PART 1 PROPONENT DETAILS, PROJECT DESCRIPTION & LOCATION

1. Information on proponent and person making Referral

Name of Proponent:	Major Projects, Office of Water Department of Sustainability and Environment
Authorised person for proponent: **Position:** **Postal address:** **Email address:** **Phone number:** **Facsimile number:**	David Downie General Manager, Office of Water PO Box 500, East Melbourne VIC 3002 david.downie@dse.vic.gov.au (03) 9637 8870 (03) 9637 8254
Person who prepared Referral: **Position:** **Organisation:** **Postal address:** **Email address:** **Phone number:** **Facsimile number:**	Paul Lloyd Senior Project Officer Department of Sustainability and Environment PO Box 500, East Melbourne VIC 3002 paul.lloyd@dse.vic.gov.au (03) 9637 8688 (03) 9637 8022
Available industry & environmental expertise: (areas of 'in-house' expertise & consultancy firms engaged for project)	DSE (Major Projects, North East Region, North West Region) Goulburn-Murray Water Goulburn Broken Catchment Management Authority Sinclair Knight Merz Ecology Australia Pty Ltd Birds Australia Arthur Rylah Institute Heritage Insight Pty Ltd Biosis Research Pty Ltd TerraCulture Pty Ltd Beca Pty Ltd

2. Project – brief outline

Project title: Lake Mokoan Decommissioning and Mid Murray Storage Project
Project location: The project is located in two distinct areas 1. The Broken River basin downstream of Lake Nillahcootie (including Lake Mokoan), and 2. The Mid Murray Storage. Key project components are located from 10km NE of Benalla (Lake Mokoan: 417720 5965638), to 15km SE of Swan Hill (Lake Boga: 739982 6073943) and 10km NW of Kerang (Kangaroo Lake: 751273 6059197, and Lake Charm: 755804 6056644).
Short project description: The project will decommission Lake Mokoan as a water storage to generate water savings to use as environmental flows in the Broken, Goulburn, Murray and Snowy Rivers. The wetlands inundated by the Lake (Winton wetland complex) will be rehabilitated. The project also includes infrastructure to maintain supply to water users around the Lake and to maintain the reliability of supply to Broken River consumptive water users. A Mid Murray Storage will be established at Lakes Boga, Kangaroo and Charm to re-regulate a portion of the water savings and allow exchange of this volume from the Murray to the Snowy River.

3. Project description

Aim/objectives of the project:
The project's purpose is to generate 48GL of water savings to be used to increase environmental flows and improve the ecological health of the Broken, Goulburn, Murray and Snowy Rivers. The project will also facilitate the rehabilitation of the 6,800Ha Winton wetland complex and surrounds.

Background/rationale of project:
This project is part of the Victorian Government water policy framework *Our Water Our Future* aimed at improving water use sustainability and river system health throughout the state. It is an important component of the Government's commitment to recover environmental water for the Murray and Snowy Rivers and protection and enhancement of those Rivers. Lake Mokoan is a highly inefficient storage with frequent water quality problems. The project will generate significant water savings and environmental benefits locally and regionally.

Main components of the project:
(i) Provision of alternative supplies to properties sourcing water directly from Lake Mokoan
(ii) Implementation of offset measures in the Goulburn- Broken system to maintain the reliability of water supply to Broken River consumptive water users, including supply infrastructure and operational changes
(iii) Establishment of a Mid Murray Storage utilising Lake Boga, Kangaroo Lake and Lake Charm to allow re-regulation of 19GL of water savings and exchange water from Murray to the Snowy
(iv) Drawdown of Lake Mokoan
(v) Decommissioning of Lake Mokoan as a water storage
(vi) Rehabilitation of the Winton wetlands

Ancillary components of the project: None

Key construction activities:
(Numbering cross referenced to "Main components of the project" above)
(i) A channel within the existing Lake Outlet Channel, a pump station and pipeline along the north-eastern side of the Lake just below the Full Supply Level, a balancing storage at the northern end of the Lake just below the Full Supply Level, and pipelines to landholders on the southern and eastern sides of the Lake
(ii) Construction of water supply infrastructure including pump stations, water supply mains/pipelines, re-regulation structures
(iii) Construction of Lake Boga outfall channel to the Little Murray River downstream of the Little Murray Weir and a floodway from Kangaroo Lake to the Avoca Floodway
(v) Creating a 10m breach in the Lake Mokoan dam wall, removal/rationalisation of Lake infrastructure including outlet structure, Inlet Channel and Outlet Channel

Key operational activities:
(ii) Reduction in downstream demand through targeted water entitlement purchases, improved efficiency of water delivery operations, improved and more efficient monitoring and management of the irrigation water delivery system.
(iii) Re-regulation in the Mid Murray Storage of 19GL of water savings from Lake Mokoan decommissioning through the Torrumbarry Irrigation System and release of this volume for downstream consumptive use; exchange of 19GL to the Snowy River from the Murray system via the Snowy Mountains Scheme.
(iv) The Lake will be drawn-down to a water level at or below the natural sill level of the former wetlands by December 2008. The need for releases to achieve this will depend on inflows into the Lake during 2007 and 2008. All releases will be subject to the normal operating rules for the storage.
(v) The hydrology of the Mokoan basin will return to a natural water regime by breaching the dam wall and decommissioning the Inlet and Outlet Channels. The removal of Lake Mokoan as a water storage will allow greater volumes of unregulated flows to pass down the Broken River into the Goulburn and Murray systems. The Broken River in particular will benefit from significantly more natural flow regimes.
(vi) The extensive Winton wetlands system that was inundated by Lake Mokoan will be progressively rehabilitated through the re-establishment of more natural water regime and the implementation of a rehabilitation plan and Lake Mokoan Future Land Use Strategy (FLUS).

