potential to affect water quality (including a small salinity effect) in Chalka Creek North and the Murray River. As noted above, managed floodwaters from the Lake Boolca Area will not be drained back to Chalka Creek and the Murray River and will be retained on the floodplain.

The project is not anticipated to affect any wetlands within the boundary of the Hattah-Kulkyne Lakes Ramsar site or the Hattah Lakes wetlands that are listed on A Directory of Important Wetlands in Australia during operation, as the project will not involve any discharges from managed flood events to these internationally and nationally important wetlands, given that the Chalka North Area is located downstream of these wetlands and no release of managed floodwaters from the Lake Boolca Area is proposed.

During operation, the project is likely to have an overall benefit to the ecological character of the nearby Ramsar and nationally important wetland sites by enabling environmental water to be delivered to nearby floodplain and episodic wetland environments to complement the existing Hattah Lakes TLM works, which have been demonstrated to provide direct benefits to these listed wetlands (Bloink *et al*., 2019).

Are any of these water environments likely to support threatened or migratory species?

☐ NYD ☐ No ☒ Yes If yes, specify which water environments.

The Murray River, Chalka Creek North, Lake Boolca, surrounding floodplain communities and nearby significant wetlands are likely to at least intermittently supported listed threatened and migratory species. These species are generally expected to benefit from the anticipated improvements in ecological condition of floodplain vegetation and associated habitats, that the project aims to deliver through the proposed reinstatement of a more natural hydrological regime. Refer to Section 12 (Native vegetation, flora and fauna) and **Attachment 12 – Flora and Fauna Assessment** of this referral.

Are any potentially affected wetlands listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'?

☐ NYD ☐ No ☒ Yes If yes, please specify.

As noted above, the project will not involve any construction works within the boundary of the Hattah-Kulkyne Lakes Ramsar site or the Hattah Lakes wetlands that are listed on A Directory of Important Wetlands in Australia. The nearest lakes included in these wetland listings are Lake Bitterang (approx. 1.0 km south of Bitterang Regulator) and Lake Cantala (approx. 3.5 km south of a River Track Passing Bay, 5.2 km south of the K10 Causeway Regulator and 6.0 km south east of the Bitterang Regulator).

With the exception of the Bitterang Regulator construction area, all other construction areas are located downstream and will therefore not adversely affect these internationally and nationally important wetlands. The Bitterang Regulator construction area is typically dry and not connected by flows to the downstream Lake Bitterang except during managed flood events controlled by the TLM and very large natural flood events.

The project will not involve any discharges of managed floodwaters to any internationally and nationally important wetlands, given that the Chalka North Area is located downstream of these wetlands and no release of managed floodwaters from the Lake Boolca Area is proposed.

Could the project affect streamflows?

☐ NYD ☐ No ☒ Yes If yes, briefly describe implications for streamflows.

The purpose of the project is to reinstate a more natural hydrological regime to the Hattah Lakes North floodplain. It is intended that this will be achieved in part, by installing a regulating structure along Chalka Creek North to regulate the flow of water to and from the proposed Chalka Creek North inundation area. Flows in Chalka Creek will therefore be affected, mainly through an increase in the frequency of flows to be more consistent with natural conditions (as compared to current conditions). The proposed inundation of the Lake Boolca Area is not anticipated to directly affect streamflows as flows into this area will be distributed via the typically dry, relatively wide Bitterang floodway rather than via a defined waterway channel.

Potential effects on Murray River flows will be assessed and managed through existing environmental water accounting frameworks under the Basin Plan, with which the current project will need to comply. These frameworks require that any water pumped from the Murray River is debited against environmental watering accounts, along with any additional evaporation and seepage losses caused by impounding natural inflows on the floodplain beyond the peak of floodwaters passing. To minimise potential effects, the project is designed to utilise natural flood inflows and to re-use water released from the TLM works, rather than additional pumping of water directly from the Murray River.

Could regional groundwater resources be affected by the project?

☐ NYD ☒ No ☐ Yes If yes, describe in what way.

SKM (2014 provides an extensive description of the local and regional hydrogeology (see **Attachment 29 – Preliminary Salinity Assessment**).

There are no groundwater extraction bores in the vicinity, although there is a network of active groundwater monitoring bores. The regional aquifer (the Parilla Sands) is present at depths of greater than 40 m below surface and there is documented evidence of the presence of a significant thickness of clay aquitard that separates the regional aquifer from the shallow alluvial aquifer system. As a result, there is expected to be no practical effect on the regional groundwater. Regional groundwater at this site is highly saline.

Groundwater is also found in the local shallow alluvial aquifer system that is closely linked to the Murray River, with the river connection strongest to the east of the proposed inundation areas. The operation of the project will likely have small changes in the groundwater elevation in the shallow alluvial aquifer (called the Channel Sands). This aquifer is located 5 to10 m below the surface. While the project will result in small increases in groundwater elevation, these have been calculated (SKM 2014) to result in the watertable level remaining deeper than 3 m below the surface and so effectively out of the range of surface interaction. As a result, there is only a very low risk of any land based salinisation. To the north of the project area, groundwater in and above the alluvial aquifer has been significantly elevated by recharge from irrigation development. The preliminary assessment did not identify that there will be any practical effect on shallow groundwater in the irrigation areas as a result of the project.

During construction, the project will not affect regional groundwater resources, because of the separation between the surface and the regional aquifers described above and documented in SKM (2014). Based on the expected excavation depths and known groundwater levels, dewatering of construction sites is unlikely to be required but may be necessary for some deeper excavations close to the Murray River (e.g. K10 Regulator).

During operation, an increase in groundwater levels in the local alluvial aquifer will likely occur in response to managed inundation events. This will be limited in extent and duration, as documented in SKM (2014), which predicted a groundwater mound rise of approximately 2 m

directly beneath the inundation areas. As this mound will comprise water that has resulted from infiltration it is expected to be at or slightly above the salinity of river water. As a result, there is low risk that a shallow saline groundwater condition will develop (also because of the depth to watertable).

The in-river salinity impacts (at Morgan, South Australia) potentially caused by the proposed actions at Hattah Lakes were assessed relative to a base case scenario by SKM (2014). The assessment concluded that the magnitude of the salinity impacts of the proposed watering scenarios was low to insignificant. This is because groundwater at the northern end of Chalka Creek is measured as low salinity as indicated by bore salinity measurements near the creek.

The Mallee CMA monitors an existing network of bores within Hattah-Kulkyne National Park and undertakes a long-term salinity monitoring program to assess the impact of inundation events on groundwater levels and groundwater quality (VMFRP, 2020b). To assist in the monitoring of salinity impacts of proposed inundation at the Chalka North Area, VMFRP is proposing to install five new monitoring bores within the proposed inundation area. These monitoring bores will be integrated into the existing Mallee CMA monitoring network and monitoring program. Monitoring and ongoing assessment of risks will occur consistent with the Basin Salinity Management Strategy.

Could environmental values (beneficial uses) of water environments be affected?

☒ NYD ☒ No ☒ Yes If yes, identify waterways/water bodies and beneficial uses (as recognised by State Environment Protection Policies)

The waterways and water bodies within the project area are located with the State Environment Protection Policy (Waters) (SEPP(Waters)) Murray and Western Plains surface water segment. Wetlands within the project area are located within the SEPP(Waters) Lakes and Swamps surface water segment. Schedule 2, Table 3 of SEPP(Waters) identifies beneficial uses of inland waters within the Murray and Western Plains and the Lakes and Swamps segments as including:

- Water dependent ecosystems and species that are slightly to moderately modified
- Human consumption after appropriate treatment where water is sourced for supply in accordance with the special water supply catchments area set out in Schedule 5 of the *Catchment and Land Protection Act 1994* or the *Safe Drinking Water Act 2003*
- Agriculture and irrigation
- Human consumption of aquatic foods
- Aquaculture where the environmental quality is suitable and an aquaculture licence has been approved in accordance with the *Fisheries Act 1995*
- Industrial and commercial (applies to the Murray and Western Plains segment only)
- Water-based recreation (primary, secondary contact and aesthetic enjoyment)
- Traditional Owner cultural values
- Cultural and spiritual values.

Potential effects on surface water environments are discussed in the following sections.

The SEPP(Waters) identifies beneficial uses of groundwater based on Total Dissolved Solids concentrations. As noted above, regional groundwater is highly saline. Potential effects on regional groundwater are discussed in the preceding section.

