Government of Western Australia
Department of Transport
Driver and Vehicle Services

mainroads WESTERN AUSTRALIA

Restricted Access Vehicle

Agricultural Machine

Operational Guidelines

December 2017

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DEFINITIONS

The following are definitions for terms used in these Operational Guidelines. Refer to the definitions in the Road Traffic Act 1974 and any subsidiary legislation to this Act for the meanings of any terms not defined in this section.

"Axle Spacing" means

(a) the distance from the centre of any single axle to the centre of any other single axle;

(b) the distance from the centre of any single axle to the centre of the furthest axle in any axle group; or

(c) the greatest distance between the centres of axles in any axle groups.

"Curfew": means a period when the movement of an Agricultural Machine is not permitted.

"Day-time Hours": means those hours between sunrise and sunset. Sunrise and sunset times can be obtained:

- from the Perth Observatory website at www.perthobservatory.wa.gov.au
- by contacting the Perth Observatory on 08 9293 8255, or
- from the Geoscience Australia website at www.ga.gov.au/geodesy/astro/sunrise.jsp .

"*Friday Long Weekend*": means a weekend extended to three days where the preceding Friday is the granted Public Holiday.

"Front Projection": means the distance measured from the front of the lens of the vehicle's headlights to the forward most part of the vehicle.

"Monday Long Weekend": means a weekend extended to three days where the following Monday is the granted Public Holiday.

"Night-time Hours": means those hours between sunset and sunrise. (See also "Day-time Hours")

"Notice": means a Restricted Access Vehicle Notice issued under Part 4 of the *Road Traffic (Vehicle Standards) Regulations 2002*

"Posted Speed Limit": means the speed limit indicated on the speed limit sign or in the absence of a speed limit sign in a built-up area, 50 kilometres per hour.

"Projection": means the distance an object extends beyond the normal confines or body of the vehicle to the front, side or rear.

"RAV": means Restricted Access Vehicle and includes an Agricultural Machine.

"RAV Network 2": means the Restricted Access Vehicle Network 2 of Permitted Roads, published electronically on Main Roads website www.mainroads.wa.gov.au or available from Main Roads Heavy Vehicle Operations.

"Retro-reflective Material": means a material that conforms with Class 1 or Class 2 specifications in the *Australian Standard AS/NZS 1906.1:2007 – Retro-reflective Materials and Devices for Road Traffic Control Purposes*.

"Special Permit" means a Temporary Permit Exceeding 48 hours (for licencing purposes) for over-mass and over-dimensional vehicles, available from the Department of Transport

"Vehicle Regulations": means the *Road Traffic (Vehicles) Regulations 2014*.

Main Roads Website - www.mainroads.wa.gov.au

If you require any assistance, contact Main Roads on **138 HVO (138 486)**.

1. APPLICATION

This document applies to a *Class 1 Restricted Access Vehicle* that is a self-propelled Agricultural Machine and is operating under the Restricted Access Vehicle (Agricultural Machine) Exemption Notice, known as RTVSR-2014-00123.
It establishes a set of Operational Guidelines for an Agricultural Machine that, if followed, will ensure compliance with the requirements of the Notice.

The Notice applies only to a Class 1 Vehicle that -

(a) is an Agricultural Machine; and
(b) has only a single axle to the front and a single axle to the rear of the vehicle: and
(c) has *Axle Spacing* between 1.83 metres and 10.00 metres; and
(d) has a mass limit for a single axle with 2 tyres no greater than 9 tonnes; and
(e) has a mass limit for a single axle with 4 or more tyres no greater than 12 tonnes; and
(g) is licensed, or is covered by a valid *Special Permit*, or is being moved by a dealer using Trade Plates; and
(f) is operating within Western Australia.

2. COMPLYING WITH LICENSING CONDITIONS

Drivers and operators are reminded that in addition to these Operational Guidelines, the Agricultural Machine must be driven in accordance with any conditions of the vehicle's licence.

3. MASS LIMITS & TYRE SIZES

3.1 An Agricultural Machine must not exceed a mass limit specified for an axle in the table below:

Width of narrowest tyre on axle (mm)		Mass limit (t)	
at least	less than	axle with 2 tyres	axle with 4 tyres
190	228	4.5	9.0
228	254	5.0	9.5
254	279	6.0	10.0
279	305	6.5	11.0
305	330	7.0	12.0
330	356	7.5	12.0
356	381	8.0	12.0
381		9.0	12.0

3.2 Ground Contact Width & Axle Mass Limits

Subject to sub-clause 3.1, an Agricultural Machine must not exceed a mass limit specified for an axle in the table below:

Number of tyres on an axle	Mass limit (t)
Axle fitted with 2 tyres	9.0
Axle fitted with 4 or more tyres and a ground contact width less than 2.51 m	9.0
Axle fitted with 4 or more tyres and a ground contact width at least 2.51 m but not more than 3.5 m	10.5
Axle fitted with 4 or more tyres and a ground contact width more than 3.5 m	12.0

4. DIMENSION LIMITS

4.1 An Agricultural Machine must not exceed 4.6 metres in height.

4.2 An Agricultural Machine must not exceed 12.5 metres in length (12m if using Trade Plates).

4.3 An Agricultural Machine must not exceed 6.0 metres in width.

4.4 An Agricultural Machine must not exceed 4.5 metres rear overhang.

4.5 Despite sub-clause 4.4, an Agricultural Machine that is an auger or conveyor may have a rear overhang not exceeding 5.5 metres.

4.6 An Agricultural Machine must be reduced to the smallest possible dimension, i.e. any boom or other equipment fully retracted.

Note: For the purpose of this clause, any flags, lights or mirrors on the Agricultural Machine shall be disregarded when measuring the dimensions.

5. AXLE SPACING

5.1 The *Axle Spacing* of an Agricultural Machine must be between 1.83 metres and 10.00 metres.

6. WARNING DEVICES

6.1 Lights

6.1.1 An Agricultural Machine must operate with headlamps switched on at all times, unless the machine is not required to be fitted with headlamps under the *Vehicle Regulations*.

6.1.2 An Agricultural Machine in excess of 2.5 metres in width must display at least one amber flashing warning light, visible at a distance of 500 metres in all directions, or supplemented by additional warning lights so at least one warning light is visible in all directions.

6.1.3 A warning light must comply with the requirements in the *Oversize Vehicle & Pilot Vehicle General Requirements* on the Main Roads website.

6.1.4 An Agricultural Machine must not display an amber flashing warning light if not required under this clause.

6.2 Warning Signs and Flags

6.2.1 An Agricultural Machine in excess of 2.5 metres in width must clearly display “Oversize” warning signs on the front and rear of the vehicle.

6.2.2 An “Oversize” warning sign must comply with the requirements in the *Oversize Vehicle & Pilot Vehicle General Requirements* on the Main Roads website.

6.2.3 An Agricultural Machine must not display an “Oversize” warning sign if not required under this clause.

6.2.4 An Agricultural Machine in excess of 2.5 metres in width must have 4 brightly coloured flags or pieces of material, with each side at least 450mm long. One of these flags must be positioned at each side of the front and rear of the vehicle.

6.2.5 An Agricultural Machine must display striping made from a *retro-reflective material*, coloured red and white, or red and yellow, along both sides of any rigid projection that extends more than 1.2 metres in front of the vehicle's body.

6.2.6 Any part of an axle on an Agricultural Machine that projects more than 150 mm from the outside wall of the tyres must be painted fluorescent yellow or have yellow fluorescent or other high-visibility material wrapped around it.

6.3 Additional Warning Devices at Night-time

An Agricultural Machine travelling during *night-time hours* must display:

(a) A warning light, as per paragraph 6.1.3, if the Machine is in excess of 2.5 metres in width;

(b) Lights showing yellow to the front and red to the rear (known as "side marker lights") no more than 2 metres apart along both sides of the vehicle and along any front or rear projection;

(c) Two (2) red lights (known as "rear clearance lights") fitted to the rear most part of the vehicle, within 400 mm of each side of the vehicle and at least 1 metre, but not more than 2.1 metres, above the ground; and

(d) On both sides of a projection that is extending more than 1.2 metres in front of the vehicle's body:

(i) Yellow lights fitted as far forward as possible and shielded from the driver's view, being visible to traffic approaching from the front and at least one light must be visible to traffic approaching from either side; and

(ii) Despite paragraph (b), side marker lights along both sides of the front projection, no more than 1.5 metres apart.

7. AREA & ROUTE CONDITIONS

7.1 Approved Areas of Travel

An Agricultural Machine must only travel within the Local Government boundaries listed in *Appendix 1*.

7.2 Route Assessment

Prior to departure, the operator of the Agricultural Machine must assess the route of travel to ensure that it is suitable for use and that it can be driven along without contravening these Operational Guidelines.

Note: A list of overhead bridge heights is available in the Main Roads Distance Book, available on www.mainroads.wa.gov.au or may be purchased from Main Roads Heavy Vehicle Operations office.

It is an offence under Road Traffic Code 2000 to drive a vehicle past a "clearance" sign or a "low clearance" sign, if the vehicle, any vehicle connected to it or any load carried by the vehicle, is higher than the height (in metres) indicated by the sign.

A list of some cable heights are available on the Western Power website to assist operators.

7.3 Damage

An Agricultural Machine must not be driven along a route or within an area if to do so would be likely to cause:

(a) Disruption *to telecommunication, electrical, rail, gas, water or sewage services; or*

(b) Damage *to a road (including a bridge), structure, rail crossing or tree.*

7.4 Restricted Bridges

An Agricultural Machine must not be driven on a bridge listed in the "Agricultural Machines Restricted Bridges", available and maintained on the Main Roads website at www.mainroads.wa.gov.au .

Note: It is an offence under the Road Traffic Code 2000 for a vehicle to cross a bridge if the vehicle has a mass limit in excess of the posted mass limit for the bridge.

7.5 Speed Restrictions

An Agricultural Machine exceeding 3.5 metres in width must not be driven at a speed that exceeds the lesser of:

(a) The maximum vehicle speed defined as part of the vehicle licencing conditions; or

(b) 80 km/h or

(c) The posted speed limit

7.6 Other Agency Height Approvals

7.6.1 An Agricultural Machine exceeding 4.3 metres in height must not be driven on a road without current written approval from all the relevant Cable Operators, unless the height is less than 4.6 metres and the vehicle is being driven on a road that is listed in RAV Network 2.

7.6.2 Any written approval, obtained in accordance with this clause, and any conditions imposed as part of the written approval form part of the conditions of the Notice.

Note: "Contact Details for Other Agency Approvals", available on www.mainroads.wa.gov.au

7.7 Minimum Following Distance

7.7.1 The driver of an Agricultural Machine must maintain a distance of at least 200 metres from any other RAV travelling in front of it, unless:

(a) It is overtaking the vehicle in front or the vehicle in front is stopping;

(b) There is a separate lane available for the use of overtaking traffic;

(c) It is in an urban area and it is not reasonably practicable to maintain such a distance; or

(d) It is stopped, or coming to a stop for the purpose of complying with a provision of any law or avoiding conflict with other traffic.

7.7.2 Despite paragraph 7.7.1, an Agricultural Machine that is travelling over a bridge must always maintain a distance of at least 200 metres from any other RAV travelling in front of it.

8. PILOT REQUIREMENTS

8.1 Number of Pilot Vehicles

8.1.1 An Agricultural Machine must be accompanied by the minimum number of pilot vehicles specified Appendix 2.

8.1.2 An Agricultural Machine in excess of 3.1 metres in width must not travel during *night-time hours* in an urban area without being accompanied by a minimum of one pilot vehicle.