Key decommissioning activities:
Lake Mokoan will be decommissioned as a water storage by creating a 10m wide breech in the existing dam, removing structures and partially infilling the Inlet and Outlet Channels. This will re-establish a more natural water regime in the wetland basin.

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)

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

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

The project includes the Tungamah domestic and stock piped water supply. This is one of the water supply offset measures and will provide part of the water savings. It has been approved, constructed and commissioned.

The FLUS will be implemented over the next 2-10 years and involve a range of activities to develop sections of the site for conservation, recreation, tourism, education and non-intensive agricultural activity in surrounding areas of the site.

4. Project alternatives

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

- Do nothing – maintain Lake Mokoan as an active water storage. This option has not been chosen because it would retain a highly inefficient storage, prevent or hinder planned environmental flows for river systems and prevent rehabilitation of the extensive wetland complex.
- Decommissioning without water supply measures. Not chosen because existing water users would be disadvantaged.
- Decommissioning without Mid Murray Storage. Not chosen because Mid Murray Storage is essential to allow transfer of water savings volume to the Snowy River for environmental flows.
- Partitioning the Lake to allow some capacity for water storage. Not chosen because of high costs, potential ecological and heritage impacts, loss of portion of the water savings and compromise of the integrity of the rehabilitated wetland complex.

Infrastructure site and route selection: A range of options have been considered for the siting of various infrastructure components. Preliminary flora, fauna and heritage assessments have been undertaken. The proposed siting has been chosen to best achieve the objectives of the project and minimise any adverse environmental impacts.

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

Not applicable.

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:

The implementation of the Lake Mokoan Future Land Use Strategy (FLUS) will be undertaken in the next 2 to 10 years. Implementation of the FLUS will compliment the ecological rehabilitation of the wetland basin by creating interpretation and other facilities. The Planning and Development issues for this will be addressed closer to the time of implementation. This will include planning requirements under the *Planning and Environment Act* (Planning Scheme Amendment and Planning Permits for proposed land use changes). All components and infrastructure for the current project are independent of the FLUS and will not be affected by the FLUS planning process.

6. Project implementation

Implementing organisation:
Goulburn-Murray Water (G-MW)
Implementation timeframe:
The project is planned to be implemented over the next 2 years with decommissioning of Lake Mokoan in early 2009. The infrastructure components of the project will be completed before the dam wall is breached to ensure water supply is provided to existing users around the Lake, the reliability of supply in the Broken system is maintained and the Mid Murray Storage is operational.
Proposed staging (if applicable):
The planned timeframes for key components are:
- Alternative water supply to Lake diverters – second half of 2007
- Construction of channel and floodway for the Mid Murray Storage – second half of 2007
- Implementation of water supply offset measures in the Goulburn- Broken system – July 2006 to December 2008
- Drawdown of Lake Mokoan – during 2008
- Breaching of the Lake Mokoan dam wall – January 2009
- Rehabilitation of the Winton wetlands – from January 2009

The project includes the Tungamah pipelining, which has been completed.

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).

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):
Lake Mokoan and the Mid Murray Storage lie mainly within the Victorian Riverina Bioregion. Part of the northern shore of Lake Mokoan extends into the adjacent Northern Inland Slopes Bioregion. The Victorian Riverina Bioregion is characterised by flat to gently undulating land on recent unconsolidated sediments with evidence of former stream channels.