Could aquatic, estuarine or marine ecosystems be affected by the project?

☒ NYD ☒ No ☒ Yes If yes, describe in what way.

The project aims to reinstate a more natural hydrological regime to the northern Hattah Lakes floodplain, which is expected to deliver a range of ecological benefits to floodplain and wetland communities. The project is designed to have the operational flexibility to vary the timing, depth,

duration and extent of inundation so that individual managed events are able to target specific ecological outcomes. Ecological monitoring of the Hattah Lakes TLM works has shown a trend of increasing ecological condition (see **Attachment 20 – Hattah Lakes TLM Condition Monitoring Report 2018-2019**), which provides confidence that implementation of the proposed supply measures under this project and its associated watering regime will provide the expected benefits.

However, if not managed appropriately, the project also has the potential to adversely affect aquatic ecosystems in the vicinity. To identify and assess these risks during project development, a comprehensive and rigorous risk assessment was completed (Lloyd Environmental, 2014). This involved identifying potential undesirable outcomes, determining their root causes, assessing likely consequences and significance; and developing relevant mitigation measures to reduce any residual risk to an acceptable level (very low to moderate). Experience gained from previous works and measures, and environmental watering projects of similar scale and complexity, including TLM Program, informed this process.

The risk assessment by Lloyd Environmental (2014) identified the following potential threats to aquatic ecosystems:

- Water manipulations may lead to suspension of sediments and / or organic matter causing elevated nutrients, high turbidity and / or low dissolved oxygen (DO) levels, which may reduce food sources and result in toxic algal blooms impacting on wetland community health, threatened species, fish and other aquatic fauna communities, and waterbird communities.
- Inability to discharge water of poor water quality during a managed flow event, due to downstream impacts (e.g. increases in instream salinity), could result in impacts on floodplain vegetation (due to extended inundation) or formation of blackwater / algal blooms.
- Low DO concentrations created through processes such as blackwater events, algal and cyanobacterial blooms, high organic matter loadings and stratification, can impact aquatic fauna and the health of wetland communities.
- Development of saline mounds under wetlands and displacement of saline groundwater to surface waters, including the Murray River. Shallow saline groundwater can also impact on the health of floodplain vegetation and wetland communities.
- Increased carp populations through more frequent flooding that creates enhanced carp recruitment conditions, potentially impacting the health and diversity of wetland vegetation, affecting native fish and other aquatic fauna.
- Stranding and isolation of fish on floodplains can occur through sudden changes in water levels and/or new barriers preventing native fish from escaping drying areas during flood recessions, which may result in the death of a portion of the native fish population.
- Installation of regulators in waterways and wetlands creates barriers to the movement of fish and other aquatic fauna, which can reduce access to feeding and breeding habitat, and limit migration or spawning opportunities.

A list of identified threats to aquatic ecosystem values and proposed mitigation measures considered in the risk assessment by Lloyd Environmental (2014) is provided in **Attachment 30 – Environmental Risk Assessment**.

Planning and design of the project continues to address these identified risks, including through:

- Ongoing review and updating of an environmental risk register for the project as further specialist assessments are undertaken.
- Design of regulating structures to satisfy fish passage requirements including those described in **Attachment 13 - Fish Management Plan** to mitigate the potential effects of creating barriers to fish movement.
- Preparation of a draft addenda to the Hattah Lakes Environmental Water Management Plan and Operating Plan to incorporate decision-making frameworks to enable adaptive

management of these risks in response to monitoring during operation of the project (see **Attachment 18 – Draft Environmental Water Management Plan** and **Attachment 19 – Draft Operating Plan**).

Is there a potential for extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems over the long-term?

☐ No ☒ Yes If yes, please describe. Comment on likelihood of effects and associated uncertainties, if practicable.

Major and long-term effects on the health and biodiversity of aquatic ecosystems associated with the project are expected to be mostly positive as defined through the ecological objectives and targets for the project set out in **Table 1** of this referral. The project aims to reinstate a more natural hydrological regime to the northern Hattah Lakes floodplain, which is expected to deliver a range of ecological benefits to floodplain and wetland communities. The project is designed to have the operational flexibility to vary the timing, depth, duration and extent of inundation so that individual managed events are able to target specific ecological outcomes. Ecological monitoring of the Hattah Lakes TLM works has shown a trend of increasing ecological condition (see **Attachment 20 – Hattah Lakes TLM Condition Monitoring Report 2018-2019**), which provides confidence that implementation of the proposed supply measures under this project and its associated watering regime will provide the expected benefits.

Is mitigation of potential effects on water environments proposed?

☐ NYD ☐ No ☒ Yes If yes, please briefly describe.

Construction

The following mitigation measures are proposed to minimise and avoid impacts on water environments during construction of the project:

- Develop and implement a CEMP, including erosion and sediment control plans, dewatering and water quality management plans, weed and pest hygiene protocols to minimise potential impacts on wetlands and other aquatic ecosystems.
- Rehabilitate construction areas following completion of works to the satisfaction of Parks Victoria.

Operation

The following mitigation measures are proposed to minimise and avoid impacts on water environments during operation of the project:

- Continue to undertake water quality monitoring before, during and after watering events to inform adaptive management strategies and real-time operational decision making.
- Commence watering as early as possible to move organic matter off the floodplain while temperatures are low. Maintain a through-flow where possible in other areas to maximise exchange rates and movement of organic material. Monitor dissolved oxygen and water temperature to identify hypoxic areas to inform consequence management.
- Schedule watering events to make use of dilution flows where possible and optimise timing of releases of Chalka Creek. Ensure dilution of low DO water by managing outflow rates and river flows: delay outflows if river flows are too low; dispose of hypoxic water by pumping to higher wetlands where possible; agitate water using infrastructure to increase aeration.
- Integrate water management with other sites in seasonal water planning process. Maintain good relationships with other water managers.

- Tailor watering regimes to provide competitive advantage for native fish over carp. Dry wetlands that contain carp. Manage drawdown following managed events to provide triggers for native fish to move off the floodplain, and where possible, strand carp.
- Monitor the salinity of ground and surface water salinity before, during and after watering events to inform management and ensure sufficient volumes are available for mitigation such as:
  - Diluting saline groundwater discharge with sufficient river flows.
  - Diluting saline water on the floodplain by delivering more fresh water to these areas.
  - Reduce the frequency and/or extent of planned watering events if sufficient volumes not available.

Mitigation measures will be implemented to minimise risks associated with pest plants, including:

- Timing water manipulations to drown seedlings, minimise growth, germination and seed set. Time water manipulations to promote native species.
- Controlling current populations and eradicate/control new infestations via existing management strategies (e.g. Parks Victoria pest management action plans/strategies). Support partner agencies to seek further funding for targeted weed control programs if necessary.

Mitigation measures will be implemented to minimise risks associated with barriers to fish passage, including:

- Design of regulating structures to satisfy fish passage requirements including those described in **Attachment 13 - Fish Management Plan**
- Continuing to build on knowledge and understanding through current studies relating to fish movement in response to environmental watering and cues to further develop and refine a fish exit strategy.

Other information/comments? (e.g. accuracy of information)

Groundwater levels and trends across the area are reasonably well known. Groundwater records exist covering nearly 40 years for this area. Specific monitoring to allow adaptive management and detailed assessment of the project has been planned and will be included in the project.

14. Landscape and soils

Landscape

Has a preliminary landscape assessment been prepared?

☒ No ☐ Yes If yes, please attach.

Is the project to be located either within or near an area that is:

- **Subject to a Landscape Significance Overlay or Environmental Significance Overlay?**

☐ NYD ☐ No ☒ Yes If yes, provide plan showing footprint relative to overlay.

All of the proposed construction areas and inundation areas are subject to the Environmental Significance Overlay (Schedule 1 – Murray River Corridor) (ESO1).

The ESO1 affects public and private land in non-urban areas and is defined by the Land Subject to Inundation Overlay or land within 100 metres of the Murray River, whichever is greater. The ESO1 recognises that *the remaining native riverine forests, woodlands and wetlands that adjoin the waterway of the Murray River are critically important for the maintenance of water quality, biodiversity, wildlife habitat and scenic beauty* and that *the visual and landscape qualities of this environment are the basis for the demand for tourist and recreation development*. Environmental objectives of the ESO1 seek to, amongst other things, protect the scenic landscape qualities of the River environs.