8.2 Standard Pilot Requirements

8.2.1 When operating outside the Perth Metropolitan Area in accordance with the Heavy Vehicle Agricultural Pilot Authorisation 2017 (found on the State Law Publisher website), a pilot facilitating the movement of an oversize Agricultural Machine is not required to hold a heavy vehicle pilot license.

8.2.2 When operating within the Perth Metropolitan Area, the driver of a pilot vehicle must hold a heavy vehicle pilot license.

8.2.3 Pilot vehicles must operate with their headlights switched on at all times.

8.2.4 Pilot vehicles must be operated in accordance with the *Oversize Vehicle & Pilot Vehicle General Requirements* on the Main Roads website.

8.3 Convoy Travel with Pilot Vehicles

8.3.1 A maximum of two Agricultural Machines may travel in convoy with one another when accompanied by pilot vehicles, unless otherwise specified on the permit.

8.3.2 When two Agricultural Machines are travelling in convoy, the pilot vehicle requirements and any other conditions that are applicable to the larger of the two Machines, apply to both Machines and the pilot vehicles must accompany both Machines as though they were one single Machine.

9. CURFEWS

9.1 Night-time curfews

An Agricultural Machine that exceeds 3.1 metres in width must not travel outside an urban area during *night-time hours*.

9.2 Public Holiday Curfews

9.2.2 An Agricultural Machine in excess of a dimension limit specified in the following table must not operate during the "Public Holiday *Curfew* Period" on any of the prohibited roads specified in the following table:

Width	Public Holiday *Curfew* Period	Prohibited Roads
Exceeding **4.5** metres	From sunset on the Wednesday prior to **Good Friday** until sunrise on the Tuesday after **Easter Monday** (over the **Easter Long Weekend**).	All roads within Western Australia.
	From sunset on 23rd December until sunrise on 4th January of the following year (over the **Christmas/New Year Period**).	• Albany Hwy (Bedfordale Road Train Assembly Area to Albany) • Brand Hwy • Eyre Hwy • Great Eastern Hwy • South Western Hwy (Armadale to Bunbury) • Great Northern Hwy (Roe Hwy to Mt Magnet)

9.2.3 If a public holiday falls on a Tuesday consecutive to a *Monday Long Weekend*, the *curfew* period specified in the above table is extended until sunrise on the following Wednesday.

9.3 Poor Visibility

9.3.1 The driver of an Agricultural Machine must not begin to travel if, due to circumstances such as fog, heavy rain, smoke, dust or insect plague:

(a) visibility is less than 250 metres during the day-time; or

(b) the headlights of a vehicle approaching within 250 metres could not be seen at night-time.

9.3.2 Where an Agricultural Machine is already travelling when visibility is reduced to the level described above, the driver must drive into the nearest safe parking area, and wait until visibility improves beyond that level before continuing to travel.

10. TOWING & LOADING RESTRICTIONS

An Agricultural Machine operating under this Notice must not:

(a) tow a trailer or any other vehicle;

(b) carry a load, unless the load is operating equipment that is specific to the operation of the Machine.

11. NOTICE SUSPENSION

Approval to operate an Agricultural Machine under the Notice to which these Operational Guidelines apply may be suspended when road and/or traffic conditions are considered unsuitable.
Main Roads WA personnel, Main Roads Traffic Escort Wardens or Police Officers may make verbal notification of such suspension.

12. NOTICE AMENDMENTS

The document "Agricultural Machines Restricted Bridges" is subject to periodic amendments, which include additional bridges being added to, or bridges being removed from the list of restricted bridges.

Any amendments to the "Agricultural Machines Restricted Bridges" document are made and published before close of business on Wednesday and take effect from midnight.

Operators and drivers are required to ensure they are operating vehicles on the public road network in accordance with the most current and up to date "Agricultural Machines Restricted Bridges" document.

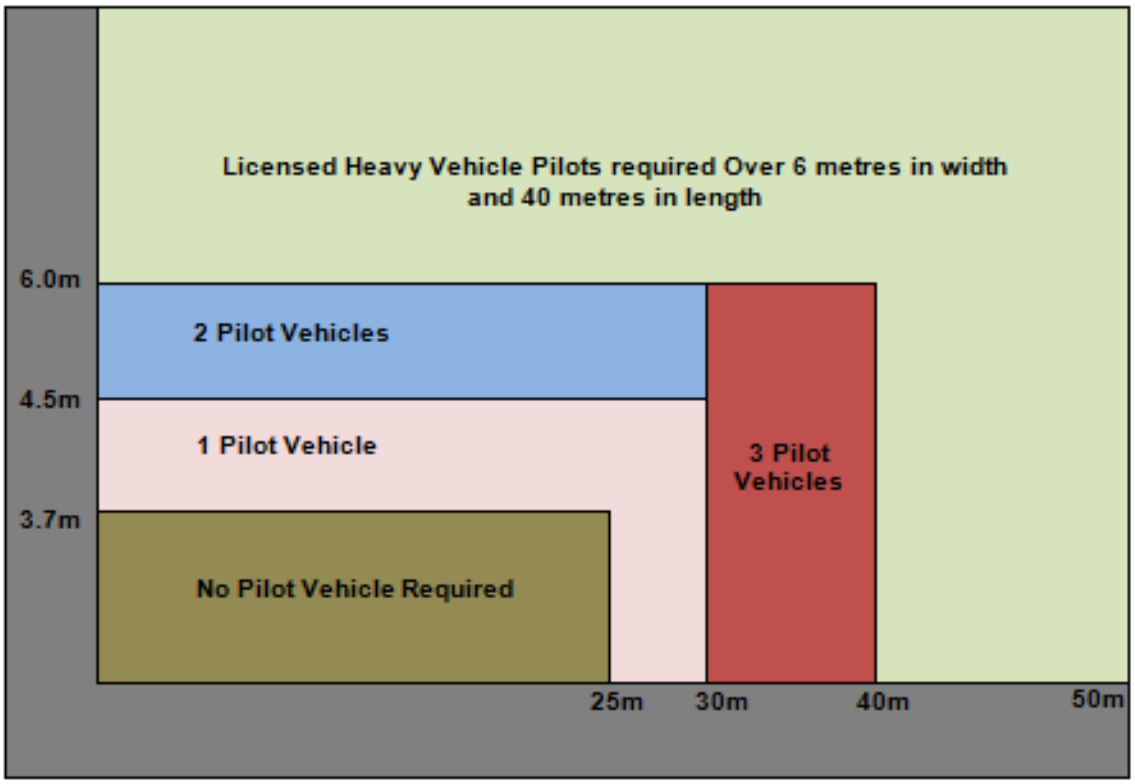
APPENDIX 1 – Approved Areas of Travel
(Local Government Boundaries)

Goldfields – Esperance Region	Great Southern Region	Mid-West Region
Dundas	Albany City	Carnamah
Esperance	Broomehill- Tambellup	Chapman Valley
Kalgoorlie - Boulder city	Cranbrook	Coorow
Laverton	Denmark	Cue
Leonora	Gnowangerup	Greater Geraldton City
Menzies	Jerramungup	Irwin
Ngaanyatjarraku	Katanning	Meekatharra
Wiluna	Kent	Mingenew
	Kojonup	Morawa
	Plantagenet	Mount Magnet
	Ravensthorpe	Murchison
	Woodanilling	Northampton
		Perenjori
		Sandstone
		Three Springs
		Yalgoo

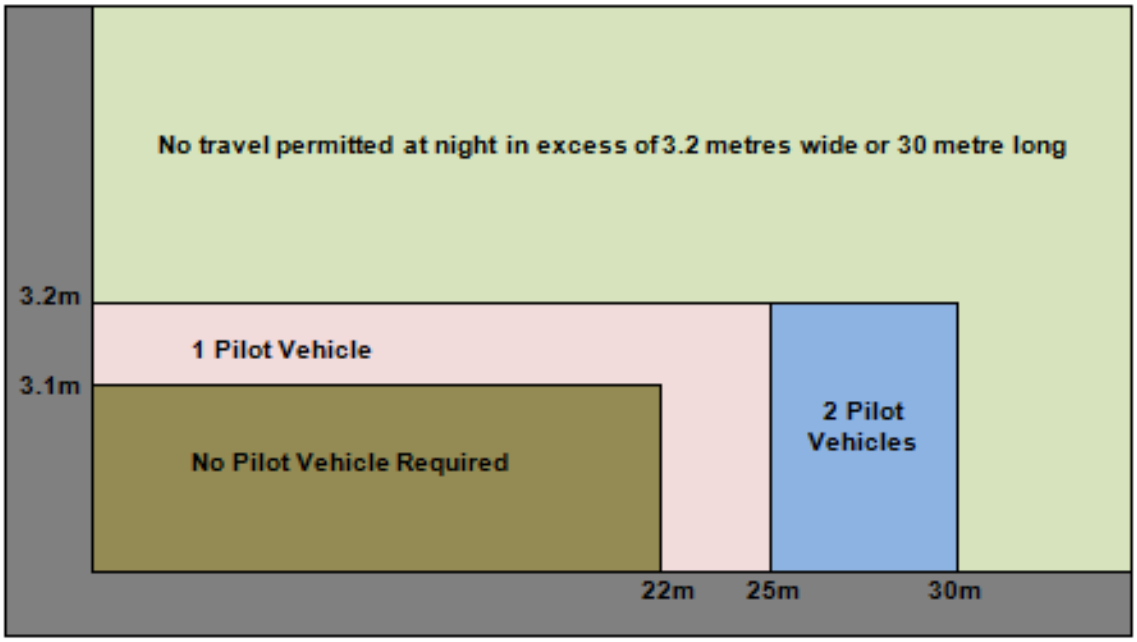
South West Region	Wheatbelt North Region	Wheatbelt South Region
Boyup Brook	Chittering	Beverley
	Cunderdin	Brookton
	Dalwallinu	Bruce Rock
	Dandaragan	Corrigin
	Dowerin	Cuballing
	Gingin	Dumbleyung
	Goomalling	Kondinin
	Kellerberrin	Kulin
	Koorda	Lake Grace
	Merredin	Narembeen
	Moora	Narrogin
	Mount Marshall	Narrogin Town
	Mukinbudin	Pingelly
	Northam	Quairading
	Nungarin	Wagin
	Tammin	Wandering
	Toodyay	West Arthur
	Trayning	Wickepin
	Victoria Plains	Williams
	Westonia	
	Wongan - Ballidu	
	Wyalkatchem	
	Yilgarn	
	York	

APPENDIX 2 - Pilot Requirements

Day-time Travel



Night-time Travel



Amendment Table

Amendment Date	Amended Section	Amendment Description
14th March 2014	Complete Document	Draft Release
2nd May 2014	Complete Document	Initial Release
4th December 2017	Complete Document	Incorporated Heavy Vehicle Agricultural Pilot Authorisation

CONFIDENTIALITY STATUS		
Unrestricted Access ☐	Confidential ☐	Restricted Access ☐
Comments:		

wheatbelt natural resource management

Lake Ewlyamartup

Maintenance and Management Plan

Document Controller:	Meghan McGregor
Version:	V1
Date:	13 November 2017

ABN 61 661 518 664

Document History

Revision	Prepared By	Date	Comments
V1	Meghan McGregor	13/11/2017	

Approvals

This Project Management Plan has been checked by:

Name	Position	Date	Signature
Rebecca Palumbo	Operations Manager		

This Project Management Plan has been approved by:

Name	Position	Date	Signature
Natarsha Woods	Project Sponsor		

Acronyms & Abbreviations

Acronym	Description
DPIRD	Department of Primary Industries and Regional Development
Wheatbelt NRM	Wheatbelt Natural Resource Management

Access to this Document

This document should be distributed to only appropriate parties in accordance with the confidentiality status stated on the cover of this document. An electronic copy of this document can be located at

Disclaimer

This report has been prepared on behalf and for the exclusive use of the Department of Primary Industries and Regional Development, and is subject to and issued in accordance with the agreement between Department of Primary Industries and Regional Development and Wheatbelt NRM.