- Lake Mokoan is a large, shallow, off-river water storage in the mid-reaches of the Broken River which was built in the early 1970s over the site of several large wetlands (including Winton and Green Swamps). It has a maximum storage capacity of 365,000 ML, a maximum depth of 7 m and annual evaporative losses averaging 50,000 ML. The Lake is used to capture flows in the Broken River and provide supply for downstream irrigation, stock and domestic use and town water. Physical features include a 17km Inlet Channel, an 8km Outlet Channel and the 7.5km dam wall. Soils consist of slightly saline calcareous dark clay, pale gradational soil and coarse sandy loam. A clayey sand lunette occurs between Winton and Green Swamps. The original River Red Gum woodland over much of the Lake site was killed by near-permanent inundation. Recent investigations (Refs 1&2) recorded 11 EVCs including large areas of wetland vegetation with 8 EVCs. The extent of wetland vegetation varies widely with hydrological regime. Large vegetated areas were present in January 2006 and only sparse vegetation occurred in February 2007. This vegetation is expected to be highly variable and mobile with water regime in the long term. Dryland vegetation around the Lake is highly modified by agriculture. Surrounding areas include exotic pasture and herbfields and sparse dryland box woodland with a predominantly exotic grassy (Phalaris) understory.
- Lakes Boga and Charm and Kangaroo Lake are part of a complex system of wetlands, streams and man-made infrastructure to the south of the Murray River between Kerang and Swan Hill. Kangaroo Lake and Lake Charm have been incorporated into the extensive, interlinked system of channels, lakes, weirs and streams which forms the Torrumbarry Irrigation System (TIS). Flow enters the TIS from the Murray River at Torrumbarry Weir via the National Channel and flows through a series of wetlands, creeks, channels before reaching Kangaroo Lake and Lake Charm (both off-stream storages). Until the mid 1960's Lake Boga was part of the TIS, but it now relies on floodwaters from the Avoca River, and rain rejection flows from the TIS for its inflows. Lake Charm discharges to the Murray River via a pump station and channel. Releases from Kangaroo Lake can be directed to the Little Murray River or Lake Boga. The majority of Lake Boga lies within the Murray Fans Bioregion, whilst the southernmost section is in the Murray Mallee bioregion. Much of the Kerang Lakes area consists of Tertiary alluvium, some being overlain by Quaternary alluvium from the Avoca and

Loddon Rivers. Lunettes occur on the eastern flanks of many of the wetlands. Lake sediments are grey, often saline calcareous clays, while the lunette deposits are finely textured duplex soils of red sands and calcareous clays. Vegetation at and surrounding the Lakes has been largely cleared for irrigated agriculture.

Site area (if known):
Lake Mokoan 7,800Ha
Lake Boga 930Ha
Lake Charm 520Ha
Kangaroo Lake 980Ha
Route length (for linear infrastructure) (km) **and width** (m)
Mokoan alternative supply to Lake diverters – approximately 15km underground pipeline
Kangaroo Lake floodway route length approximately 2.5km
Lake Boga outfall channel route length approximately 3.5km

Current land use and development:
Lake Mokoan – Recreation (fishing, duck hunting, yachting, water skiing, day visits), water supply, agriculture (surrounds)
Lakes Boga, Kangaroo and Charm have been set aside by Government for the purpose of water supply and drainage, and protection of the environment when this does not conflict with its primary use.
Lake Charm, Kangaroo, Boga - Water supply, conservation, recreation and tourism (sightseeing, camping, swimming, sailing, water skiing, boating, fishing).
Mid Murray Storage channels - Existing water infrastructure, agriculture

Description of local setting:
Lake Mokoan - agricultural (viticulture, orchards, dry land stock grazing)
Lakes Charm, Kangaroo, Boga – grazing, irrigated agriculture

Planning context (eg. strategic planning, zoning & overlays, management plans):
Lake Mokoan and surrounds – Public Use (Service and Utility)
Broken River - Public Conservation and Resource, Farming, Urban Floodway
Lake Boga, Lake Charm and Kangaroo Lake – Public Conservation and Resource
Other infrastructure – predominantly Farming Zone with some areas along streams zoned Public Conservation and Resource
See Attachment C

Local government area(s):
Benalla Rural City - Lake Mokoan, alternative supply to Lake diverters, water supply offset measures
Greater Shepparton - Water supply offset measures
Gannawarra Shire - Kangaroo Lake and floodway connection, Lake Charm
Swan Hill Rural City - Lake Boga and channel to Little Murray River

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)**:**
Several threatened species listed under the *Flora and Fauna Guarantee Act* (FFG Act) and Advisory Lists have been recorded or may occur at the project areas (refer to Section 12 and Attachment E)

- Lake Mokoan - There is little intact remnant vegetation in or adjacent to the Lake. Wetland littoral vegetation noted in Section 7 is highly variable and mobile with water regime. Nearby remnant vegetation includes the Warby Ranges State Park, Chesney Vale hills and Mount Meg Reserve. A total of 34 indigenous archaeological sites are known to exist within 5km of Lake Mokoan, comprising scarred trees, rock wells, artefact scatters and mounds. There are two registered sites (scarred trees) within the boundaries of the Lake Mokoan site (Ref.6).
- Broken River - The River has relatively high environmental values for a lowland stream due to a range of factors including good habitat diversity, connectivity with the Murray River and with the floodplain and remnant riparian vegetation (Ref. 4). It supports riparian woodland along much of its length. Nearby remnant vegetation includes Mt Samaria State Park and State Forests along ridges in the upper catchment, and Reef Hills State Park near Benalla Broken Creek, Lower Broken River, Lower Goulburn River Floodplain are listed in the Directory of Important Wetlands in Australia (DIWA). These wetlands will benefit from increased environmental flows and the return to more natural seasonal flow regime in Broken River.