The proposed construction areas and inundation areas are not subject to a Significant Landscape Overlay.

Refer to **Attachment 27 – Planning Zones & Overlays Map**.

- **Identified as of regional or State significance in a reputable study of landscape values?**
  ☐ NYD ☐ No ☒ Yes If yes, please specify.

The Hattah Lakes are identified as an area of national geomorphological significance in the Victorian Environmental Assessment Council's River Red Gum Forests Investigation – Final Report (July 2008), being the largest overflow lake system on the Murray River. The report recommended for Hattah-Kulkyne National Park that:

> *(a) the area of 24,428 hectares shown on Map A be used in accordance with the general recommendations for national parks, and*
>
> *(b) An appropriate environmental water regime be established for this national park as outlined in recommendation R13.*

R13 states:

> *That environmental watering of the floodplains, conducted through the relevant existing or new national and state water programs, include:*
>
> *(a) identifying appropriate allocations of water to maintain flood-dependent natural assets;*
>
> *(b) distributing that water in a way that maximises the maintenance of the flood-dependent natural assets, through overbank flows if feasible, otherwise using targeted works;*
>
> *(c) monitoring so that the sites, requirements and prioritisation of natural values and selection of watering regimes are regularly refined and updated; and*
>
> *(d) Developing a greater public understanding of the natural values, and monitoring and publicly reporting on the delivery of water to sites.*

- **Within or adjoining land reserved under the *National Parks Act 1975*?**
  ☐ NYD ☐ No ☒ Yes If yes, please specify.

All of the proposed construction areas (except Kulkyne Station Claypit) and the majority of proposed inundation areas are located within the Hattah-Kulkyne National Park and Murray-Kulkyne Park, which are reserved under the *National Parks Act 1975*.

Scenic landscapes are identified in the Mallee Parks Management Plan[30] as an important contributor to the tourism and recreational values of the Mallee Parks. The Management Plan describes the special features of the Mallee Parks landscape as including:

- *distinctive dune formations (including lunettes) in contrast to the more common flat landform patterns;*
- *the Murray River and Outlet Creek and their associated woodland communities of River Red Gum and Black Box;*
- *relatively intact examples of Pine-Buloke and Belah Woodlands; lakebed herbfields, especially where surrounded by forest; and*
- *saline discharge complexes (boinkas) of the Raak Plain and Pink Lakes.*

According to the Management Plan, due to the visual uniformity of the Mallee landscape, there is a high level of public sensitivity to the presence of unnatural elements, with potential causes of damage to the Parks' landscape qualities including management activities and structures, power lines, vehicle tracks left by off-road vehicles, and trespassing stock.

One of the management strategies identified in the Mallee Parks Management Plan to protect landscape values is to *maintain vegetation of high scenic quality by ensuring appropriate fire and hydrological regimes, and pest plant and animal control.*

- **Within or adjoining other public land used for conservation or recreational purposes?**
  ☐ NYD ☐ No ☒ Yes If yes, please specify.

The Murray River runs along the eastern boundary of the Murray-Kulkyne Park in the vicinity of the project area and is used for a range of recreational purposes.

Is any clearing vegetation or alteration of landforms likely to affect landscape values?
☐ NYD ☐ No ☒ Yes If yes, please briefly describe.

The project will involve the removal of approximately 18.94 ha of native vegetation as described in Section 12 (Native vegetation, flora and fauna) and **Attachment 12 – Flora and Fauna Assessment** of this referral. The proposed regulating structures will be installed along existing access tracks, within and adjacent to areas previously subject to vegetation removal for construction of existing infrastructure. The area of vegetation to be cleared is very small compared to the 1,130 ha of vegetation within the proposed inundation areas that is expected to benefit from the project. As a result, proposed vegetation removal is unlikely to materially affect landscape values.

The project will involve a level of landform alteration associated with excavation and filling activities, which will include:

- Excavation of a 3.5 ha claypit up to about 2 m deep within Kulkyne Station to source construction fill and backfilling of the claypit with spoil from construction works.
- Raising of existing access tracks (approx. 1.8 km length) and modification of the existing Bitterang Containment Bank to enable the installation of proposed regulating structures, and contribute to retention of floodwaters during managed inundation events.

The K10 Regulator and K10 Causeway Regulator will be located along the River Track, which is a publicly accessible track within the Hattah-Kulkyne National Park and Murray-Kulkyne Park (partially forms the boundary between these parks). As such, these regulating structures will be visible to park visitors using River Track and nearby Raak Track and the access to Kulkyne Station. The Bitterang Regulator is located along the Eagles Nest Track, which is open to

[30] Department of Natural Resources and Environment, 1996.

management vehicles only, but may also be visible to visitors using nearby Mournpall Track and Bitterang Track. The proposed regulating structures will be largely integrated with the access tracks, which will assist to mitigate landscape impacts.

See **Attachment 31 – Example Infrastructure Photos** for examples of similar regulating structures previously installed in similar landscapes along the Murray River floodplain.

Overall, the project is expected to have a positive effect on the landscape values of the floodplain. By aiming to restore a more natural inundation regime to about 1,130 ha of the Hattah Lakes North floodplain, the project is consistent with the management strategies outlined in the Mallee Parks Management Plan, which recognise that ensuring appropriate hydrological regimes is critical to protecting the scenic landscapes that maintain the Park's recreational and tourism values. The project is supported by Parks Victoria, which is responsible for management of the Hattah-Kulkyne National Park and Murray-Kulkyne Park.

Is there a potential for effects on landscape values of regional or State importance?

☐ NYD ☐ No ☒ Yes Please briefly explain response.

As described in the preceding responses, the project will involve some removal of native vegetation and alteration of landforms within areas supporting state and regional landscape values, specifically the Hattah-Kulkyne National Park. However, the extent of vegetation removal (up to 18.94 ha) and landform alteration, in the context of the 1,130 ha of floodplain vegetation communities expected to benefit from the project and the 55,000 ha of the Hattah-Kulkyne National Park and Murray-Kulkyne Park, is not expected to have a significant adverse effect on landscape values of state or regional importance.

Furthermore, as mentioned in the previous response, by aiming to restore a more natural inundation regime to about 1,130 ha of the Hattah Lakes North floodplain, the project is consistent with the management strategies outlined in the Mallee Parks Management Plan, which recognise that ensuring appropriate hydrological regimes is critical to protecting the scenic landscapes that maintain the Park's recreational and tourism values.

Is mitigation of potential landscape effects proposed?

☐ NYD ☐ No ☒ Yes If yes, please briefly describe.

The following measures are proposed to mitigate potential landscape effects:

- Limit the extent of ground disturbance and native vegetation removal, particularly large old trees, to the minimum extent necessary to safely and efficiently construct the proposed works.
- Design of proposed structures is to be sympathetic to the surrounding landscape and consistent with Parks Victoria infrastructure design guidelines.
- During and following completion of construction works, waste materials will be stored, handled and ultimately removed from site to minimise potential for adverse visual effects.
- On completion of works, temporary construction areas will be rehabilitated to the satisfaction of Parks Victoria.
- During the operational phase, inundation events will be managed in accordance with operational guidelines informed by detailed hydrodynamic modelling and ecological investigations and adapted as required in response to proposed monitoring and evaluation frameworks to support achievement of the identified ecological objectives for the project.
- If structures are no longer required, a decommissioning and rehabilitation plan will be developed in consultation with Parks Victoria, which may involve removal of redundant structures where removal is deemed most appropriate to minimise adverse environmental, heritage and visual effects.

Other information/comments? (e.g. accuracy of information)

Note: A preliminary landscape assessment is a specific requirement for a referral of a wind energy facility. This should provide a description of:

- The landscape character of the site and surrounding areas including landform, vegetation types and coverage, water features, any other notable features and current land use;
- The location of nearby dwellings, townships, recreation areas, major roads, above-ground utilities, tourist routes and walking tracks;
- Views to the site and to the proposed location of wind turbines from key vantage points (including views showing existing nearby dwellings and views from major roads, walking tracks and tourist routes) sufficient to give a sense of the overall site in its setting.

Soils

Is there a potential for effects on land stability, acid sulphate soils or highly erodible soils?
☒ NYD ☒ No ☒ Yes If yes, please briefly describe.