Executive Summary

This Plan outlines the maintenance and management requirements for the engineering infrastructure delivered as part of Stage 3 of the Living Lakes project at Lake Ewlyamartup. The Plan considers the need for each significant element of the works and outlines likely recurrent tasks to undertake those works. The Plan also outlines preliminary criteria for operation of the controls at the lake.

This Plan was prepared by Worley Parsons during Stage 2 of the Living Lakes project. It has now been updated by Wheatbelt NRM, in conjunction with the Shire of Katanning and the Lake Ewlyamartup Working Group. The Shire of Katanning, together with the Lake Ewlyamartup Working Group have agreed to undertake all responsibilities for maintenance and management referred to the responsibility of the Operator under this Plan.

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1 Introduction

The Lake Ewlyamartup Maintenance and Management Plan (the Plan) addresses the maintenance and management needs of each major element of the engineering works at Lake Ewlyamartup, delivered as part of Stage 3 of the Living Lakes project.

Furthermore, it outlines preliminary operating criteria for the lakes, to enable a level of control over water quality and quantities in the lakes. Ultimately however, the water quality and quantities in the lakes will be climate dependent, responding to the rainfall runoff received and the timing of effectiveness of potential flushing flows. The water quality will also be influenced by agricultural activities in the catchment.

The Plan also documents likely recurrent tasks to operate and maintain the designed works.

1.1 Objectives of the Maintenance and Management Plan

The objective of this Plan is to clearly identify the tasks required to operate and maintain the enhancement facilities (engineering works) for the lake. This includes issues of land tenure and access for operation and maintenance.

The Plan outlines the recurrent costs and requirements for ongoing monitoring of water quality and sediments at each lake.

Ongoing monitoring is vital to ensure that the water quality in the lakes is suitable for high contact recreation purposes in line with relevant public health requirements. In essence, this Plan serves as an Operations and Maintenance Plan for the key features and elements of the engineering enhancement options associated with the lake.

The enhancement options that have been developed incorporate a robustness in the design to reduce maintenance needs and to minimise the risk of damage under normal operation conditions.

2 Inspection and Maintenance Tasks

2.1 Excavated Channels and Drains

1. Inspect annually and after every significant storm event or flushing operation. Remove accumulated sediment to restore the channel gradient and repair any erosion gullies;
2. Base of channel should be kept free of weeds and dense vegetation growth;
3. Some vegetation growth on the side slopes is acceptable and beneficial to promote soil stabilisation. Dense vegetation on the channel side slopes however is undesirable and should be avoided. Dense vegetation should be cleared or thinned. Care should be taken to avoid damage to side slopes; and
4. Tree growth should be discouraged within the full profile of the channel.

2.2 Control Structures, Culverts and Weirs

1. Routine inspections of all structures should be carried out to ensure the integrity and operability of the structures. Inspections should occur annually and also after any significant flood event;
2. Ensure that structure inlets and outlets are clear of debris and accumulated sediment or debris should be removed;

3. Any debris lodged in or against the inlet grates or aprons must be removed;
4. Ensure that culverts and head walls are clear of accumulated sediment and debris;
5. The integrity of stop boards and seals shall be regularly checked and any defective stop board must be replaced. Stopboard details are show on WorleyParsons Drawing No.3010012-01903-CI-DRD-0012_0. Stopboards must be locked in position after any adjustments to reduce risk of unauthorised removal. Padlocks may be coated with a suitable grease to prolong durability under wet and saline conditions;
6. Seals on stop boards should also be checked under operating conditions to ensure that leakage is not excessive. These checks should occur when lake water levels have risen to above the joint seal level of the boards;
7. Steel work (grates and guides) must be inspected annually to ensure that it is relatively free of rust and remains in a fully functional state;
8. Inspect weirwalls, headwalls and endwalls for erosion damage and rectify as required. Inspections should occur after any significant flood event and at least annually;
9. Ensure that removable hatches are always locked in position when not in use;
10. Ensure that vegetation is kept clear of control structures to facilitate operation of the structure; and
11. The Operator will need to have legal access to each structure to undertake these works.

2.3 Bunds, Levees and Other Embankments

1. Inspect annually and after every significant storm event;
2. Repair any erosion gullies, wear or embankment settlement to maintain the design crest level;
3. Vegetation growth on the embankments is generally acceptable and beneficial to promote soil stabilisation, however tree growth should be discouraged on both slopes and crests of embankments; and
4. Existing natural banks to which new sections connect are already vegetated. New sections connecting embankments may be similarly vegetated to improve soil stabilisation and amenity of the new works.

2.4 Existing Channels at Control Structures

1. Periodic removal of sediment may be required to maintain hydraulic capacity in existing natural and excavated waterways immediately downstream of the Control Structures;
2. Erosion gullies due to flood flows entering the channel or breakouts leaving the channel may also warrant repair; and
3. The Operator will need to have legal access to each structure to undertake these works.

3 Operational Requirements

3.1 General

Outlined in this section are the recommended operational requirements for Lake Ewlyamartup. These serve as recommendations only. Throughout the operation of these assets the operational procedures and thresholds described may need to be modified in response to the actual amounts of rainfall runoff delivered to the lake and the resulting impacts on lake water levels and quality.

The Operator must monitor the lake water levels and record the facility operations undertaken. The experience gained over a number of years of operations will assist to rationalise and further develop the operational needs of the assets to optimise retention of inflowing water whilst ensuring that flood risk to adjacent properties and the environmental values of the lake and its surrounds are not adversely affected.

Care should be taken by the Operator not to deviate from what is outlined below without the appropriate level of discussion and consideration by a professionally qualified Hydrologist.

It should be noted that roads and pavement assets will be vested with the Local Authority or with Main Roads Western Australia, as appropriate, and would be maintained under their normal works programs.

The water supply pipeline diversion at the Katanning-Nyabing Road involves works to an existing Water Corporation asset which will fall under their ongoing operational and maintenance works programs.

3.2 Operation of Controls

Table 3-1 Bypass

Location:	In Ewlyamartup Creek, north of Katanning-Nyabing Road near the Ewlyamartup Creek Bridge.
Land Tenure and Access	The bypass lies within Crown Land (UCL199) vested with the Department of Primary Industries and Regional Development. Ongoing access for maintenance will be required. Extension of the inlet channel may be necessary to more efficiently capture inflows from Ewlyamartup Creek. This channel extension would extend in private land Lot 179, for which access would also be required.
Description:	The bypass comprises a 450 mm diameter pipe culvert passing through a low diversion bund within Ewlyamartup Creek and excavated channels upstream and downstream connecting into the creek.
Function:	The bypass culvert permits “first flush” low flow from Ewlyamartup Creek to pass downstream, rather than flowing directly to the lake.
Operation Type:	Manual – Operator to move sandbags in accordance with the operating criteria.
Control Operation:	The bypass culvert is normally closed by placing sandbags across its inlet on the western side of the culvert. The culvert should be opened (sandbags removed) whenever low flows passing down Ewlyamartup Creek are determined to be of poor quality. The presence of an existing constructed channel, which directs flows towards the bridge at Katanning-Nyabing Road, compromises the natural flow regimes of Ewlyamartup Creek, making the bypass less effective. To counter the effects of this channel it may be necessary, only when the bypass is opened, to partially block the bridge waterway with a low wall of sandbags (two bags high), to force water to flow towards the bypass. When the culvert is again closed, the bridge waterway must be opened.

Opening Criteria*:	Open (remove sandbags) when salinity of creek flows exceeds 15,000*mg/L (TDS). Refer to Table 3-2 for classifications. Close (place sandbags) when salinity of creek falls below 10,000*mg/L (TDS).
Inspection Frequency*:	Inspect annually and after every significant flood event.

**Interim values. Values to be reviewed and adjusted following operational experience.*

Table 3-2 Salinity classification used for TDS

Classification	Total dissolved solids mg/L
Fresh	<500
Marginal	500-1000
Brackish	100-5000
Saline	5000 – 10 000
Highly Saline	10 000 – 35 000
Brine	>35 000

From Department of Water (2008) and as adapted from Mayer, Ruprecht and Bari (2005)

Table 3-3 Overflow Weir

Location:	Across Ewlyamartup Creek, north of Katanning-Nyabing Road near the Ewlyamartup Creek Bridge.
Land Tenure and Access	The overflow weir and its embankments extend from the Katanning-Nyabing Road reserve into Crown Land (UCL 199) vested with the Department of Primary Industries and Regional Development. Ongoing access for maintenance will be required.
Description:	The overflow weir comprises a low concrete wall, with rock protection each side, spanning 60m between higher end walls and earth abutments.
Function:	The overflow weir permits flows in excess of the capacity of the lake to pass downstream to the Coblinine River.
Operation Type:	Automatic – no Operator intervention required.
Control Operation:	The weir operates automatically, bypassing excess flows whenever water levels upstream of the weir exceed the weir's crest level.
Opening Criteria*:	Overflows when upstream water levels exceed 272.8m AHD, the design crest level of the weir.
Inspection Frequency*:	Inspect annually and after every significant flood event.

**Interim values. Values to be reviewed and adjusted following operational experience.*

Table 3-4 Flushing Channel Control

Location:	On the south side of Katanning-Nyabing Road just east of the Ewlyamartup Creek bridge.
Land Tenure and Access	The flushing channel control structure is located within private property (Lot 33 owned by Greg Garlick). Ongoing access for maintenance will be required through this land parcel.
Description:	The flushing channel control comprises a reinforced concrete headwall structure containing two sets of adjustable stopboards located at the upstream end of dual 1500mm wide x 900mm high reinforced concrete box culverts under Katanning-Nyabing Road. The stopboards are protected from unauthorised operation by lockable steel grating covering the structure.
Function:	The flushing channel control allows water from the lake to pass downstream to the Coblinine River via the flushing channel. It facilitates partial emptying of the lake when downstream conditions are suitable.
Operation Type:	Manual – Operator to remove or replace stopboards in accordance with the operating criteria.
Control Operation:	The stopboards are normally in position, restricting flushing channel flows from the lake. The stopboards are removed (some or all) to permit flows to pass through the box culverts and downstream to discharge at the Coblinine River. With all boards in position, the lake levels must rise to exceed 273.0m AHD before overflow will occur at this structure.
Opening Criteria*:	Based on The Stage 1 Report (JDA, 2012): Open channel for flushing in February each year. Close channel for refilling in August each year. The Stage 1 report included a model analysis of the operation of the bypass and flushing channel. In this model, it was assumed that the control gates would be open from February to July to flush out the lake and closed from August through January to capture ongoing winter rains and to retain water through spring and for most of the summer. With falling water levels through the spring/summer period, due mainly to evaporation, salinity levels in the lake would increase. The gates would be opened in February to facilitate flushing. The lake would drain through February to April and start to refill with the onset of winter rains in May/June. But with the gates still open, these initial winter flows would assist in mixing with and flushing the residual saline water from the lake. Closing the gates in August would again enable the late winter rains to be captured for refilling of the lake. The modelled scenario was dependent on reliable rainfall, however with significant variability in rainfall, it may be necessary also to vary the operating regime to best manage the lake.