- Mid Murray Storage - The 3 Lakes and proposed channel and floodway are in a highly disturbed agricultural landscape and surrounded mostly by non-native vegetation. Nearby remnant vegetation comprises: Loddon River floodplain 3km north-east of Lake Charm and part of the Avoca floodplain around Third and Second Marsh and Lake Cullen about 2.5km south-west of Kangaroo Lake. Lake Charm and Kangaroo Lake are part of the Kerang Lakes Ramsar site, comprising 23 wetlands, covering 9,419 hectares and located at the junction of three major floodplains, associated with the Avoca, Loddon and Murray Rivers. The following wetlands in the vicinity are listed in the DIWA: Avoca Floodway (Tutchewop Plains), Third Marsh (Top Marsh), Second Marsh (Middle Marsh), First Marsh (The Marsh), Lake Bael Bael, Lake Cullen, Little Lake Charm, Kangaroo Lake & Racecourse Lake, Lake Charm, Lake William, Lake Kelly & Stevensons Swamp, Third, Middle and Reedy Lakes, Town Swamp, Cemetery Swamp, Fosters Swamp. Kangaroo Lake and Lake Charm are rated as poor for water birds (breeding and non-breeding). Atlas of Victorian Wildlife records from 1980-2003 include 30 and 26 water bird species, and 363 and 555 birds (out of approximately 75,000 birds recorded throughout Kerang Lakes) at these lakes respectively. Breeding at Kangaroo Lake comprises 1 species (Nankeen Night Heron) in 4 years and 3 species (Swamp Harrier, Australian Shelduck, Black-fronted Dotterel) in single years. No breeding events have been observed at Lake Charm (Ref.5). Lake Charm and Kangaroo Lake have low and moderate, respectively, conservation value. Lake Charm supports 5% of the state or 10% of the regional population of Great Crested Grebe. Several Indigenous heritage sites occur around Lake Boga, including 18 mounds, a burial site and an artefact scatter (Ref.7). All but 2 of these sites occur on the eastern shoreline and lunette. The Lake Boga landscape has significance for the Wembawemba community. One site (a scar tree) is known on the eastern margin of Lake Charm. The proposed route of the Kangaroo Lake Floodway is moderately to heavily disturbed due to existing channel construction and agricultural activity and only 100 m of the proposed development (the margin of the Lake) is expected to be archaeologically sensitive.

There are 13 State Reserves located within the study areas. Seven of these State Reserves are located within Lake Mokoan or within a 2 km radius of Lake Mokoan. Four are located within the environs of Kangaroo Lake and Lake Charm, and two are located within the environs of Lake Boga.

9. Land availability and control

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

☐ No ■ Yes If yes, please provide details.

Lakes Charm, Kangaroo and Boga are Crown Land (Water Supply Reserves).

Current land tenure (provide plan, if practicable):

- Lake Mokoan, Inlet Channel, Outlet Channel, Supply to Lake diverters – Freehold land owned by Goulburn-Murray Water.
- Offset packages – Proposed infrastructure is on freehold land owned by Goulburn-Murray Water, Crown Land along watercourses (including the Broken River) and some freehold (farm) land.
- Lake Boga – Crown land. A section fringing the Lake is Crown Land managed by Swan Hill Rural City Council under the *Crown Land (Reserves) Act 1978* (CLR Act).
- Kangaroo Lake and Lake Charm are Water Supply Reserves managed by Goulburn-Murray Water under the CLR Act.
- The proposed alignments for the Kangaroo Lake outlet floodway is located on cleared freehold land (with existing or proposed easements) and on land owned by G-MW.

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

- Lake Mokoan – Public land used for wetland, tourism and recreation, and surrounding dry land lacking significant environmental values may be used for agriculture.
- Lake Charm, Kangaroo, Boga - No change to land use proposed
- Mid Murray Storage channels - No change to land use proposed, though some localise impacts may occur on individual properties from channel/floodway works

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

Water supply easements exist along or near parts of the routes for the Kangaroo Lake floodway and the Lake Boga outlet channel.

Native Title – The Wamba Wamba, Barapa Barapa and Wadi Wadi Peoples are Native Title Claimants for an area covering the Mid Murray Storage (VC00/5).

10. Required approvals

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

A referral under the *Environment Protection and Biodiversity Conservation Act 1999* has been submitted to the Federal Minister for the Environment and Water Resources. A determination is expected in March 2007.

Have any applications for approval been lodged?

☐ No ■ Yes If yes, please provide details.

See above

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

Australian Government Department of the Environment and Heritage

Other agencies consulted:

Goulburn Broken Catchment Management Authority, Goulburn–Murray Water

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):
Refer to Attachment D, which provides a summary of the *Environmental Effects Act* criteria for the project

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?
Preliminary flora and fauna assessments undertaken for the alternative supply to Lake diverters, Kangaroo Lake floodway and Lake Boga outlet channel (Refs 1, 2, 3, 7, 13).

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

■ NYD ☐ Estimated area (hectares)

Clearing of native vegetation will be minimised by selective siting and routing of infrastructure to utilise existing cleared or disturbed areas and avoid native vegetation where ever possible. Detailed surveys will be undertaken prior to construction to avoid significant flora.

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 ☐ Preliminary/detailed assessment completed. If assessed, please list.

Much of the affect land within the Lake Mokoan basin and around Mid Murray Storage has been heavily disturbed by water storage, water supply infrastructure or agriculture.