A desktop geological assessment was undertaken by GHD (2012a). The Geological Survey of Victoria, Mildura Map Sheet (1:250 000 scale) describes the surface geology of the area as overlain by various Quaternary aged deposits, namely:

- Coonambidgal Formation (Qc): Fluvial, lacustrine deposits, clay, sand and sandy clays
- Woorinen Formation and Lowan Sands (Qw and Ql): Aeolian: dune sand, fine to medium grained
- Blanchetown Clay (Qb): Fluvial: clayey sand, sandstone and sand.

The basement geology of the area is generally unclear and relatively little is known of the pre-Cretaceous geology of the Mildura Map area, although it is likely that folded and metamorphosed sediments of the Cambrian Period underlie the entire area (GHD, 2012a). Cambrian sediments are typically overlain by a sequence of Quaternary and flat-lying Tertiary formations including: Upper Tertiary shallow and deep marine sediments (including the Parilla Sand) and Lower Tertiary terrestrial and marine sediments.

Geotechnical investigations described by GHD (2012a) indicate a variable thickness of very stiff to hard clays likely to be the Coonambidgal or Blanchetown clays overlying dense sands which suggests intercepting the Tertiary Parilla Sand formation. Parilla Sand sediments are known to exhibit a high erosion potential and are commonly subject to tunnel erosion.

A series of geotechnical investigations have been undertaken for the project area and proposed structure locations over the last decade, mostly by GHD and Jacobs. Key findings of these investigations are summarised by Jacobs (2016b) (see **Attachment 15 – Geotechnical Report**) which informed the detailed design of the project. A summary of geotechnical findings is provided below.

Jacobs (2016b) has summarised ground conditions at the Chalka Creek / K10 Regulator site and at the Kulkyne Station Claypit, and determined that:

- K10 Regulator – Investigations by Jacobs (2016b) determined that ground conditions generally comprise dry, very dense, low to intermediate plasticity clayey sand and sandy clay at the surface; overlying very stiff and dry, low plasticity clay with interbedded dense sand; overlying medium dense to dense fine to medium grained sand; overlying stiff to very stiff silty clay. During investigations in 2016, groundwater was observed to be approximately 5 m

below natural ground level. Given the desiccated and fissured nature of the surface clays, it is reasonable to assume that when the area is in flood, the groundwater table would be hydraulically connected to surface water, and therefore effectively at ground surface level. A high degree of variability in the groundwater table during the design life of the regulator can therefore be assumed.

- Bitterang Regulator – Geotechnical investigation works by GHD (2009) at the site of the Bitterang Containment Bank (prior to construction) identified sandy clay and clayey sands to a depth of up to 4.2m below natural ground level. Geotechnical investigation works undertaken by GHD (2010) to describe the borrow material (in the former Bitterang Borrow Pit), which was ultimately used in construction of the Bitterang Containment Bank, identified similar material to the founding strata of the containment bank itself. Based on investigations by GHD 2009/10, Jacobs (2016b) determined that foundation conditions provide suitable bearing capacity for the proposed containment bank augmentation.
- Kulkyne Station Claypit – Investigations by Jacobs (2016b) determined that ground conditions generally comprise dark brown and dark grey, low to intermediate plasticity silty clay; overlying light brown and orange-brown low plasticity silty clay; overlying pale brown fine-grained sand with some silt. These soils were found to be moderately dispersive (Emerson class 2 or 3) but otherwise suitable as general impermeable fill for regulator and containment bank construction, assuming it is adequately moisture conditioned and compacted. Testing within the previously disturbed and backfilled pit used for TLM works confirmed the presence of fill material that is generally considered to be unsuitable for reuse in regulator or containment bank construction and is likely to comprise waste spoil excavated from TLM work sites. The proposed claypit for this project is therefore located outside but immediately adjacent to the backfilled TLM pit. No groundwater was encountered any test pits at the Kulkyne Station Claypit site in 2016.

Jacobs (2016b) described the project area as being located in an area of low seismicity.

No site-specific acid sulphate soil investigations have been undertaken for the project at this stage. A desktop acid sulphate soils assessment was undertaken as part of the water management options investigation by GHD (2012a). The desktop assessment included a review of CSIRO's Australian Soil Resource Information System (ASRIS) mapping, which indicated areas of 'high probability with very low certainty' for ASS at two locations within Hattah Lakes, including:

- South of Lake Mournpall between and Little Hattah Lake (west of Mournpall Track); and
- East of Lake Lockie including the junction with Chalka Creek and encompassing the northern area of Lake Roonki.

These two areas are not within the proposed construction or inundation areas for the current project. The Murray-Darling Basin Acid Sulphate Soils Risk Assessment Project (MDBA, 2011) determined that in Victoria, sites affected by inland ASS appear to be localised around Mildura.

Re-wetting of dried soils (lowering then raising of water tables) or excavation works / soil disturbance within areas of potential ASS could result in the formation of actual ASS. GHD (2012a) recommended further investigations to determine the presence of potential ASS in accordance with the protocols and methods for assessment of inland ASS developed through the Murray-Darling Basin Acid Sulphate Soils Risk Assessment Project (MDBA, 2011). Prior to commencement of construction, the contractor will be required to undertake an ASS investigation and if potential ASS are identified and disturbance cannot be avoided, an ASS management plan will be developed to minimise potential effects on surrounding soils, vegetation and water environments.

Are there geotechnical hazards that may either affect the project or be affected by it?

☐ NYD ☐ No ☒ Yes If yes, please briefly describe.

Recommendations for design of structures in response to geotechnical conditions identified at the site (e.g. scour protection, conditioning of dispersive fill material, seepage barriers etc) are contained in **Attachment 15 – Geotechnical Report** and were considered in the detailed design of the project.

In addition, prior to commencing works the contractor will be required to prepare a CEMP outlining measures to identify and avoid or manage disturbance of potential ASS, an erosion and sediment control plan and a dewatering management plan (if required).

Other information/comments? (eg. accuracy of information)

15. Social environments

Is the project likely to generate significant volumes of road traffic, during construction or operation?

☒ NYD ☐ No ☐ Yes If yes, provide estimate of traffic volume(s) if practicable.

Traffic generated during operation of the project will be minimal and limited to maintenance vehicles (e.g. mostly 4WDs). Prior to commencement of a temporary pumping event at the Bitterang Regulator, a fuel truck will be required to access the site to deliver the temporary pumps and bunded fuel storage, as access to this site by fuel trucks and other large vehicles will be restricted during a managed inundation event.

An increase in traffic along access roads and park access tracks will occur during construction and is expected to involve:

- Haulage of fill / spoil between the Kulkyne Station Claypit and each of the proposed construction areas.
- Delivery and removal of approximately 10-15 pieces of plant as required, including excavators, truck and trailers, graders, rollers and forklifts.
- Workers travelling daily to and from site, anticipated to mostly be from Mildura to the north.

During construction, public access along River Track will be closed from the northern national park entry through to south of Kulkyne Station. Mournpall Track will also be temporarily closed to public access for approximately one week during haulage of fill material to the Bitterang Regulator site.

Is there a potential for significant effects on the amenity of residents, due to emissions of dust or odours or changes in visual, noise or traffic conditions?

☐ NYD ☒ No ☐ Yes If yes, briefly describe the nature of the changes in amenity conditions and the possible areas affected.

The proposed regulating structures and associated construction areas are contained within national park and are well separated from residential dwellings. The nearest dwellings to the proposed construction areas are located on rural properties between the northern national park

boundary and Boonoonar Road and are separated by at least 3.5 km from the proposed construction areas.

A small number (approximately. 10-15) of dwellings located adjacent to the proposed access roads may experience some additional noise, dust and traffic during construction, particularly during haulage of fill and spoil between the Kulkyne Station Claypit and Bitterang Regulator construction area. These effects will be temporary and limited to the construction period.

Potential effects on the relatively small number of residents are typical of construction projects. As such, potential effects are well understood and able to be managed through standard controls contained in a Traffic Management Plan and CEMP.

Is there a potential for exposure of a human community to health or safety hazards, due to emissions to air or water or noise or chemical hazards or associated transport?

☐ NYD ☒ No ☐ Yes If yes, briefly describe the hazards and possible implications.