	The designed flushing channel is also lower in the lake than that which was modelled, so it is able to access (discharge) a greater proportion of the residual water in the lake, thus requiring less mixing and flushing in early winter. To facilitate flushing of the lake: Progressively remove stopboards when the following conditions are all met: • Lake salinity exceeds 30,000*mg/L TDS; and • Water levels in the lake exceed 271.7m AHD; and • There is reasonable expectation of following rains producing further inflow if suitable quality to the lake (for instance at the onset of winter/wet season). These conditions are expected to be present in February to March in most years. It is suggested that if the TDS is lower in February, then flushing could be delayed and water levels maintained for a longer period. Depending on the water levels in the lake, the stop boards may need to be removed progressively as the water level drops. Note that when lake water levels fall below 271.4m AHD (the flushing channel invert level within the lake), flow through the channel is expected to cease. Following the flushing operation, the stopboards must be replaced in position in preparation for refilling of the lake. With reliance on winter rains to complete the flushing cycle, replacement of the boards would normally occur in August of each year. If the following conditions are met however, the stopboards could be replaced earlier: • Lake water salinity below 10,000*mg/L; and • Water levels in the lake exceed 271.5m AHD; and • Inflowing water from Ewlyamartup Creek has salinity below 5,000*mg/L. To assist with the draining of the lake: The residual water in the lake below 271.4m AHD could be removed by pumping if required (and appropriate) for lake maintenance. Portable sump pumps could be set up to discharge into the lake end of the flushing channel. The control structure stopboards would need to be removed to allow the pumped discharge to pass downstream. Following pumping replace stopboards.
Inspection Frequency*:	Inspect annually, after every significant flood event and during and at completion of every flushing and draining operation.

**Interim values. Values to be reviewed and adjusted following operational experience.*

3.3 Maintenance requirements

The enhancement option elements that will need to be managed and maintained at Lake Ewlyamartup are as follows:

Table 3-5 Option Element Management and Maintenance

Enhancement Option	Element	Management	Maintenance Action
Flushing Channel and Restricted Bypass	Flushing Channel Control Structure and Culvert	Inspection of Control Structure, culvert and headwalls	Clear debris and accumulated sediments Check integrity of stop boards and replace if faulty Check stop board seals for excessive leakage and replace if faulty Inspect steelwork to confirm operability, otherwise Inspect headwalls and embankments for erosion damage
	Flushing channel	Inspect for evidence of erosion, sediment accumulation and in-channel weed growth	Remove accumulated sediment and repair any erosion, wear or settlement Remove excessive weed growth from channel invert Remove any trees sprouting within the channel
	Protective spoil bund	Inspect for evidence of erosion, debris and sediment accumulation, weed growth and structural integrity	Remove debris and accumulated sediments Remove any weed growth adversely affecting the structure Repair any erosion gullies at the discharge or inlet or abutting embankments Repair displaced rock protection Repair any structural damage to weir
	Restricted Bypass Culvert	Inspect for evidence of erosion, debris and sediment accumulation, weed growth and structural integrity	Clear debris and accumulated sediments Remove any weed growth adversely affecting the structure

			Repair any erosion gullies at the discharge or inlet or abutting embankments Repair displaced rock protection
	Diversion Bund	Inspect for evidence of erosion, settlement and weed growth	Repair any erosion gullies, wear or embankment settlement to restore embankment integrity Remove any trees establishing on the embankments
Sludge Removal	Sludge Removal	Inspection in-lake monitoring of sedimentation and sludge build up	Remove accumulated sludge if adversely affecting lake use
General	Water Quality	Water quality monitoring	Sampling, testing and reporting of lake water quality to inform lake management Sampling, testing and reporting of Ewlyamartup Creek inflows to inform bypass and flushing operations

The flushing channel and its spoil bunds extend from the lake (within Crown Reserve R16358, vested with the Shire of Katanning), passes through private property (Lot 33 owned by Greg Garlick, crosses the Katanning-Nyabing Road reserve into Crown Land (UCL199 and UCL 31, vested with the Department of Primary Industries and Regional Development), then crosses and unmade road reserve before passing through private property (Lot 6296, owned by Mal Packard), to its termination within Lot 6296. Ongoing access for maintenance will be required through all of these parcels.

4 Water Quality and Sediment Monitoring

4.1 Water Quality Monitoring

There will be a need for ongoing water quality and sediment monitoring at the lake to ensure the lake is suitable for high contact recreation. Sampling should be in accordance with the relevant public health standards. Water quality monitoring requirements considered necessary at Lake Ewlyamartup are outlined as follows.

It is recommended that the proposed sampling regime for each lake be discussed and agreed with the relevant regulatory authorities (i.e. Department of Water and Environmental Regulation), as there may be specific monitoring requirements attached to the permits required for construction (i.e. Bed and Banks Permit). Additionally, given Lake Ewlyamartup is currently listed as a Nationally important wetland, the Commonwealth Department of Environment may also mandate a specific water quality and sediment sampling regime.

For the purposes of this document it has been assumed that the Operation of the lake assets will be vested with the Local Authority, referred to as the Operator. The Operator will be responsible for arranging regular water quality monitoring, sampling, testing and reporting conducted in the lake.

On completion of the water quality sampling, the test data and reports should be issued and distributed to the relevant regulatory authorities including (but not limited to) Local Government, Department of Water and Environmental Regulation. Results should also be provided to the Lake Ewlyamartup Working Group.

1. In-Lake Water Quality Sampling
    a. Undertake water quality sampling, testing and reporting during the seasons when high contact recreation can be expected or permitted. This should be undertaken monthly during the active recreation period, however the sampling regime should be discussed and agreed with the regulators;
    b. Water quality sampling should focus on Public Health issues and the suite of sampling tests should be aligned for these purposes; and
    c. Sampling points should be selected at sites as advised by the Local Authority's Environmental or Public Health Officer or as advised by the appropriate Regulator.
2. Inflow Water Quality Sampling
    a. Inflow water quality monitoring to occur at specified sites, table 4-1 should include the full suite of Public Health parameters, as well as salinity.

4.2 Sediment Monitoring

Outlined below is the sediment monitoring requirements that are considered necessary for monitoring lake health.

1. In-Lake Sediment Sampling
    a. Undertake sediment sampling during the recreation season. This should be undertaken monthly or as agreed with the regulator;
    b. Sediment sampling should focus on Public Health issues and the suite of sampling tests should be aligned for these purposes;
    c. Sediment sampling points should be selected at locations as advised by the Local Authority's Environmental or Public Health Officer or the appropriate Regulator; and
    d. Sediment sampling should also include the locations specified in Table 4-1.

Water Quality Sampling	Sediment Sampling
In-Lake water sampling at sites determined by the regulator.	In-Lake sediment sampling at sites determined by the regulator.
Inflow water sampling from Ewlyamartup Creek at the Wallis Road crossing.	Inflow sediment sampling from Ewlyamartup Creek at the Katanning-Nyabing Road bridge crossing at Lake Ewlyamartup.
Outflow water sampling at the Katanning-Nyabing Road.	Outflow sediment sampling at the Katanning-Nyabing Road.

5 Indicative Maintenance Cost

Maintenance Task	Qty	Unit	Rate	Total	Comments
Review of sludge build up in the Lake	2	Visit	$600	$1,200	Shire Inspector + Labourer + Ute + Dinghy for 2 hours each visit per year + 1 hour reporting each visit
Removal of Sludge each year (once every 10 years 1,000m^3/10)	100	m^3	$60	$6,000	$60,000 every 10 years
Inspection of Control Structures and Gates and Cleaning	6	Visit	$250	$1,500	Two Shire Labourers + Ute x 6 times per year
Replacement of timber and seals once every 5 years	1	Item	$2,000	$2,000	By Contractor, supervised by Shire rep. $10,000 every 5 years
Earthworks Maintenance outside Maintenance Period	24	Hours	$250	$6,000	Bobcat + Operator + Shire Rep @ 3 days per year
Water Quality Monitoring and Reports					
Sampling	64	Tests	$300	$19,200	Approx. 64 samples per annum @ $300 per sample
8 visits	64	Hours	$300	$19,200	Shire Environ + Lab + Ute + Dinghy x 8 visits x 8 hours
Courier	8	Trips	$1,000	$8,000	Courier to NATA Lab
			ANNUAL COST:	**$63,100**	

CONFIDENTIALITY STATUS		
Unrestricted Access ☐	Confidential ☐	Restricted Access ☐
Comments:		

Lake Ewlyamartup

Maintenance and Management Plan

Document Controller:	Meghan McGregor
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Document History

Revision	Prepared By	Date	Comments
V1	Meghan McGregor	20/03/2018	

Approvals

This Project Management Plan has been checked by:

Name	Position	Date	Signature
Rebecca Palumbo	Operations Manager		

This Project Management Plan has been approved by:

Name	Position	Date	Signature
Natarsha Woods	Project Sponsor		

Acronyms & Abbreviations

Acronym	Description
DPIRD	Department of Primary Industries and Regional Development
Wheatbelt NRM	Wheatbelt Natural Resource Management

Access to this Document

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This report has been prepared on behalf and for the exclusive use of the Department of Primary Industries and Regional Development, and is subject to and issued in accordance with the agreement between Department of Primary Industries and Regional Development and Wheatbelt NRM.

Executive Summary

This Plan outlines the maintenance and management requirements for the engineering infrastructure delivered as part of Stage 3 of the Living Lakes project at Lake Ewlyamartup. The Plan considers the need for each significant element of the works and outlines likely recurrent tasks to undertake those works. The Plan also outlines preliminary criteria for operation of the controls at the lake.

This Plan was prepared by Worley Parsons during Stage 2 of the Living Lakes project. It has now been updated by Wheatbelt NRM, in conjunction with the Shire of Katanning and the Lake Ewlyamartup Working Group. The Shire of Katanning, together with the Lake Ewlyamartup Working Group have agreed to undertake all responsibilities for maintenance and management referred to the responsibility of the Operator under this Plan.

Table of Contents

1 Introduction

The Lake Ewlyamartup Maintenance and Management Plan (the Plan) addresses the maintenance and management needs of each major element of the engineering works at Lake Ewlyamartup, delivered as part of Stage 3 of the Living Lakes project.

Furthermore, it outlines preliminary operating criteria for the lakes, to enable a level of control over water quality and quantities in the lakes. Ultimately however, the water quality and quantities in the lakes will be climate dependent, responding to the rainfall runoff received and the timing of effectiveness of potential flushing flows. The water quality will also be influenced by agricultural activities in the catchment.

The Plan also documents likely recurrent tasks to operate and maintain the designed works.

1.1 Objectives of the Maintenance and Management Plan

The objective of this Plan is to clearly identify the tasks required to operate and maintain the enhancement facilities (engineering works) for the lake. This includes issues of land tenure and access for operation and maintenance.

The Plan outlines the recurrent costs and requirements for ongoing monitoring of water quality and sediments at each lake.

Ongoing monitoring is vital to ensure that the water quality in the lakes is suitable for high contact recreation purposes in line with relevant public health requirements. In essence, this Plan serves as an Operations and Maintenance Plan for the key features and elements of the engineering enhancement options associated with the lake.

The enhancement options that have been developed incorporate a robustness in the design to reduce maintenance needs and to minimise the risk of damage under normal operation conditions.

2 Inspection and Maintenance Tasks

2.1 In-Lake Flushing Channel

1. Routine inspection and monitoring of sedimentation and sludge building up in the lake in general and approach to the channel in particular. Initially annual inspections are suggested, with the frequency of inspections being reviewed thereafter.
2. If sedimentation and sludge build up exceeds acceptable levels for lake users, then further sludge removal may need to be carried out.

   The Operator will need to have legal access to the lake to undertake these works.