- Lake Mokoan - Wetland Plains Rushy Wetland (EVC 961), Plains Grassy Wetland (EVC 125), Tall Marsh (EVC 82), Cane-grass Wetland (EVC 291), Red Gum Swamp (EVC 292), Drainage-line Aggregate (EVC 168), Lakebed Herbland (EVC 107), Submerged Aquatic Herbland (EVC 918); Dryland) – Plains Grassy Woodland (EVC 55), Lunette Woodland (EVC 652), Grassy Woodland (EVC 175) (Ref 1). Wetland EVCs were present in January 2006, but are likely to be variable with hydrological regime.
- Lake Charm - Exotic Non-native vegetation (969), Small area of Lignum Wetland (EVC 104) (in Lake Charm/Little Lake Charm)
- Kangaroo Lake – predominantly Exotic Non-native vegetation (969)
- Kangaroo Lake floodway – Exotic Non-native vegetation (969), Chenopod Grassland (EVC 829), Outfall to the Avoca Floodway is Riverine Chenopod Woodland (103)
- Lake Boga – predominantly Exotic Non-native vegetation (EVC 969) around the Lake with some Riverine Chenopod Woodland (EVC 103) and Semi-arid Woodland (EVC 97).
- Lake Boga Outlet – Largely cleared with some Riverine Chenopod Woodland (EVC 103) mainly along the Little Murray River, Riverine Grassy Woodland and Forest near the Little Murray Weir and Semi-arid Woodland (EVC 97) near Lake outlet.

Have potential vegetation offsets been identified as yet?

■ NYD ☐ Yes If yes, please briefly describe.

The project is likely to result in a net native vegetation gain from the rehabilitation of 6,800Ha of the Winton wetlands and surrounds, improved management of surrounding dryland areas, more natural seasonal flow regimes in the Broken River and increased environmental flows in the Broken, Goulburn, Murray and Snowy Rivers.

Other information/comments? (eg. accuracy of information)
EVCs were determined from ecological assessments and from a search of the DSE Catchment Information Mapper database

NYD = not yet determined

Flora and fauna

What investigations of flora and fauna in the project area have been done?

- Flora and fauna assessments of Lake Mokoan and surrounds (Refs 1, 2)
- Environmental assessment of options for the Mid Murray Storage (Ref.7)
- Preliminary flora and fauna assessments of the Kangaroo Lake floodway and the Lake Boga outlet channel (Refs 3, 13)
- Hydrologic and spatial modelling to assess potential impacts on the availability of suitable habitat for Latham's Snipe with decommissioning of Lake Mokoan (Ref. 12). This study assessed the variation in space (extent and location around the lake) and time (seasonality and year to year frequency/availability) of habitat for the species' migration season (September to February). The study was reviewed by independent ecologists including Birds Australia (Refs 9,10,11).
- Assessment of potential changes in short-term flow variability in the Broken River with decommissioning and likely water supply offset measures (Ref. 8). The study initially considered changes in average monthly flows. It then assessed expected changes in daily flows to determine the availability of critical flow features, such as shallow and slackwater habitat, and implications for native fish recruitment. The study was reviewed by Arthur Rylah Institute (Ref.9).

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.

See Attachment E listing species listed under the FFG Act or occurring on the DSE Advisory List of Threatened Vertebrate Fauna in Victoria (2003) or Advisory List of Rare or Threatened Plants in Victoria (2005).

If known, what threatening processes affecting these species or communities may be exacerbated by the project? (eg. loss or fragmentation of habitats) Please describe briefly.
See Attachment E listing Potentially Threatening Processes under the FFG Act.

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.

See Attachment F

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

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

The project is likely to result in a net benefit to flora and fauna habitat from the rehabilitation of 6,800Ha of the Winton wetlands and surrounds, improved management of surrounding dryland areas, more natural seasonal flow regimes in the Broken River and increased environmental flows in the Broken, Goulburn, Murray and Snowy Rivers.

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

Initial assessment of environmental impacts was undertaken with assistance from a panel of ecologists comprising Brett Lane (Brett Lane and Associates, Lawrie Conole and Geoff Carr (Ecology Australia), Terry Hillman (Hillman et al.), David Crook (Arthur Rylah Institute), Simon Treadwell and Kylie Lewin (SKM) and river managers from DSE and G-MW. Specialist consultants were used in all investigations. Key investigations for Latham's Snipe and flow variability were reviewed by the panel of ecologists to critique assumptions and methods, to identify and address any uncertainties and to ensure the studies were technically sound and complete. Further field surveying will be undertaken as part of the preliminary design of infrastructure works to identify significant features and plan suitable avoidance/mitigation measures.

13. Water environments

Will the project require significant volumes of fresh water (eg. > 1 Gl/yr)?
☐ NYD ■ No ☐ Yes If yes, indicate approximate volume and likely source.
This project will result in 48GL of water savings.

Will the project discharge waste water or runoff to water environments?
☐ NYD ■ No ☐ Yes If yes, specify types of discharges and which environments.