Proposed construction activities are located within the national parks and a significant distance from residential dwellings. Potentially adverse effects on local communities during the construction phase will most likely be limited to increases in noise, dust and traffic associated with transport of fill / spoil between the Kulkyne Station Claypit and Bitterang Regulator construction area.

A Traffic Management Plan will be developed to minimise potential risks to communities along haulage routes associated with a temporary increase in heavy vehicle traffic during construction. Stakeholder engagement activities will also continue through the construction phase to manage any issues raised by local communities.

Is there a potential for displacement of residences or severance of residential access to community resources due to the proposed development?

☐ NYD ☒ No ☐ Yes If yes, briefly describe potential effects.

The project will not displace any residences or sever residential access to community resources as the works are located within discrete sites within national parks. Although public access along River Track will be temporarily closed from the northern national park boundary to south of Kulkyne Station during construction, provision will be made for private landowners of Kulkyne Station and Sexton's to access their properties.

Are non-residential land use activities likely to be displaced as a result of the project?

☐ NYD ☒ No ☐ Yes If yes, briefly describe the likely effects.

No land use activities will be permanently displaced by the project. No designated national park camping areas or licensed bee-keeping sites are located within the permanent footprint of proposed infrastructure or in the proposed inundation areas.

Temporary restrictions on access and land use activities within the national parks may occur during construction and managed inundation events as described in the following section.

Do any expected changes in non-residential land use activities have a potential to cause adverse effects on local residents/communities, social groups or industries?

☐ NYD ☐ No ☒ Yes If yes, briefly describe the potential effects.

Temporary disruptions to access and activities within the Hattah-Kulkyne National Park and Murray-Kulkyne Park are likely to occur during construction and inundation events, including:

- Access along River Track and Mournpall Track will be closed to the public during construction. Eagles Nest Track will also be closed to public access but is already limited to management vehicles only and has no public access.
- Access along some park access tracks will also be closed to the public during managed inundation events. This is described further below.
- No currently available camping areas (e.g. Lake Mournpall campground) will be closed to public access during managed inundation events, although access to the Lake Mournpall campground will be restricted to 4WD access as currently occurs during managed watering by TLM works.
- A number of licensed bee-keeping sites are located in the vicinity of proposed inundation areas and may have restricted / no access during managed inundation events. VMFRP will utilise an existing arrangement between Parks Victoria and apiarists during times of park closure, including ongoing consultation.

The project will not involve any permanent closure of park access tracks, camping areas or other facilities that are currently available for public use.

It is noted that camping opportunities in Hattah–Kulkyne National Park are already affected by current environmental watering programs, with Lake Hattah campground regularly inundated in recent years and typically remaining under water for months at a time (Parks Victoria, 2018). Lake Mournpall campground is situated above the highest water levels likely to occur through managed watering (current TLM and proposed project). However, Mournpall Track, which provides two-wheel drive access to the campground from both Mildura and the park visitor centre, is cut by water during managed watering by the TLM works, making the campground only accessible by four-wheel drive vehicle (Parks Victoria, 2018). Both campgrounds are therefore already largely inaccessible during environmental watering.

The location of park access tracks and other facilities temporarily affected during construction and managed inundation events is shown in **Attachment 25 – National Parks Visitor Map**.

Although temporary disruptions to access and activities within the Hattah-Kulkyne National Park and Murray-Kulkyne Park will likely occur during construction and managed inundation events, implementation of the project is expected to improve the condition of vegetation communities and associated habitats within the proposed inundation areas, which will contribute to improved park user experiences in the longer term.

Is mitigation of potential social effects proposed?

☐ NYD ☐ No ☒ Yes If yes, please briefly describe.

The constructing authority (LMW) will work closely with Parks Victoria and other interested groups to minimise disruption to park users and commercial operations during construction and managed inundation events. A stakeholder and community engagement strategy will be developed and implemented during the construction and operation phases to disseminate information regarding proposed road, track or park facility closures in a timely and readily available manner to interested parties to minimise disruption.

During the construction phase, the stakeholder and community engagement strategy will be informed by a Traffic Management Plan consistent with the approach specified for the Stage 1 Hattah TLM Project. Key elements of the Traffic Management Plan for this project will include:

- Raak Track is not to be used during construction to avoid impacts on cultural heritage values.
- River Track is to be closed to public access during construction (i.e. from northern national park boundary to south of the turnoff into Kulkyne Station).
- Consultation with private landowners (Sextons and Kulkyne Station) in relation to access during construction.
- Access along Eagles Nest Track between Mournpall Track and River Track is currently a "management vehicles only" track, and will continue to be closed to public access.
- Track maintenance and dust management.
- Liaison with Parks Victoria regarding the process for road closure.
- Management requirements for heavy vehicles transporting fill / spoil along local roads near dwellings to minimise noise, dust, and potential safety risks.

Other information/comments? (eg. accuracy of information)

Cultural heritage

Have relevant Indigenous organisations been consulted on the occurrence of Aboriginal cultural heritage within the project area?

☐ No If no, list any organisations that it is proposed to consult.
☒ Yes If yes, list the organisations so far consulted.

Pearce Family, Latji Latji Mumthelang Aboriginal Corporation, Tati Tati Aboriginal Corporation, Murray Valley Aboriginal Co-op, Nyeri Nyeri / Wergaia Peoples.

What investigations of cultural heritage in the project area have been done?
(attach details of method and results of any surveys for the project & describe their accuracy)

The following cultural heritage studies have been undertaken for the project to date:

- Hattah Lakes Wetland System, Hattah-Kulkyne National Park, North West Victoria Due Diligence Assessment (8 October 2013) prepared by Jo Bell Heritage Services Pty Ltd for the Mallee CMA (**Attachment 32 – Cultural Heritage Due Diligence**):
  - Assessment of Aboriginal cultural heritage values within an approximate 100 m radius of the proposed structures, not including access tracks or the proposed Kulkyne Station Claypit[31].
  - Hattah Lakes region has been extensively investigated for Aboriginal cultural heritage in the past. Bitterang Regulator will be constructed within an existing embankment constructed as part of CHMP 10455. A portion of the area surrounding the K10 Regulator was investigated during preparation of CHMP 10455. The K10 Embankment (no longer part of this project) and River Track Causeway (now called K10 Causeway) locations do not appear to have been previously investigated.
  - A review of the Victorian Aboriginal Heritage Register (VAHR) identified six previously recorded places within 100 m of the proposed structures.
  - One previously unrecorded Aboriginal cultural heritage place was identified within 100 m of the proposed structures during a site inspection between 24-26 February 2013.

[31] Access tracks and the claypit are addressed in subsequent CHMP investigations.

- A CHMP is required as the proposed activity is a high impact activity (utility installation) within an area of cultural heritage sensitivity.

- Hattah Lakes North SDL Design Works Project: Draft Complex Cultural Heritage Management Plan No. 14330 (September 2019) prepared by Jacobs for the Mallee CMA:
  - A Notice of Intent (NOI) to prepare a CHMP was lodged with Aboriginal Victoria on 18 May 2016.
  - There is no Registered Aboriginal Party (RAP) for the activity area.
  - The following Aboriginal stakeholder groups were consulted with during the field assessment and will be further consulted with in information sessions prior to submitting the CHMP for approval:
    - Latji Latji Mumthelang Aboriginal Corporation (LLMAC)
    - Tati Tati Aboriginal Corporation (TTAC)
    - Murray Valley Aboriginal Co-op (MVC)
    - Nyeri Nyeri / Wergaia Peoples (NNWP)
    - Pearce Family (PF).
  - A total of 1,200 Aboriginal Places have now been recorded within the Hattah-Kulkyne National Park.
  - The findings of the desktop assessment, standard assessment and complex assessment are summarised in the following sections.