2.2 Excavated Channels and Drains

1. Inspect annually and after every significant storm event or flushing operation. Remove accumulated sediment to restore the channel gradient and repair any erosion gullies;
2. Base of channel should be kept free of weeds and dense vegetation growth;
3. Some vegetation growth on the side slopes is acceptable and beneficial to promote soil stabilisation. Dense vegetation on the channel side slopes however is undesirable and should be avoided. Dense vegetation should be cleared or thinned. Care should be taken to avoid damage to side slopes; and

4. Tree growth should be discouraged within the full profile of the channel.

2.3 Control Structures, Culverts and Weirs

1. Routine inspections of all structures should be carried out to ensure the integrity and operability of the structures. Inspections should occur annually and also after any significant flood event;
2. Ensure that structure inlets and outlets are clear of debris and accumulated sediment or debris should be removed;
3. Any debris lodged in or against the inlet grates or aprons must be removed;
4. Ensure that culverts and head walls are clear of accumulated sediment and debris;
5. The integrity of stop boards and seals shall be regularly checked and any defective stop board must be replaced. Stopboard details are shown on WorleyParsons Drawing No.3010012-01903-CI-DRD-0012_0. Stopboards must be locked in position after any adjustments to reduce risk of unauthorised removal. Padlocks may be coated with a suitable grease to prolong durability under wet and saline conditions;
6. Seals on stop boards should also be checked under operating conditions to ensure that leakage is not excessive. These checks should occur when lake water levels have risen to above the joint seal level of the boards;
7. Steel work (grates and guides) must be inspected annually to ensure that it is relatively free of rust and remains in a fully functional state;
8. Inspect weirwalls, headwalls and endwalls for erosion damage and rectify as required. Inspections should occur after any significant flood event and at least annually;
9. Ensure that removable hatches are always locked in position when not in use;
10. Ensure that vegetation is kept clear of control structures to facilitate operation of the structure; and
11. The Operator will need to have legal access to each structure to undertake these works.

2.4 Bunds, Levees and Other Embankments

1. Inspect annually and after every significant storm event;
2. Repair any erosion gullies, wear or embankment settlement to maintain the design crest level;
3. Vegetation growth on the embankments is generally acceptable and beneficial to promote soil stabilisation, however tree growth should be discouraged on both slopes and crests of embankments; and
4. Existing natural banks to which new sections connect are already vegetated. New sections connecting embankments may be similarly vegetated to improve soil stabilisation and amenity of the new works.

2.5 Existing Channels at Control Structures

1. Periodic removal of sediment may be required to maintain hydraulic capacity in existing natural and excavated waterways immediately downstream of the Control Structures;
2. Erosion gullies due to flood flows entering the channel or breakouts leaving the channel may also warrant repair; and
3. The Operator will need to have legal access to each structure to undertake these works.

3 Operational Requirements

3.1 General

Outlined in this section are the recommended operational requirements for Lake Ewlyamartup. These serve as recommendations only. Throughout the operation of these assets the operational procedures and thresholds described may need to be modified in response to the actual amounts of rainfall runoff delivered to the lake and the resulting impacts on lake water levels and quality.

The Operator must monitor the lake water levels and record the facility operations undertaken. The experience gained over a number of years of operations will assist to rationalise and further develop the operational needs of the assets to optimise retention of inflowing water whilst ensuring that flood risk to adjacent properties and the environmental values of the lake and its surrounds are not adversely affected.

Care should be taken by the Operator not to deviate from what is outlined below without the appropriate level of discussion and consideration by a professionally qualified Hydrologist.

It should be noted that roads and pavement assets will be vested with the Local Authority or with Main Roads Western Australia, as appropriate, and would be maintained under their normal works programs. The culvert under the Katanning-Nyabing Road will be vested with the Shire of Katanning.

The water supply pipeline diversion at the Katanning-Nyabing Road involves works to an existing Water Corporation asset which will fall under their ongoing operational and maintenance works programs.

3.2 Operation of Controls

Table 3-1 Bypass

Location:	In Ewlyamartup Creek, north of Katanning-Nyabing Road near the Ewlyamartup Creek Bridge.
Land Tenure and Access	The bypass lies within Crown Land (UCL199) vested with the Department of Primary Industries and Regional Development. Ongoing access for maintenance will be required. Extension of the inlet channel may be necessary to more efficiently capture inflows from Ewlyamartup Creek. This channel extension would extend in private land Lot 179, for which access would also be required.
Description:	The bypass comprises a 450 mm diameter pipe culvert passing through a low diversion bund within Ewlyamartup Creek and excavated channels upstream and downstream connecting into the creek.
Function:	The bypass culvert permits “first flush” low flow from Ewlyamartup Creek to pass downstream, rather than flowing directly to the lake.
Operation Type:	Manual – Operator to move sandbags in accordance with the operating criteria.
Control Operation:	The bypass culvert is normally closed by placing sandbags across its inlet on the western side of the culvert. The culvert should be opened (sandbags removed) whenever low flows passing down Ewlyamartup Creek are determined to be of poor quality.

	The presence of an existing constructed channel, which directs flows towards the bridge at Katanning-Nyabing Road, compromises the natural flow regimes of Ewlyamartup Creek, making the bypass less effective. To counter the effects of this channel it may be necessary, only when the bypass is opened, to partially block the bridge waterway with a low wall of sandbags (two bags high), to force water to flow towards the bypass. When the culvert is again closed, the bridge waterway must be opened.
Opening Criteria*:	Open (remove sandbags from culvert) when salinity of creek flows exceeds 15,000*mg/L (TDS). Refer to Table 3-2 for classifications. Close (place sandbags to culvert) when salinity of creek falls below 10,000*mg/L (TDS).
Inspection Frequency*:	Inspect annually and after every significant flood event.

**Interim values. Values to be reviewed and adjusted following operational experience.*

Table 3-2 Salinity classification used for TDS

Classification	Total dissolved solids mg/L
Fresh	<500
Marginal	500-1000
Brackish	100-5000
Saline	5000 – 10 000
Highly Saline	10 000 – 35 000
Brine	>35 000

From Department of Water (2008) and as adapted from Mayer, Ruprecht and Bari (2005)

Table 3-3 Overflow Weir

Location:	Across Ewlyamartup Creek, north of Katanning-Nyabing Road near the Ewlyamartup Creek Bridge.
Land Tenure and Access	The overflow weir and its embankments extend from the Katanning-Nyabing Road reserve into Crown Land (UCL 199) vested with the Department of Primary Industries and Regional Development. Ongoing access for maintenance will be required.
Description:	The overflow weir comprises a low concrete wall, with rock protection each side, spanning 60m between higher end walls and earth abutments.
Function:	The overflow weir permits flows in excess of the capacity of the lake to pass downstream to the Coblinine River.
Operation Type:	Automatic – no Operator intervention required.
Control Operation:	The weir operates automatically, bypassing excess flows whenever water levels upstream of the weir exceed the weir's crest level.

Opening Criteria*:	Overflows when upstream water levels exceed 272.8m AHD, the design crest level of the weir.
Inspection Frequency*:	Inspect annually and after every significant flood event.

**Interim values. Values to be reviewed and adjusted following operational experience.*

Table 3-4 Flushing Channel Control

Location:	On the south side of Katanning-Nyabing Road just east of the Ewlyamartup Creek bridge.
Land Tenure and Access	The flushing channel control structure is located within private property (Lot 33 owned by Greg Garlick). Ongoing access for maintenance will be required through this land parcel.
Description:	The flushing channel control comprises a reinforced concrete headwall structure containing two sets of adjustable stopboards located at the upstream end of dual 1500mm wide x 900mm high reinforced concrete box culverts under Katanning-Nyabing Road. The stopboards are protected from unauthorised operation by lockable steel grating covering the structure.
Function:	The flushing channel control allows water from the lake to pass downstream to the Coblinine River via the flushing channel. It facilitates partial emptying of the lake when downstream conditions are suitable.
Operation Type:	Manual – Operator to remove or replace stopboards in accordance with the operating criteria.
Control Operation:	The stopboards are normally in position, restricting flushing channel flows from the lake. The stopboards are removed (some or all) to permit flows to pass through the box culverts and downstream to discharge at the Coblinine River. With all boards in position, the lake levels must rise to exceed 273.0m AHD before overflow will occur at this structure.
Opening Criteria*:	Based on The Stage 1 Report (JDA, 2012): Open channel for flushing in February each year. Close channel for refilling in August each year. The Stage 1 report included a model analysis of the operation of the bypass and flushing channel. In this model, it was assumed that the control gates would be open from February to July to flush out the lake and closed from August through January to capture ongoing winter rains and to retain water through spring and for most of the summer. With falling water levels through the spring/summer period, due mainly to evaporation, salinity levels in the lake would increase. The gates would be opened in February to facilitate flushing. The lake would drain through February to April and start to refill with the onset of winter rains in May/June. But with the gates still open, these initial winter flows would assist in mixing with and flushing the residual saline water from the lake.

	Closing the gates in August would again enable the late winter rains to be captured for refilling of the lake. The modelled scenario was dependent on reliable rainfall, however with significant variability in rainfall, it may be necessary also to vary the operating regime to best manage the lake. The designed flushing channel is also lower in the lake than that which was modelled, so it is able to access (discharge) a greater proportion of the residual water in the lake, thus requiring less mixing and flushing in early winter. To facilitate flushing of the lake: Progressively remove stopboards when the following conditions are all met: • Lake salinity exceeds 30,000*mg/L TDS; and • Water levels in the lake exceed 271.7m AHD; and • There is reasonable expectation of following rains producing further inflow if suitable quality to the lake (for instance at the onset of winter/wet season). These conditions are expected to be present in February to March in most years. It is suggested that if the TDS is lower in February, then flushing could be delayed and water levels maintained for a longer period. Depending on the water levels in the lake, the stop boards may need to be removed progressively as the water level drops. Note that when lake water levels fall below 271.4m AHD (the flushing channel invert level within the lake), flow through the channel is expected to cease. Following the flushing operation, the stopboards must be replaced in position in preparation for refilling of the lake. With reliance on winter rains to complete the flushing cycle, replacement of the boards would normally occur in August of each year. If the following conditions are met however, the stopboards could be replaced earlier: • Lake water salinity below 10,000*mg/L; and • Water levels in the lake exceed 271.5m AHD; and • Inflowing water from Ewlyamartup Creek has salinity below 5,000*mg/L. To assist with the draining of the lake: The residual water in the lake below 271.4m AHD could be removed by pumping if required (and appropriate) for lake maintenance. Portable sump pumps could be set up to discharge into the lake end of the flushing channel. The control structure stopboards would need to be removed to allow the pumped discharge to pass downstream. Following pumping replace stopboards.
Inspection Frequency*:	Inspect annually, after every significant flood event and during and at completion of every flushing and draining operation.