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.
Lake Mokoan will no longer be used for water storage and supply, and the extensive wetland system (covering 6,800Ha including fringing areas) inundated by the Lake will be rehabilitated. The Broken, Goulburn, Murray and Snowy Rivers will receive additional environmental flows from the generated water savings. Flow patterns in the Broken River will become closer to the natural regime.
Lake Charm, Kangaroo Lake and Lake Boga will be subject to minor operational changes and minor changes in water level fluctuation which will remain within agreed operating ranges. The Lakes would be filled from May to November and releases made to the Murray River during the subsequent irrigation season for downstream use. Proposed operating ranges for the Lake are:
- Lake Boga - 67.0 to 69.5mAHD (similar to current but increased regularity)
- Kangaroo Lake - increase by +/-30cm compared to current operation
- Lake Charm - 73.00 to 73.92mAHD (currently 73.52 to 73.92mAHD).

The proposed additional infrastructure works will allow greater flexibility to manage storage air space and mitigate flooding risks in the area particularly along downstream sections of the Avoca Floodway. Discussions have commenced with the North Central CMA about suitable flood management arrangements.

Are any of these water environments likely to support threatened or migratory species?
☐ NYD ☐ No ■ Yes If yes, specify which water environments.
Lakes Mokoan, Charm, Kangaroo and Boga are likely to support threatened and/or migratory species - see Attachments E and F.

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.
Lake Charm and Kangaroo Lake are listed in the DIWA (VIC046 and VIC050) and are part of the Kerang Lakes Ramsar site. The Ramsar listing recognises that 8 (including Lakes Charm and Kangaroo) of the 14 Kerang Lakes are used for water supply purposes. The intended use and management of these lakes for water supply purposes is also recognised in land use planning. The project is not expected to affect the representativeness of the Ramsar site, nor have a significant impact on the ecological character of the site. Lake Charm and Kangaroo Lake do not support significant diversity or abundance of waterfowl or substantial numbers of waterfowl (compared to the other lakes in the system) (Ref.7). Lake Charm will be subject to a doubling of water level range compared to historic management (from approximately 0.5m to 1.0m), although this will remain within the existing maximum operational range for the Lake. This is not expected to have any significant impacts in terms of permanent fresh water habitat. The changes may alter the littoral environment of the wetland, with a minor risk of encroachment of a weed species (Sharp Rush) in the areas of the Lake exposed for longer periods each year (approximately 2% of wetland area). This species may spread seasonally as the periphery is exposed but is likely to be drowned by subsequent inundation. This will be managed through monitoring to identify any encroachment and adaptive management contingencies to reduce the risk. The DIWA notes increasing salinity as a threat. Salinity levels are likely to reduce gradually with increased flushing of the Lake.
Changes in water level management at Kangaroo Lake are not expected to have any significant impact on the Lake's environment (Ref.7). Water levels variations will remain within the existing operating targets.
Recommendations for both lakes in the Directory include increasing water levels fluctuations to reduce salinity (for Lake Charm) and allow seasonal inundation of littoral areas. These threats and management actions have been recognised in the Ramsar Listing.
Lake Boga is not included in the Ramsar listing, nor is it listed in the DIWA.

The management of salt from these 3 Lakes will be a notifiable action under Schedule C of the Murray Darling Basin Salinity Management Strategy. Water management will be consistent with all interstate agreements particularly the MDBC Cap on further diversions.
The other DIWA wetlands in the vicinity will not be affected.

- Avoca Floodway (Tutchewop Plains) (VIC131) is downstream of, and will not be affected by, releases the project sites.
- Flows in the upper section of the Avoca floodway will not be modified - Third Marsh (Top Marsh) (VIC056), Second Marsh (Middle Marsh) (VIC054), First Marsh (The Marsh) (VIC038), Lake Bael Bael (VIC045), Lake Cullen (VIC047).
- Lakes William (VIC049) and Lake Kelly (VIC048) are hydrologically separate from the project lakes.
- Operation and management of Little Lake Charm, Racecourse Lake (VIC050), Stevensons Swamp (VIC048), Third, Middle and Reedy Lakes (VIC057), Town Swamp (VIC058), Cemetery Swamp (VIC037), Fosters Swamp (VIC039) will not be modified.

Could the project affect streamflows?

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

Lake Mokoan will be removed as an off-stream storage, resulting in more natural streamflow in the Broken River. Mid-Murray storages will be used to re-regulate water savings, with environmental flow benefits to the Broken, Goulburn, Murray and Snowy Rivers.

Could regional groundwater resources be affected by the project?

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

Changes to the operating regimes of Lakes Boga, Charm and Kangaroo to enable them to act as mid-Murray storages has the potential to alter their interactions with local groundwater systems (particularly at Lake Charm). This will be monitored.

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)

Lake Mokoan and the Mid Murray Storages are not covered by any SEPP Schedule.
Nonetheless, the following environmental values will be preserved (see Attachment D):

- aquatic ecosystems
- water based recreation
- water for agriculture and irrigation.

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

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

The former extensive wetland system and fringing areas underlying Lake Mokoan (6,800Ha) will be rehabilitated by re-establishing the natural water regime and active management. This will create significant aquatic ecosystem values that had been degraded by the Lake.
The instream and riparian ecosystems of the Broken, Goulburn, Murray and Snowy Rivers will benefit from increased environmental flows. Flows in the Broken River, in particular, will be returned to more natural seasonal patterns.
The aquatic ecosystems of Lakes Charm, Kangaroo and Boga are not expected to be adversely affected (Ref.7). Salinity in Lake Charm is expected to decline gradually from flushing.