- Mallee Environmental Water Projects, Hattah Lakes Wetland System, North West Victoria, Due Diligence Assessment, Historical Archaeology (8 October 2013) prepared by Jo Bell Heritage Services Pty Ltd for the Mallee CMA (**Attachment 33 – Historical Heritage Due Diligence**):
  - Assessment of historic archaeological values within an approximate 100 m radius of the proposed structures, not including access tracks or the proposed Kulkyne Station Claypit.
  - A review of the Victorian Heritage Register (VHR) and the Victorian Heritage Inventory (VHI) identified no previously recorded historic archaeological sites within 100 m of a proposed structure.
  - Parts of the Hattah Lakes have been the subject of previous historical and archaeological investigations.
  - A review identified the following historic heritage places within the Hattah Lakes region:
    - Ten places listed on the VHI (H7328-0001: Hattah-Kulkyne Military Internment Camp, H7328-0002: Moonah Track & Wattle Track Charcoal Pits, H7328-0007: Lake Hattah Pump Station, H7328-0008: Chalka Historic Scatter, H7328-0009: Nowingi Historic Scatter, H7328-0011: Second Mornpool Homestead Site, H7328-0012: Belton's Bridge, H7328-0013: Hattah Nature Road Site, H7328-0015: Mahons Burial Marker, H7328-0016: Kulkyne Drop Log Stockyards)
    - Four places listed on the Mildura Heritage Overlay (HO117: Brighton's Block, HO118: Brighton's Bridge, HO119: 'Florence Annie' Wreck, HO120: Mahon Homestead Site)
    - Two National Trust sites (Kulkyne Homestead and Kulkyne Grave).
  - No new historic archaeological sites were identified within 100 m of a proposed structure during a site inspection undertaken between 24 - 26 February 2013.
  - No further areas of potential sensitivity for historic archaeological sites were identified within 100 m of a proposed structure during a site inspection undertaken between 24 - 26 February 2013.
  - Recommended that no further historic archaeological assessment was required for the areas considered in the report.

Is any Aboriginal cultural heritage known from the project area?

☒ NYD ☒ No ☒ Yes If yes, briefly describe:

- Any sites listed on the AAV Site Register
- Sites or areas of sensitivity recorded in recent surveys from the project site or nearby
- Sites or areas of sensitivity identified by representatives of Indigenous organisations

Draft CHMP No. 14330 provides the following findings:

- Desktop assessment identified 31 previously recorded Aboriginal Places located within 50 m of the activity area, with 19 of these Aboriginal Places located within the activity area.
- Twenty-five new Aboriginal Places were recorded during the standard assessment and nine re-inspected Aboriginal Places were found to be within the activity area.
- Aboriginal cultural heritage in the activity area is characterised by four recurring types:
  - Low density stone artefacts (chert and silcrete) occurring as surface scatters or within sandy soil horizons which have developed along Chalka Creek
  - Scarred trees, generally River Red Gum where associated with a watercourse, or Black Box upon the open floodplain
  - Earth features (hearths), generally eroded and in poor condition, however they can be expected to occur anywhere within the activity area and are more prevalent across the floodplain, particularly the lower lying floodplain which is prone to inundation.
  - Shell middens, occurring either as a discrete area of shell deposit or as substantial creek bank coverage.
- Complex assessment confirmed 31 Aboriginal Places are located within the activity area. The activity will not impact upon 25 of these 31 Aboriginal Places, and harm will be avoided to these Places through the application of buffering fencing (where required). Specific management recommendations for the six Aboriginal Places identified as being impacted are contained in the draft CHMP.

Further details regarding Aboriginal Places identified during the desktop, standard and complex assessment, along with stakeholder engagement, impact assessment and specific management recommendations relating to these places are contained in Draft CHMP No. 14330[32].

Since the preparation of draft CHMP No. 14330, a revised Investigation Area has been developed and reflects a substantial reduction in the extent of the activity area assessed in the draft CHMP No. 14330. A preliminary review indicates that only 21 recorded Aboriginal Places now fall within 50 m of the current Investigation Area, with only 11 of these Aboriginal Places located within the Investigation Area (compared to 31 places in the draft CHMP activity area). Further assessment is required to determine impacts on Aboriginal Places within the revised investigation area and will be undertaken as part of the updates to the draft CHMP.

Are there any cultural heritage places listed on the Heritage Register or the Archaeological Inventory under the *Heritage Act 1995* within the project area?

☒ NYD ☒ No ☒ Yes If yes, please list.

No places listed on the Victorian Heritage Register (VHR) are located within or adjoining the proposed construction areas or proposed inundation areas.

No places listed on the Victorian Heritage Inventory (VHI) or the Heritage Overlay in the Mildura Planning Scheme are located within the proposed construction areas.

One place listed on the VHI is intersected by the southern section of the River Track, between the central and southern Passing Bay construction areas (VHI Site H7328-0016: Kulkyne Drop Log Stockyards). This VHI site is not within the proposed inundation areas and no passing bays or

[32] Due to the cultural sensitivity of information contained in draft CHMP, this document has not been attached to this referral.

track upgrade works are proposed at this location. If maintenance works are required along the River Track and cannot avoid works within the VHI site, consent would be required from Heritage Victoria under the *Heritage Act 2017*.

Another place listed on the VHI is located approximately 130 m south of the southernmost / Murray River end of the River Track (VHI Site 7328-0009: Nowingi Historical Scatter). This VHI site will not be impacted by the proposed construction works and is not located within the proposed inundation areas.

One place listed on the VHI is wholly located within the proposed inundation area (VHI Site 7328-0002: Moonah Track & Wattle Track Charcoal Pits). Two places listed on the Mildura Heritage Overlay are partially located within the proposed inundation areas: HO117 (Brighton's Block) and HO118 (Brighton's Bridge). These heritage places will not be impacted by the proposed construction works.

The whole of the Hattah-Kulkyne National Park and Murray-Kulkyne Park are listed on the non-statutory Register of the National Estate.

No places listed on the World Heritage List, National Heritage List or Commonwealth Heritage List are located within or adjoining the proposed construction areas or proposed inundation areas.

The location of registered historical heritage places is shown in **Attachment 34 – Historical Heritage Features Map**.

Is mitigation of potential cultural heritage effects proposed?

☐ NYD ☐ No ☒ Yes If yes, please briefly describe.

Aboriginal Cultural Heritage

- The Draft CHMP will be amended and finalised in consultation with the identified Aboriginal stakeholder groups for approval by AV and is likely to include specific management conditions for a number of Aboriginal Places along with general management recommendations relating to induction training, salvage methods and stakeholder engagement, and procedures for unexpected 'finds' of potential Aboriginal cultural material.

Historical Heritage

- Further historical heritage investigations are proposed to be undertaken to identify risks to registered and potentially unrecorded historical heritage features within proposed construction areas not previously assessed in the Historical Heritage Due Diligence (Jo Bell Heritage Services, 2013b).
- Further historical heritage investigations are proposed to be undertaken to identify risks to registered heritage places within the proposed inundation areas to identify potential approval requirements.
- The following general management recommendations will be included in the CEMP to minimise risks to unregistered historical heritage places that may be encountered within proposed construction areas:

Unexpected discoveries of archaeological sites

- All historical archaeological sites in Victoria older than 75 years are protected by the *Heritage Act 2017*, whether they are recorded on the VHI or not. It is an offence to knowingly or negligently deface, damage, or otherwise interfere with an archaeological site without obtaining the appropriate consent from the Executive Director of Heritage Victoria (HV).

- Under Section 127 of the *Heritage Act 2017*, if an archaeological site is discovered during construction or excavation on any land, the person in charge of the construction or excavation must as soon as practicable report the discovery to HV. If any unexpected archaeological sites are uncovered during construction works, the following procedure must be followed by LMW and/or their contractors:

  STOP
  - Stop any activity which may impact on the discovery
  - Ensure that other people working in the area are aware of it and have also stopped work in the area
  - Protect the artefacts or site by erecting temporary fencing or other suitable barrier

  ADVISE
  - A supervisor or the cultural heritage consultant must be consulted if they are on site
  - Supervisors are to contact LMW to advise of the discovery
  - Supervisors are to advise HV where the discovery was made and provide a description or photograph of the discovery

  MANAGE
  - HV, the onsite heritage consultant or supervisor to advise on how to manage the discovery
  - Management of the discovery may involve protection, recovery, recording or removal of the artefacts or features and is likely to require Consent to Damage from HV.

Heritage Induction Training

Historical heritage awareness training should be completed as part of the site induction for LMW personnel and/or contractors prior to the commencement of construction works to ensure understanding of potential heritage items that may be impacted during the project, and the procedure required to be undertaken in the event of discovery of historical archaeological material, features or deposits, or the discovery of human remains.

Other information/comments? (eg. accuracy of information)

16. Energy, wastes & greenhouse gas emissions

What are the main sources of energy that the project facility would consume/generate?