**Interim values. Values to be reviewed and adjusted following operational experience.*

3.3 Maintenance requirements

The enhancement option elements that will need to be managed and maintained at Lake Ewlyamartup are as follows:

Table 3-5 Option Element Management and Maintenance

Enhancement Option	Element	Management	Maintenance Action
Flushing Channel and Restricted Bypass	Flushing Channel Control Structure and Culvert	Inspection of Control Structure, culvert and headwalls	Clear debris and accumulated sediments from flushing channel and culvert Check integrity of stop boards and replace if faulty Check stop board seals for excessive leakage and replace if faulty Inspect steelwork to confirm operability, otherwise Inspect headwalls, aprons, rock protection and embankments for erosion damage
	Katanning Nyabing Road Culvert	Inspection of culvert and headwalls	Clear debris and accumulated sediments from flushing channel and culvert Inspect headwalls, aprons, rock protection and embankments for erosion damage Repair rock protection as required.
	Flushing channel	Inspect for evidence of erosion, sediment accumulation and in-channel weed growth	Remove accumulated sediment and repair any erosion, wear or settlement Remove excessive weed growth from channel invert Remove any trees sprouting within the channel
	Protective spoil bund	Inspect for evidence of erosion, debris and sediment accumulation, weed growth and structural integrity	Remove debris and accumulated sediments Remove any weed growth adversely affecting the structure Repair any erosion gullies at the discharge or inlet or abutting embankments

			Repair displaced rock protection Repair any structural damage to weir
	Restricted Bypass Culvert	Inspect for evidence of erosion, debris and sediment accumulation, weed growth and structural integrity	Clear debris and accumulated sediments Remove any weed growth adversely affecting the structure Repair any erosion gullies at the discharge or inlet or abutting embankments Repair displaced rock protection
	Diversion Bund	Inspect for evidence of erosion, settlement and weed growth	Repair any erosion gullies, wear or embankment settlement to restore embankment integrity Remove any trees establishing on the embankments
Sludge Removal	Sludge Removal	Inspection in-lake monitoring of sedimentation and sludge build up	Remove accumulated sludge if adversely affecting lake use
General	Water Quality	Water quality monitoring	Sampling, testing and reporting of lake water quality to inform lake management Sampling, testing and reporting of Ewlyamartup Creek inflows to inform bypass and flushing operations

The flushing channel and its spoil bunds extend from the lake (within Crown Reserve R16358, vested with the Shire of Katanning), passes through private property (Lot 33 owned by Greg Garlick, crosses the Katanning-Nyabing Road reserve into Crown Land (UCL199 and UCL 31, vested with the Department of Primary Industries and Regional Development), then crosses and unmade road reserve before passing through private property (Lot 6296, owned by Mal Packard), to its termination within Lot 6296. Ongoing access for maintenance will be required through all of these parcels.

4 Water Quality and Sediment Monitoring

4.1 Water Quality Monitoring

There will be a need for ongoing water quality and sediment monitoring at the lake to ensure the lake is suitable for high contact recreation. Sampling should be in accordance with the relevant public health standards. Water quality monitoring requirements considered necessary at Lake Ewlyamartup are outlined as follows.

It is recommended that the proposed sampling regime for each lake be discussed and agreed with the relevant regulatory authorities (i.e. Department of Water and Environmental Regulation), as there may be specific monitoring requirements attached to the permits required for construction (i.e. Bed and Banks Permit). Additionally, given Lake Ewlyamartup is currently listed as a Nationally important wetland, the Commonwealth Department of Environment may also mandate a specific water quality and sediment sampling regime.

For the purposes of this document it has been assumed that the Operation of the lake assets will be vested with the Local Authority, referred to as the Operator. The Operator will be responsible for arranging regular water quality monitoring, sampling, testing and reporting conducted in the lake.

On completion of the water quality sampling, the test data and reports should be issued and distributed to the relevant regulatory authorities including (but not limited to) Local Government, Department of Water and Environmental Regulation. Results should also be provided to the Lake Ewlyamartup Working Group.

1. In-Lake Water Quality Sampling
    a. Undertake water quality sampling, testing and reporting during the seasons when high contact recreation can be expected or permitted. This should be undertaken monthly during the active recreation period, however the sampling regime should be discussed and agreed with the regulators;
    b. Water quality sampling should focus on Public Health issues and the suite of sampling tests should be aligned for these purposes; and
    c. Sampling points should be selected at sites as advised by the Local Authority's Environmental or Public Health Officer or as advised by the appropriate Regulator.
2. Inflow Water Quality Sampling
    a. Inflow water quality monitoring to occur at specified sites, table 4-1 should include the full suite of Public Health parameters, as well as salinity.

4.2 Sediment Monitoring

Outlined below is the sediment monitoring requirements that are considered necessary for monitoring lake health.

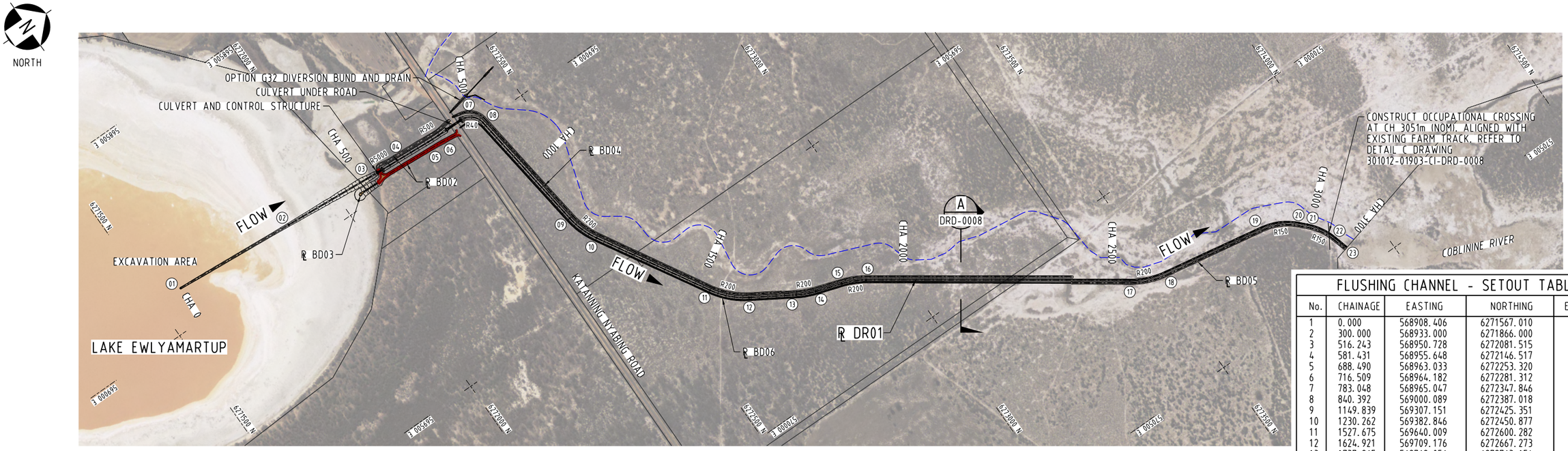
1. In-Lake Sediment Sampling
    a. Undertake sediment sampling during the recreation season. This should be undertaken monthly or as agreed with the regulator;
    b. Sediment sampling should focus on Public Health issues and the suite of sampling tests should be aligned for these purposes;
    c. Sediment sampling points should be selected at locations as advised by the Local Authority's Environmental or Public Health Officer or the appropriate Regulator; and
    d. Sediment sampling should also include the locations specified in Table 4-1.

Table 4-1 Specified Sampling Sites

Water Quality Sampling	Sediment Sampling
In-Lake water sampling at sites determined by the regulator.	In-Lake sediment sampling at sites determined by the regulator.
Inflow water sampling from Ewlyamartup Creek at the Wallis Road crossing.	Inflow sediment sampling from Ewlyamartup Creek at the Katanning-Nyabing Road bridge crossing at Lake Ewlyamartup.
Outflow water sampling at the Katanning-Nyabing Road.	Outflow sediment sampling at the Katanning-Nyabing Road.

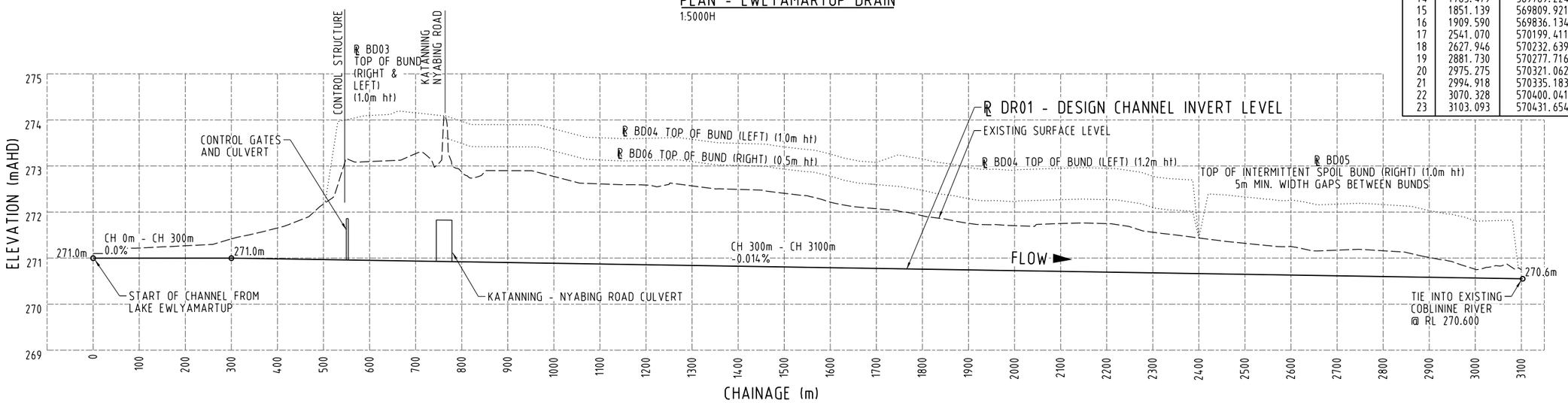
5 Indicative Maintenance Cost

Maintenance Task	Qty	Unit	Rate	Total	Comments
Review of sludge build up in the Lake	2	Visit	$600	$1,200	Shire Inspector + Labourer + Ute + Dinghy for 2 hours each visit per year + 1 hour reporting each visit
Removal of Sludge each year (once every 10 years 1,000m^3/10)	100	m^3	$60	$6,000	$60,000 every 10 years
Inspection of Control Structures, culverts and Gates and Cleaning. Include minor repair to rock protection as required.	6	Visit	$250	$1,500	Two Shire Labourers + Ute x 6 times per year
Replacement of timber and seals once every 5 years	1	Item	$2,000	$2,000	By Contractor, supervised by Shire rep. $10,000 every 5 years
Earthworks, Bund and Flushing Channel Maintenance outside Maintenance Period. Remove debris and sediment, repair erosion, repair rock protection and remove tree regrowth (channel base) and excessive weeds.	24	Hours	$250	$6,000	Bobcat + Operator + Shire Rep @ 3 days per year
Water Quality Monitoring and Reports					
Sampling	64	Tests	$300	$19,200	Approx. 64 samples per annum @ $300 per sample
8 visits	64	Hours	$300	$19,200	Shire Environ + Lab + Ute + Dinghy x 8 visits x 8 hours
Courier	8	Trips	$1,000	$8,000	Courier to NATA Lab
			ANNUAL COST:	**$63,100**	



PLAN - EWLYAMARTUP DRAIN
1:5000H

FLUSHING CHANNEL - SETOUT TABLE				
No.	CHAINAGE	EASTING	NORTHING	ELEVATION
1	0.000	568908.406	6271567.010	271.000
2	300.000	568933.000	6271866.000	271.000
3	516.243	568950.728	6272081.515	270.969
4	581.431	568955.648	6272146.517	270.960
5	688.490	568963.033	6272253.320	270.945
6	716.509	568964.182	6272281.312	270.940
7	783.048	568965.047	6272347.846	270.931
8	840.392	569000.089	6272387.018	270.923
9	1149.839	569307.151	6272425.351	270.879
10	1230.262	569382.846	6272450.877	270.867
11	1527.675	569640.009	6272600.282	270.825
12	1624.921	569709.176	6272667.273	270.811
13	1737.965	569769.056	6272763.154	270.795
14	1785.479	569789.224	6272806.053	270.788
15	1851.139	569809.921	6272868.365	270.778
16	1909.590	569836.134	6272920.377	270.770
17	2541.070	570199.411	6273436.900	270.680
18	2627.946	570232.639	6273516.433	270.667
19	2881.730	570277.716	6273766.181	270.631
20	2975.275	570321.062	6273847.372	270.618
21	2994.918	570335.183	6273861.026	270.615
22	3070.328	570400.041	6273897.922	270.604
23	3103.093	570431.654	6273906.531	270.600



PROFILE - EWLYAMARTUP DRAIN
1:5000H 1:50V

NOTE: BUND PROFILES ARE INDICATIVE ONLY

LEGEND:

- APPROX LINE OF EXISTING EWLYAMARTUP CREEK
- 271.6m VERTICAL DESIGN LEVEL
- (04) HORIZONTAL SETOUT POINT

NOTES

1. HORIZONTAL DATUM: GDA'94
   MAP PROJECTION: MGA'94 ZONE 50
   VERTICAL DATUM: mAHD
2. ONLY USE FIGURED DIMENSIONS. DO NOT SCALE OFF DRAWINGS.
3. RL = HEIGHT AT AHD
4. FOR BUND DETAILS REFER TO TYPICAL SECTION AND TABLE 1 ON DRAWING 301012-01903-CI-DRD-0008
5. PROPOSED CULVERTS 2x1200x1200 RCBC AT EACH LOCATION. REFER TO DRG 301012-01903-CI-DAL-0022 AND 0025 TO 0027 FOR DETAILS.