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.

The project is expected to have significant positive effects on ecosystem health and biodiversity at Winton wetlands (Lake Mokoan) and the Broken, Goulburn, Murray and Snowy Rivers.
No extensive or major negative effects are expected at Lakes Charm, Kangaroo and Boga and connecting waterways (including Little Murray River).

Is mitigation of potential effects on water environments proposed?

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

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

See comments in Section 12. Additional information was obtained from Land Conservation Council reports, the DIWA, the Kerang Lakes Ramsar Site Ramsar Information Sheet and Description of the Ecological Character

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.

Areas identified on the Environmental Significance Overlays:

- Site to the south of Lake Mokoan near Winton township (ES01) (not in project area)
- Loddon River and Sheepwash Creek to the east of Lake Charm (ES01) (not in project area)
- Area north of Lake Charm (ESO4)
- Lake Kangaroo (and surrounding lakes) (ESO3)
- Lake Kangaroo floodway (ESO4)
- Lake Boga (ESO1)

Areas identified on Landscape Significance Overlays:

- Warby Ranges State Park located to the east of Lake Mokoan (SL01) (not in project area - closest point 3km)

Plans of these sites are in Attachment C.2.

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

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

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

Lake Mokoan and its foreshores are used for recreation. Lake Charm and Kangaroo Lake are used for conservation and recreation. Lake Boga is used for recreation. These uses are not expected to be adversely affected.

There are several reserves along the Broken River, particularly downstream of Benalla. The use of these areas will not be adversely affected.

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

Is there a potential for effects on landscape values of regional or State importance?
☐ NYD ☐ No ☐ Yes Please briefly explain response.

Is mitigation of potential landscape effects proposed?
☐ NYD ☐ No ☐ Yes If yes, please briefly describe.

Other information/comments? (eg. accuracy of information)
Information was obtained from Planning Schemes and existing reports.

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.

Are there geotechnical hazards that may either affect the project or be affected by it?
☐ NYD ☐ No ☐ Yes If yes, please briefly describe.

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.

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 inundated area of Lake Mokoan will be reduced. However, the visual amenity of the Winton wetland complex will be enhanced through rehabilitation.

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.

No hazardous emissions are expected from the project.

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.

Access to the Lake Mokoan site has been assessed in several studies and mitigation measures identified (such as maintaining bridges).

In all other cases there will be no impact - access infrastructure will be maintained or improved.

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.

Lake Mokoan/Winton wetland complex, once rehabilitated, will no longer be suitable for sailing of (motorised) boating. A broad range of other activities will be possible following decommissioning and rehabilitation of the wetland.

Existing beneficial uses of the Mid Murray Storages will continue. Recreational and tourism uses at Lake Boga will benefit from more secure water supply and levels. Salinity in Lake Charm is expected to decline gradually from flushing.

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.

Several studies have assessed potential social and economic impacts from the project and concluded that these can be managed through the provision of suitable water supply offset and other measures. A small lifestyle rural residential subdivision and a caravan park on the western side of Lake Mokoan will be located further from water recreation sites as a consequence of the reduced water level in the Lake. The project will develop new social and economic resources through the implementation of the FLUS.

No adverse impacts are expected at the Mid Murray Storage.

Is mitigation of potential social effects proposed?

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

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.

Lake Mokoan - Consultation was undertaken with the following Indigenous community stakeholders in the initial phase of the development of the FLUS (Ref.6):
- Rumbalara Aboriginal Co-operative Ltd
- North East Region Aboriginal Cultural Heritage Program
- Yorta Yorta Nation Aboriginal Corporation
- Taungurong Clans Aboriginal Corporation
- Bangerang Cultural Centre Co-operative Ltd
- Mungabareena Aboriginal Corporation.

This contributed to clarifying the cultural heritage values of Lake Mokoan and its environs, and the appropriate and necessary cultural heritage process for the project.
Initial consultation has occurred at the Mid Murray Storage sites with representatives from relevant Indigenous community organisations present during recent archaeological field surveys of the proposed Kangaroo Lake floodway and Lake Boga outfall channel (Refs 15,16).

What investigations of cultural heritage in the project area have been done?

Heritage investigations have been carried out at Lake Mokoan during the development of the FLUS (Ref.6). Cultural heritage studies have also been done at Lakes Charm, Kangaroo and Boga incorporating desktop study and fieldwork (Ref.15,16).

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

Lake Mokoan: two registered AAV sites (scarred trees), 34 known indigenous archaeological sites within 5km, comprising scarred trees, rock wells, artefact scatters and mounds
Lakes Charm and Kangaroo: One site (a scar tree) is known on the eastern margin of Lake Charm. The proposed route of the Kangaroo Lake Floodway is moderately to heavily disturbed due to existing channel construction and agricultural activity and only 100 m of the proposed development (the margin of the Lake) is expected to be archaeologically sensitive.
Lake Boga: There are over 180 registered sites within the vicinity of Lake Boga. Sites around the Lake including 18 mounds, a burial site and an artefact scatter. All but 2 of these sites occur on the eastern shoreline and lunette. The Lake Boga landscape has significance for the *Wembawemba* community.