- ☒ Electricity network. If possible, estimate power requirement/output …….
- ☒ Natural gas network. If possible, estimate gas requirement/output ……...
- ☒ Generated on-site. If possible, estimate power capacity/output …….
- ☒ Other. Please describe.

Please add any relevant additional information.

No power is required to operate the proposed environmental watering works, with the exception of the temporary diesel pumps used at the Bitterang Regulator.

According to preliminary hydrodynamic modelling, in order to deliver environmental water to the extent of the proposed Lake Boolca Area, it is estimated that the temporary pumps may need to pump at 300 ML/d for approximately one month, about once every 10 years (see **Attachment 35 – Hydrodynamic Modelling (Operating Scenarios) Report**). Operation of regulators (opening /

closing of gates) is managed through the use of truck-mounted hydraulic lifts that will access the sites as required.

What are the main forms of waste that would be generated by the project facility?

- ☒ Wastewater. Describe briefly.
- ☒ Solid chemical wastes. Describe briefly.
- ☒ Excavated material. Describe briefly.
- ☒ Other. Describe briefly.

Please provide relevant further information, including proposed management of wastes.

The main waste streams as a result of the construction works include:

- Excess spoil
- Cleared vegetation
- General building and miscellaneous wastes such as packaging, off cuts, excess materials, and
- Worker's waste such as packaging, containers, food scraps, etc.

As part of the CEMP, the contractor will be required to prepare a waste management plan demonstrating compliance with the *Environment Protection Act 1970* (and *Environment Protection Act 2017*) and EPA Publication 480: Environmental Guidelines for Major Construction Sites.

Excavated materials which are unsuitable for use or which are excess to the needs of construction (i.e. spoil) will be disposed of within the excavated area of the Kulkyne Station Claypit unless otherwise approved by the Superintendent in accordance with the Contract Specifications. Spoil will be temporarily stockpiled at the Kulkyne Station Claypit until excavation from the claypit is complete. Spoil will then be placed within the excavation, nominally compacted, shaped and spread with topsoil as per the Contract Specifications to facilitate rehabilitation and provide for adequate drainage.

Subject to approval from Parks Victoria, cleared native vegetation not containing pest plant propagules will be mulched and stockpiled within the designated construction area for reuse in rehabilitation of construction or extraction areas. Where directed by Park Victoria, cleared vegetation containing hollows will be salvaged and placed in appropriate locations within the national parks.

No significant volumes of waste will be generated during operation of the project.

What level of greenhouse gas emissions is expected to result directly from operation of the project facility?

- ☒ Less than 50,000 tonnes of CO_2 equivalent per annum
- ☒ Between 50,000 and 100,000 tonnes of CO_2 equivalent per annum
- ☒ Between 100,000 and 200,000 tonnes of CO_2 equivalent per annum
- ☒ More than 200,000 tonnes of CO_2 equivalent per annum

Please add any relevant additional information, including any identified mitigation options.

A greenhouse gas emissions assessment has not been undertaken, however direct emissions from operation of the project are not likely to exceed 50,000 tonnes of CO_2 equivalent per annum. Greenhouse gas emissions directly generated from operation of the project will be limited to emissions associated with operation of the temporary diesel pumps used at the Bitterang Regulator.

According to preliminary hydrodynamic modelling, in order to deliver environmental water to the extent of the proposed Lake Boolca Area, it is estimated that the temporary pumps may need to

pump at 300 ML/d for approximately one month, about once every 10 years (see **Attachment 35 – Hydrodynamic Modelling (Operating Scenarios) Report**).

17. Other environmental issues

Are there any other environmental issues arising from the proposed project?

☒ No ☐ Yes If yes, briefly describe.

18. Environmental management

What measures are currently proposed to avoid, minimise or manage the main potential adverse environmental effects? (if not already described above)

☒ Siting: Please describe briefly

☒ Design: Please describe briefly

☒ Environmental management: Please describe briefly.

☐ Other: Please describe briefly

Add any relevant additional information.

Siting and Design

Key siting and design decisions to minimise adverse environmental effects include:

- Siting proposed structures primarily along or immediately adjacent to existing access tracks and other previously disturbed areas to minimise the removal of native vegetation and other construction impacts, including:
  - Construction of the K10 Regulator adjacent to an existing access track and on a disturbed section of the creek bed
  - Construction of the raised, embankment at the K10 Regulator along the alignment of the existing River Track
  - Construction of the K10 Causeway Regulator and associated raised embankment along the alignment of the existing River Track
  - Construction of the Bitterang Regulator within the existing Bitterang Containment Bank
- Design to include installation of guardrails along extended sections of raised containment banks developed in consultation with Parks Victoria to enable design of steeper 1:3 batters rather than shallower 1:4 or 1:6 batters to minimise extent of native vegetation removal and other construction impacts.
- Option to include infrastructure (e.g. gates) to facilitate temporary restrictions on public access along certain access tracks during higher risk periods (e.g. flooding) and to provide Parks Victoria with operational flexibility to restrict access to parts of the national parks where deemed necessary to provide rest and recovery from visitation.
- Design of structures, containment banks and spillways arranged to minimise the potential for erosion over a broad range of flow and tailwater conditions, by sizing and placing structures and spillways to pass flows in a manner which is consistent with the natural flow distribution and the hydraulic capacity of the multiple flow paths.

- Provision for fish passage requirements consistent with the recommendations of the Fish Management Plan – Hattah Lakes (ARI, 2018) (see **Attachment 13 – Fish Management Plan**)
- Siting of the coffer dam required for construction of the K10 Regulator as close as possible to the regulator site based on in-field siting to reduce the stream length potentially effected by construction disturbances.

In addition to minimising adverse environmental effects, siting and design of the proposed structures and containment banks have been developed to effectively and efficiently maximise the environmental benefits of environmental watering as demonstrated through the substantial optioneering and concept refinement investigations undertaken for the project over the last decade.

Environmental Management

A draft Environmental Management Framework (EMF) has been prepared for the VMFRP containing an overview of:

- Project description – location, environmental context, project objectives, construction and operational activities
- Roles and responsibilities for implementation of environmental management during construction and operation of the program
- An overview of related environmental management documentation and associated approval processes (e.g. CEMP, CHMP, EWMP, Operating Plans, etc)
- An overview of relevant legislation and statutory approval requirements
- The approach to identifying and evaluating potential risks to environmental values during construction and operation of the project
- Environmental management measures to avoid or mitigate environmental impacts
- Monitoring, reporting and auditing requirements to inform adaptive management.

A copy of the draft EMF is provided in **Attachment 36 – Draft Environmental Management Framework**. The draft EMF will evolve as the project assessment and approvals processes progress.

Construction environmental management

The primary environmental management documentation for managing adverse environmental and heritage risks and impacts during construction of the project will be:

- Construction Environmental Management Plan
- Cultural Heritage Management Plan.

Construction Environmental Management Plan (CEMP)

In accordance with the draft EMF, the contractor will be required to prepare a CEMP for the project, including:

- The project's environmental management system, procedures and processes, including all project forms and registers;
- A project environmental risk assessment and control program;
- Clear delegation of responsibilities (i.e. within the contractor's project team);
- Project legislative requirements;
- Details of approvals, permits, agreements and/or licences for the various stages of work;

- Relevant environmental procedures and work instructions, incorporating management requirements;
- An environmental inspection/monitoring program and inspection checklist;
- Worksite specific plans; and
- A checklist that demonstrates that each requirement of the draft EMF has been addressed in the preparation of the CEMP.

Cultural Heritage Management Plan

A mandatory CHMP is required to be prepared and approved for the project under the *Aboriginal Heritage Act 2006* and the *Aboriginal Heritage Regulations 2018* as the project involves a high impact activity in an area of Cultural Heritage Sensitivity.

A draft CHMP has already been prepared for the project but will be amended and finalised in consultation with the identified Aboriginal stakeholder groups for approval by AV to reflect the final design.

Operation environmental management

The primary environmental management documentation for managing adverse environmental effects and maximising environmental benefits during operation of the project will be the:

- Hattah Lakes Environmental Water Management Plan (EWMP)
- Hattah Lakes Operating Plan.

Hattah Lakes EWMP

The Hattah Lakes EWMP:

- Aligns with the Environmental Watering Plan prepared by the Murray-Darling Basin Authority in accordance with Chapter 8 of the Murray-Darling Basin Plan
- Provides the framework for water planning, monitoring and consultation processes
- Identifies environmental objectives and targets, water delivery options and regimes.