ISSUED FOR USE

SCALE OF METRES 1:50

SCALE OF METRES 1:5000

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
2	22-AUG-17	RE-ISSUED FOR USE	SL							
1	19-JUL-16	RE-ISSUED FOR USE	SL							
0	06-JUL-16	ISSUED FOR USE	MI	DH	IW	IW	CC			

A1 SHEET SCALE AS SHOWN

OneWay to zero harm

WORLEYPARSONS PROJECT No. 301012-01903

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

Government of Western Australia
Department of Regional Development

"This drawing is prepared solely for the use of the contractual customer of WorleyParsons and WorleyParsons assumes no liability to any other party for any representations contained in this drawing."

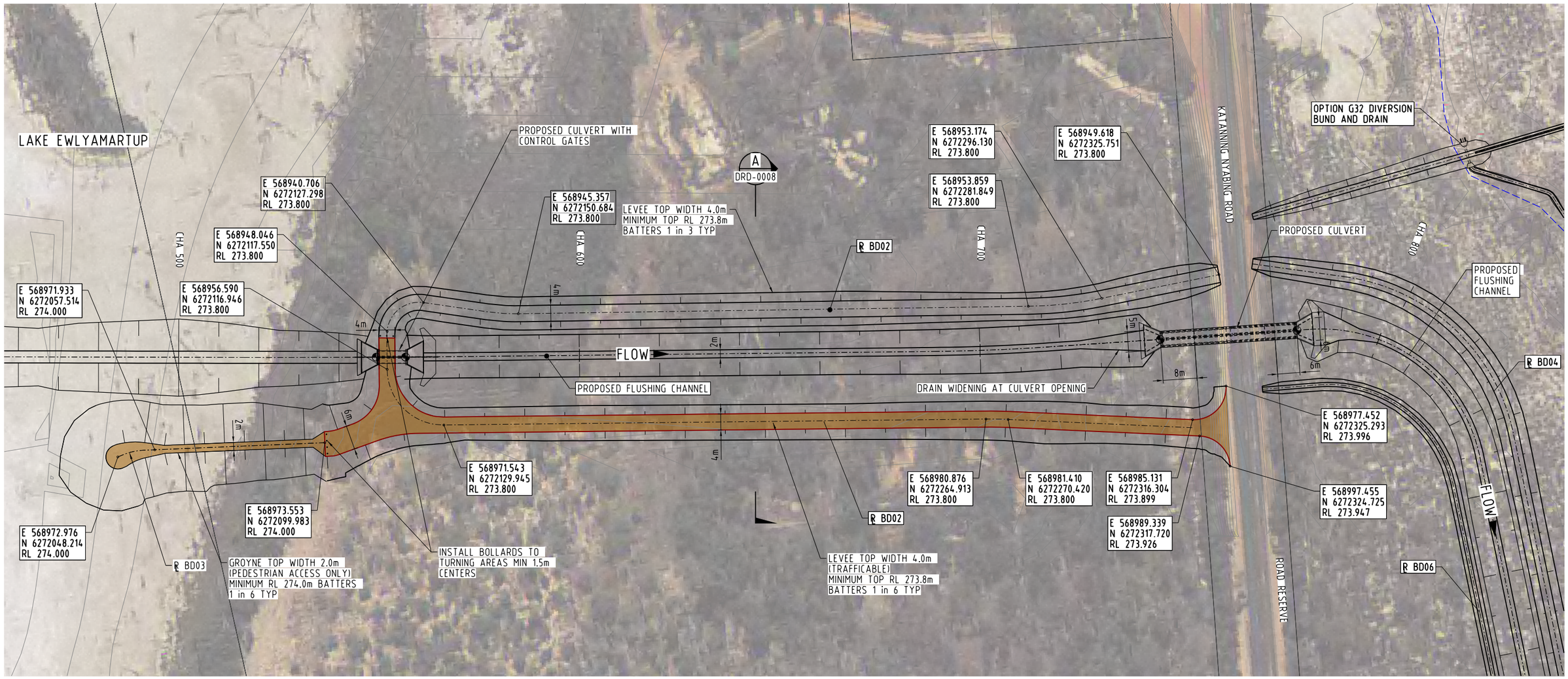
WorleyParsons
resources & energy

DRD LIVING LAKES PROJECT STAGE 2
LAKE EWLYAMARTUP
FLUSHING CHANNEL
PLAN AND PROFILE

DRG No 301012-01903-CI-DAL-0001

REV 2

WORLEYPARSONS.A1



PLAN
1:500

NOTES:

1. HORIZONTAL DATUM: GDA'94
   MAP PROJECTION: MGA'94 ZONE 50
   VERTICAL DATUM: mAHD
2. ONLY USE FIGURED DIMENSIONS. DO NOT SCALE OFF DRAWINGS.
3. REFER TO DRAWING 301012-01903-CI-DAL-0001 FOR FLUSHING CHANNEL PLAN AND PROFILE

ISSUED FOR USE

LEGEND:

- EXISTING CONTOURS: 0.1m INTERVAL ESTIMATED WITHIN LAKE EWLYAMARTUP, 2.0m INTERVAL ELSEWHERE
- EXISTING CADASTRAL BOUNDARY
- 100mm CAPPING LAYER (TRAFFICABLE)

10 0 10 20 30 40 50
SCALE OF METRES 1:500

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
0	06-JUL-16	ISSUED FOR USE	MI	DH	IW	IW	CC			

A1 SHEET SCALE 1:500

OneWay to zero harm

WORLEYPARSONS PROJECT No. 301012-01903

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

Government of Western Australia
Department of Regional Development

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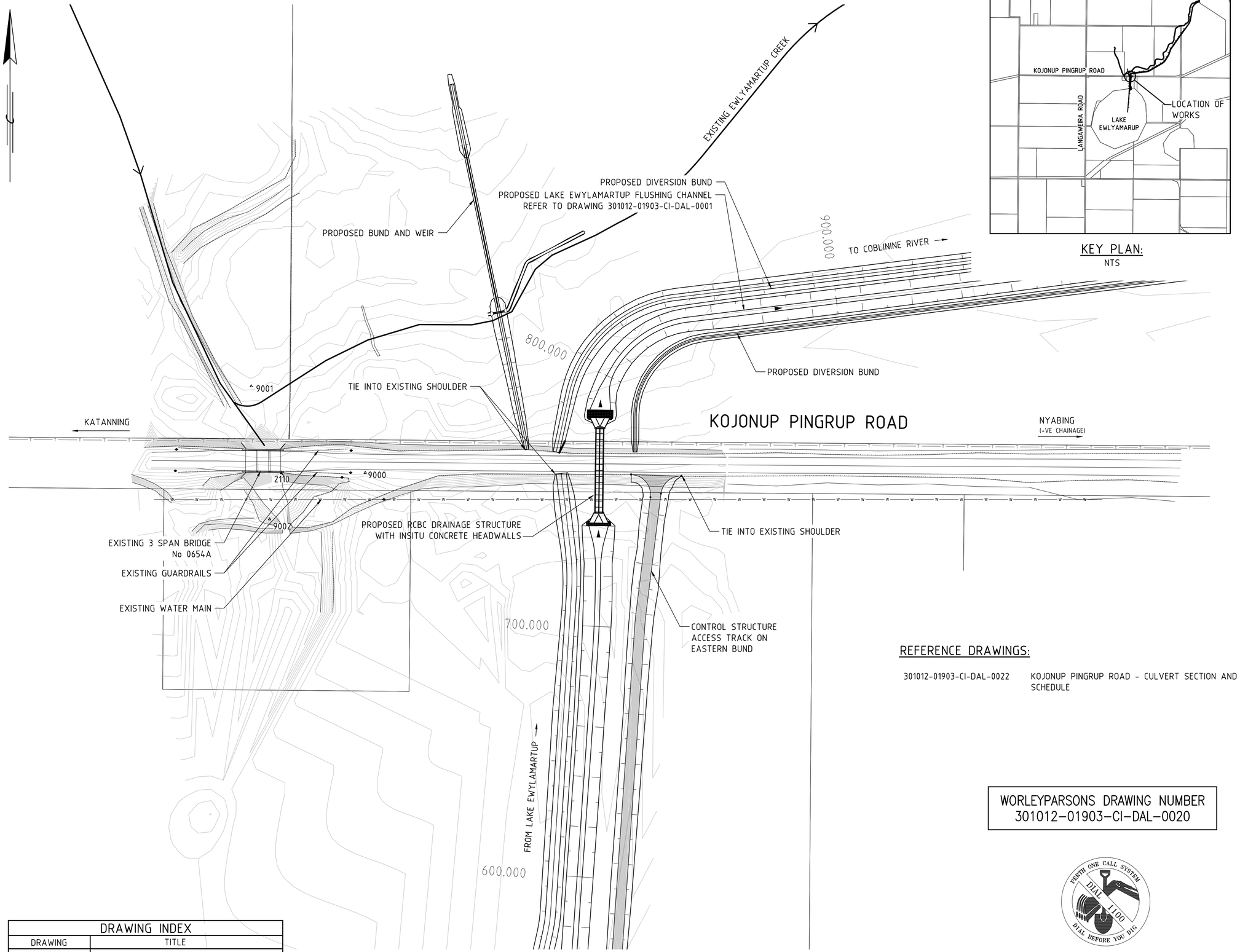
WorleyParsons resources & energy

DRD LIVING LAKES PROJECT STAGE 2
LAKE EWLYAMARTUP
CONTROL STRUCTURE ACCESS AND GROYNE SETOUT PLAN

DRG No 301012-01903-CI-DAL-0004 REV 0

WORLEYPARSONS_A1



PLAN
SCALE 1:750

KEY PLAN:
NTS

REFERENCE DRAWINGS:

301012-01903-CI-DAL-0022	KOJONUP PINGRUP ROAD - CULVERT SECTION AND SCHEDULE

DRAWING INDEX

DRAWING	TITLE
2016-01-288-0	GENERAL ARRANGEMENT PLAN
2016-01-289-0	CULVERT SECTION AND SCHEDULE
2016-01-290-0	CULVERT CONCRETE PLAN
2016-01-291-0	CULVERT AND HEADWALL STRUCTURES
2016-01-292-0	CULVERT CONCRETE SECTIONS

WorleyParsons
resources & energy

REV	DATE	DESCRIPTION
1	15.09.17	RE-ISSUED FOR MRWA APPROVAL
0	22.08.17	ISSUED FOR MRWA APPROVAL
A0	11.02.16	ISSUED FOR USE

WARNING:
SERVICES AND CADASTRAL BOUNDARY LOCATIONS SHOWN ARE ONLY INDICATIVE AND MUST NOT BE USED FOR EXCAVATION.
THE "ONE CALL 1100" SYSTEM SHALL BE USED TO OBTAIN ACCURATE SERVICE LOCATIONS.