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.

Lake Boga: 2 known archaeological sites on the HV Site Inventory within 3 km radius of Lake

Is mitigation of potential cultural heritage effects proposed?

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

Potential risks can be minimised through on-going consultation and appropriate management. Monitoring of earthworks will be done in consultation with representative Aboriginal organisations. Protocols for further consultation recommended by heritage consultants will be implemented at Lake Mokoan. Detailed surveys will be undertaken at the site and along the final routes for all infrastructure works to identify archaeologically sensitive areas and sites of heritage significance. This will minimise the risk of minor localise disturbance from infrastructure construction.

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

Heritage assessments have been undertaken by qualified specialists and involved consultation with local Indigenous organisations. Future surveys will be done by specialists and in consultation with local Indigenous communities.
A field survey will be carried out by a suitably qualified archaeologist and an appropriate local Aboriginal representative(s) of the Lake Mokoan area in the first half of 2007 while low water levels allow access. The survey will seek to validate the location of registered sites and identify any new sites and any areas of potential sensitivity
Protocols will be developed by qualified specialist for ongoing consultation with Aboriginal stakeholders and defining “the process for the dissemination of information at each stage of the project, to the indigenous communities” (Ref.6).

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.

Minor

Please add any relevant additional information

Only minor short-term energy use for construction

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.

Only minor short-term waste generation for construction

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.

Only minor short-term greenhouse gas generation from fuel use for construction

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

Preliminary design investigations, including on-ground assessment of flora, fauna and heritage features, are proceeding for
- Lake diverters alternative supply;
- the Kangaroo Lake outfall floodway; and
- Lake Boga outfall channel.

This and other technical information will be used to optimise the route alignment/site selection to avoid identified significant features. Heritage investigations include consultation with the local representative Aboriginal organisations. Clearance of native vegetation will be minimised and areas of significance avoided where ever possible.

Several measures are being implemented for the alternative supply to Lake diverters to minimise vegetation disturbance. The channel from the Broken River and the southern balancing storage (if required) will be placed in the bed of the existing Lake Mokoan Outlet Channel. The pump station will be on the Outlet Channel Reserve. The pipeline will be routed underground along the Lake foreshore below the existing Lake Full Supply Level. The northern balancing storage will be sited below the existing Lake Full Supply Level.

- ☐ Design: Please describe briefly

- ■ Environmental management: Please describe briefly.

Construction and installation of all infrastructure works will be done with best practice techniques and be subject to Environmental Management Plans.

■ Other: Please describe briefly

Monitoring and assessment will be undertaken in February to April 2007 of:
- Latham's Snipe populations and vegetation associations; and
- the location, extent, composition and structure of wetland littoral vegetation that has established near the 2006 (low) water level over the last 12 months.

This information will be used to develop water regime management strategies for the next 2 years leading to decommissioning of Lake Mokoan in December 2008 aimed at facilitating the recolonisation of suitable littoral vegetation down the basin profile towards the level of the natural wetlands. This will also assist in establishing suitable vegetation structure close to future mud flats for Latham's Snipe habitat.

Add any relevant additional information.

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.

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.

Has a program for future environmental studies been developed?

☐ No ■ Yes If yes, briefly describe.

Detailed flora, fauna and heritage studies will be carried out for all infrastructure works to identify environmentally significant or sensitive sites. Environmental Management Plans will be prepared for all infrastructure works.

The monitoring program for the rehabilitation of the wetland basin will be developed in 2007. Initial monitoring of the drawdown has commenced.

Consultation program

Has a consultation program conducted to date for the project?

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

Lake Mokoan – Development of the FLUS included thorough community consultation about the decommissioning and the future options for the area. Benalla Rural City Council has been consulted about the project. Consultation has also been done directly with landholders requiring alternative water supplies. Broad community and stakeholder consultation has been undertaken for the water supply offset measures.

Mid Murray Storage – Initial consultation has been done with landholders who may be affected by the project. The project has been discussed with Swan Hill Rural City and Gannawarra Shire Councils.

Has a program for future consultation been developed?

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

Lake Mokoan – The second phase of consultation with local indigenous organisations and communities will be timed to coincide with on-ground heritage surveys during 2007. Consultation is continuing with the regional community about the decommissioning, the alternative water supply to Lake diverters and the water supply reliability offset measures.

Mid Murray Storage – The next stage of consultation will proceed when the preliminary designs of infrastructure works are available.

Authorised person for proponent:

I, David Downie, General Manager, Office of Water, Department of Sustainability and Environment, confirm that the information contained in this form is, to my knowledge, true and not misleading.

Signature _____

Date

Person who prepared this referral:

I, Paul Lloyd, Senior Project Officer, Major Projects, Office of Water, Department of Sustainability and Environment, confirm that the information contained in this form is, to my knowledge, true and not misleading.

Signature _____

Date