A copy of the current Hattah Lakes Environmental Water Management Plan (MDBA, 2012) and a draft addendum prepared to integrate the proposed Hattah North environmental watering works into the current EWMP is provided in **Attachment 18 – Draft Environmental Water Management Plan.**

Hattah Lakes Operating Plan

The Operating Plan provides the framework for operation of the Hattah Lakes water management structures to meet key ecological objectives and comply with relevant legislative requirements (e.g. *Water Act 2007* (Cth), s52-54 of Murray-Darling Basin Agreement), and outlines:

- Governance arrangements for managed inundation activities
- Roles and responsibilities of partner agencies
- Decision-making protocols for prior to, during, and after watering events
- Operational risks and mitigation strategies
- Water measurement arrangements

- Communication and consultation requirements,
- Links to related documents.

A copy of the current Hattah Lakes Operating Plan (MDBA, 2016) and a draft addendum prepared to integrate the proposed Hattah North environmental watering works into the current Operating Plan is provided in **Attachment 19 – Draft Operating Plan.**

19. Other activities

Are there any other activities in the vicinity of the proposed project that have a potential for cumulative effects?

☐ NYD ☐ No ☒ Yes If yes, briefly describe.

The project has some potential for cumulative effects in relation to other VMFRP projects. The potential for cumulative effects is generally associated with:

- Salinity impacts associated with saline water discharge to the Murray River and compliance with the Basin Salinity Management Strategy targets for Morgan.
- Removal of large, hollow-bearing trees and associated habitat for threatened species such as Regent Parrot, Carpet Python, and Lace Monitor from river red gum and black box communities along the Murray River floodplain.
- Removal of native vegetation and associated habitat from similar EVCs across multiple sites due to the need to locate proposed infrastructure at certain elevations on the floodplain and potential impacts on bioregional conservation status of particular EVCs.

Further assessment of potential cumulative effects will be ongoing as design development and environmental investigations are advanced at other VMFRP sites.

20. Investigation program

Study program

Have any environmental studies not referred to above been conducted for the project?

☐ No ☒ Yes If yes, please list here and attach if relevant.

A list of environmental investigations completed for the project to date is included in **Attachment 21 – List of Project Investigations.**

Has a program for future environmental studies been developed?

☐ No ☒ Yes If yes, briefly describe.

The effectiveness of the proposed supply measure and its operation will primarily be monitored and reported on through the Mallee CMA's well-established monitoring, evaluation and reporting (MER) strategies and protocols. These strategies and protocols build upon experience and lessons learned through the ongoing, long-term TLM ecological monitoring programs, which include condition and intervention monitoring across several sites in the Mallee region. The Mallee CMA has been implementing and coordinating the local, annual TLM Monitoring, Evaluation and Reporting Framework process since 2006.

These strategies and protocols provide a routine process to:

- Establish a robust program logic to define the correlation between works and other inputs and identified outputs and ecosystem outcomes. This provides the basis for a suite of quantifiable ecological targets that are relevant to the specific site;
- Monitor progress against those targets on a regular basis;
- Evaluate the implications of the results for the operational parameters of the scheme;
- Amend and adjust the operational arrangements to optimise performance and outcomes;
- Utilise monitoring data to plan watering events, optimise water delivery, manage risks and refine ecological objectives. The evaluation process involves analysing collected data and improving operations accordingly.

Monitoring and evaluation will focus on the effects of local watering actions and include:

- Evaluating water use;
- Measuring ecological outcomes;
- Refining conceptual models and improving knowledge;
- Managing risks.

A detailed monitoring and evaluation plan was previously developed for the project by Ecological Associates (2014b) (see **Attachment 37 – Example Monitoring and Evaluation Plan**). The monitoring and evaluation plan identifies the agencies responsible for commissioning, reviewing and acting on monitoring data. The linkages back to decision-making are described in the detailed plan. A new Monitoring, Evaluation and Reporting Framework is currently being funded by the project and is due to be completed by June 2020. This framework will aim to establish a social, heritage and environmental benchmark and monitoring programme to demonstrate the ongoing benefits of the project.

Initial monitoring will provide a baseline of the existing status of the ecological objectives and outcome monitoring will measure progress towards these objectives and their targets. This information will inform the ongoing operations at the site. Over time, the results of the outcome monitoring will test assumptions and assist with refining conceptual models and ecological objectives. Monitoring data will identify emerging hazards and enable operational decisions to minimise risk through the adaptive management framework incorporated into Operating Plans and Environmental Water Management Plans.

The final Monitoring, Evaluation and Reporting Framework approach for this project will be informed by broader intergovernmental arrangements for Basin-wide monitoring and evaluation under the Basin Plan. This project is expected to contribute to the achievement of outcomes under two key Chapters of the Plan, namely: (i) the delivery of ecological outcomes under Chapter 8; and (ii) meeting the relevant SDLs under Chapter 10, which must be complied with under the relevant State water resource plan/s (WRPs) from 1 July 2019.

Both Chapter 8 and Chapter 10 of the Basin Plan are captured under the MDBA's own monitoring and evaluation framework. Once specific Basin Plan Chapters commence within a State, the State must report to the MDBA on relevant matters. This will include five yearly reporting on the achievement of environmental outcomes at an asset scale in relation to Chapter 8, and annually reporting on WRP compliance in relation to Chapter 10.

VMFRP is satisfied that its participation in the MDBA's reporting and evaluation framework will effectively allow for progress in relation to this project to be monitored, and for success in meeting associated ecological objectives and targets to be assessed.

This approach closely aligns with agreed arrangements under the Basin Plan Implementation Agreement, where implementation tasks are to be as streamlined and as cost-effective as possible.

Consultation program

Has a consultation program been conducted to date for the project?

☐ No ☒ Yes If yes, outline the consultation activities and the stakeholder groups or organisations consulted.

The Mallee CMA has worked with key stakeholders and interested community groups to develop the concept for the Hattah Lakes North Floodplain Restoration Project from 2012 to current. Consultation activities will continue throughout the duration of the project.

Communication and engagement activities conducted have included:

- More than 135 face-to-face briefing sessions, meetings, presentations and on-site visits, engaging more than 505 people, which is reflective of the wide range of project stakeholders; and
- Fact sheets, media releases, electronic communication (website, emails, newsletters), brochures and correspondence.

This direct approach to engagement has helped capture the views and local knowledge of key stakeholders and community members to directly integrate these into the project, resulting in broad community support from:

- Materially-affected land managers such as Parks Victoria;
- Partner and government agencies such as LMW, GMW, Mallee CMA, DELWP, Commonwealth and Victorian Environmental Water Holders
- Adjacent private landholders
- Aboriginal stakeholders
- Regional Development Australia, Regional Development Victoria – Loddon Mallee and Mildura Regional Development
- Local government (Mildura Rural City Council)
- Industry groups
- Tourism operators
- Community groups including Sunraysia Riverwatch, Sunraysia Victorian Apiarists Association, recreational anglers, rotary clubs and progress associations
- Education providers such as La Trobe University.

Broad community support for the project is evidenced by the sustained interest in the proposal as illustrated by on-going requests from key stakeholders to provide briefings, presentations and updates.

Information regarding the Hattah Lakes North Floodplain Restoration Project is published on the VMFRP website: https://www.vmfrp.com.au/wp-content/uploads/2019/07/VMFRP_FactSheet_A4_Hattah_Lake_North_0319_02.pdf

Has a program for future consultation been developed?

☒ NYD ☒ No ☒ Yes If yes, briefly describe.

Targeted, tailored consultation will continue to be conducted with key stakeholders throughout the project, aligning to project milestones, assessments and approvals processes where necessary and/or appropriate. This includes further face-to-face briefings, presentations, site visits and regular project updates via mail-outs and newsletters.

Broader engagement via traditional and social media, community events and information displays will also continue.

Authorised person for proponent:

I, …Josh White…… (full name),

……Project Director - VMFRP……(position), confirm that the information contained in this form is, to my knowledge, true and not misleading.

Signature _____

Date 6 March 2020

Person who prepared this referral:

I, … Josh White …… (full name),

……Project Director - VMFRP……(position), confirm that the information contained in this form is, to my knowledge, true and not misleading.

Signature _____

Date 6 March 2020

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