WORLEYPARSONS DRAWING NUMBER
301012-01903-CI-DAL-0020

AMENDMENTS

No.	DESCRIPTION	APPROVED & DATE

NOTES

1. REFER TO 12D OUTPUT AND REPORTS FOR SETOUT DETAILS.
2. DESIGN BASED ON FEATURE SURVEY DATE: 14TH MAY, 2014 BY PH AND KE GOW SURVEYORS.
3. HORIZONTAL DATUM: GDA '94 MAP PROJECTION: MGA '94 ZONE 50 VERTICAL DATUM: AHD (m)
4. ALL DIMENSIONS SHOWN ARE IN METRES UNLESS NOTED OTHERWISE.
5. ONLY USE FIGURED DIMENSIONS. DO NOT SCALE OFF DRAWINGS.
6. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH MAINROADS WA SPECIFICATIONS.
7. KATANNING-NYABING ROAD PAVEMENT TO BE REINSTATED TO MATCH ORIGINAL, INCLUDING REINSTATEMENT OF ROAD MARKINGS.

LEGEND:

- EXISTING DN150 PVC WATER MAIN
- EXISTING TELSTRA LINE
- CADASTRAL BOUNDARY
- 9000 EXISTING SURVEY CONTROL POINT

METADATA

GROUND SURVEY STANDARD:
DATE OF CAPTURE: 14.05.2014
MAPPING SURVEY STANDARD:
DATE OF CAPTURE:
MAIN ROADS PROJECT ZONE: PCG 94
HEIGHT DATUM: AHD

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WP PROJECT No. 301012-01903
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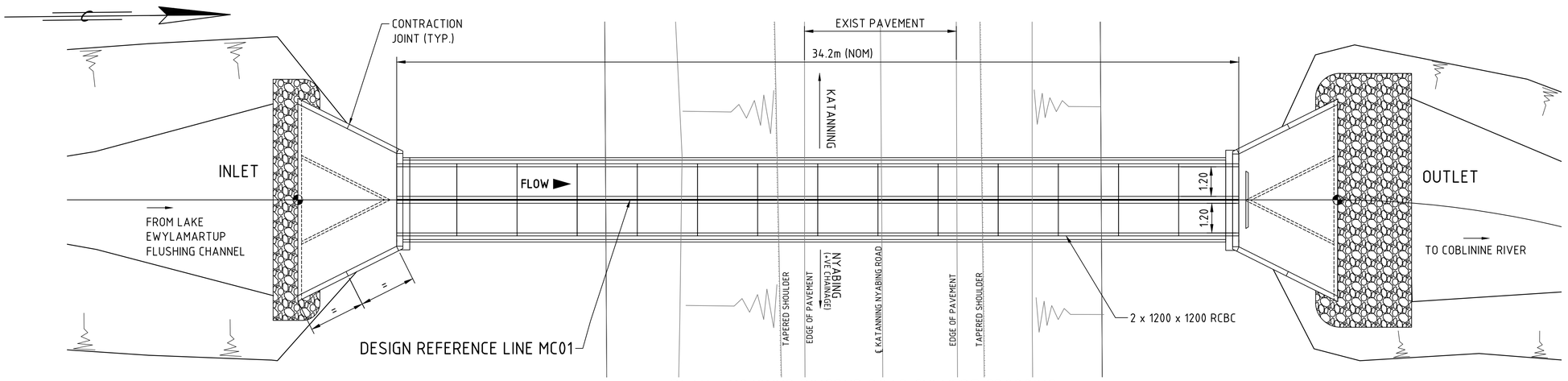
SCALES 1:750
A1

MRWA FILE NUMBER
APPROVED (MRWA)

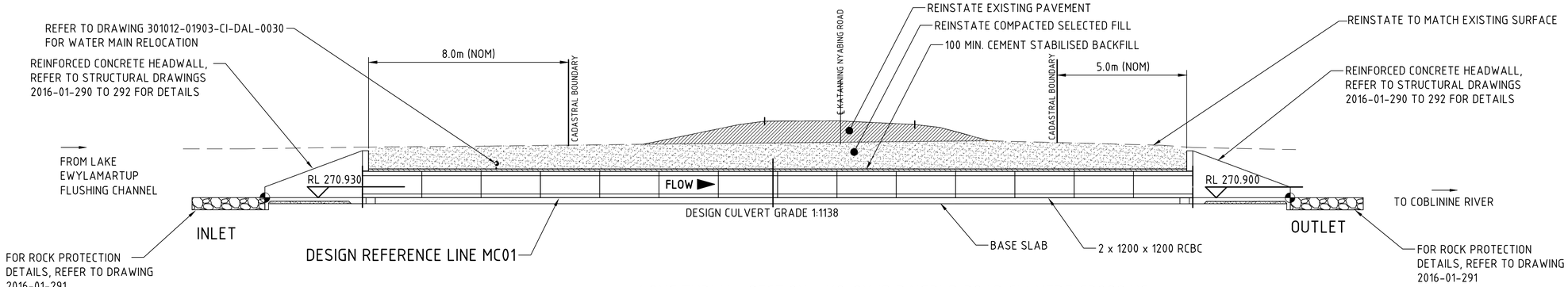
KOJONUP PINGRUP ROAD (M021)
LAKE EWYLAMARTUP DRAINAGE CULVERT
SLK 58.30
GENERAL ARRANGEMENT PLAN

LOCAL AUTHORITY SHIRE OF KATANNING (308)
MRWA DRAWING NUMBER
2016-01-288-0

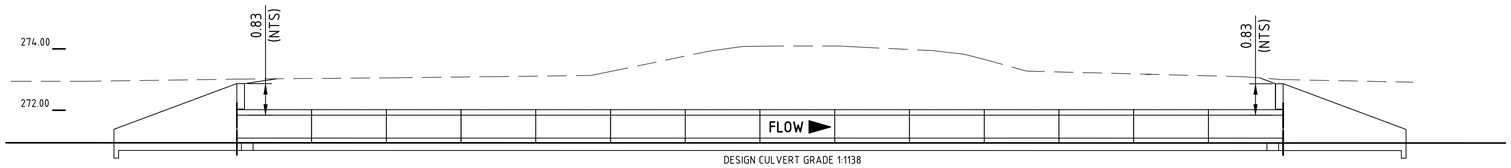
STRUCTURE NUMBER	REF. LINE	CHAINAGE (m)	CULVERT TYPE R.C.P. PIPE DIAMETER (mm) AND CLASS	CULVERT TYPE R.C.P. NUMBER OF BARRELS	CULVERT TYPE R.C.P. PIPE TYPE	CULVERT TYPE R.C.B. WIDTH & HEIGHT (mm)	CULVERT TYPE R.C.B. NUMBER OF BARRELS & LINK SLABS	SKEW (DEGREES)	OVERALL LENGTH OF CULVERTS (m)	INLET SIDE L=LEFT R=RIGHT	INLET OFFSET FROM CENTRELINE (m)	INLET INVERT LEVEL (m)	INLET HEADWALL HEIGHT (mm)	INLET APRON LENGTH (m)	INLET REFERENCE POINT EASTING	INLET REFERENCE POINT NORTHING	INLET ROCK PROTECTION REF. TABLE 1	OUTLET SIDE L=LEFT R=RIGHT	OUTLET OFFSET FROM CENTRELINE (m)	OUTLET INVERT LEVEL (m)	OUTLET HEADWALL HEIGHT (mm)	OUTLET APRON LENGTH (m)	OUTLET REFERENCE POINT EASTING	OUTLET REFERENCE POINT NORTHING	OUTLET ROCK PROTECTION REF. TABLE 1	GROUND CONDITIONS	COMMENTS
KOJONUP PINGRUP ROAD																											
001	M021	SLK 58.30				1200 x 1200	2	0	34.16	R	19.66	270.93	1.930	4.260	228725.65	69398.20	FACING	L	14.50	270.90	1.930	4.260	228726.69	69440.89	FACING	AGGRESSIVE	



PLAN - KOJONUP PINGRUP ROAD CULVERT CROSSING
1:100



LONGITUDINAL SECTION - KOJONUP PINGRUP ROAD CULVERT CROSSING
1:100



DATUM 270.00

CULVERT LEVELS			270.962																		270.932
EXISTING GROUND	273.055	273.055	273.055	273.055	273.055	273.055	273.078	273.101	273.126	273.412	273.824	274.086	274.093	274.028	273.919	273.514	273.245	273.193	273.142	273.081	272.986
CHAINAGES (m)	0.000	2.000	4.000	6.000	8.000	10.000	12.000	14.000	16.000	18.000	20.000	22.000	24.000	26.000	28.000	30.000	32.000	34.000	36.000	38.000	40.000

STRUCTURE No. 001
1:100

TABLE 1 : ROCK GRADING			
ROCK CLASS	ROCK SIZE (m)	ROCK MASS* (kg)	MIN. PERCENTAGE OF ROCK LARGER THAN
FACING	0.4	100	0%
	0.3	35	50%
	0.15	2.5	90%

* ASSUMING SPHERICAL SHAPE AND SG OF 2.65

REFERENCE DRAWINGS

2016-01-290-0	KOJONUP PINGRUP ROAD - CULVERT CONCRETE PLAN
2016-01-291-0	KOJONUP PINGRUP ROAD - CULVERT AND HEADWALL STRUCTURES
2016-01-292-0	KOJONUP PINGRUP ROAD - CULVERT CONCRETE SECTIONS

WorleyParsons resources & energy

REV	DATE	DESCRIPTION
1	15.09.17	RE-ISSUED FOR MRWA AAPOVAL
0	22.08.17	ISSUED FOR MRWA APPROVAL
A0	11.02.16	ISSUED FOR USE

WORLEYPARSONS DRAWING NUMBER
301012-01903-CI-DAL-0022

AMENDMENTS

No.	DESCRIPTION	APPROVED & DATE

NOTES

1. DESIGN BASED ON FEATURE SURVEY DATE: 14TH MAY, 2014 BY PH AND KE GOW SURVEYORS.
2. ALL DIMENSIONS SHOWN ARE IN METRES UNLESS NOTED OTHERWISE.
3. ONLY USE FIGURED DIMENSIONS. DO NOT SCALE OFF DRAWINGS.
4. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH MAINROADS WA SPECIFICATIONS.
5. ALL REINFORCED BOX CULVERTS SHALL BE MANUFACTURED USING AN APPROVED CONCRETE WATERPROOFING ADMIXTURE IN ACCORDANCE WITH THE REQUIREMENTS OF MAIN ROADS WA. REFERENCE IS MADE TO MAIN ROADS WA SPECIFICATION 404C CLAUSE 404C.05.05 ADMIXTURES.

METADATA

GROUND SURVEY STANDARD:
DATE OF CAPTURE: 14.05.2014
MAPPING SURVEY STANDARD:
DATE OF CAPTURE:
MAIN ROADS PROJECT ZONE: PCG 94
HEIGHT DATUM: AHD

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WP PROJECT No. 301012-01903
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VERIFIED I.WEAVER
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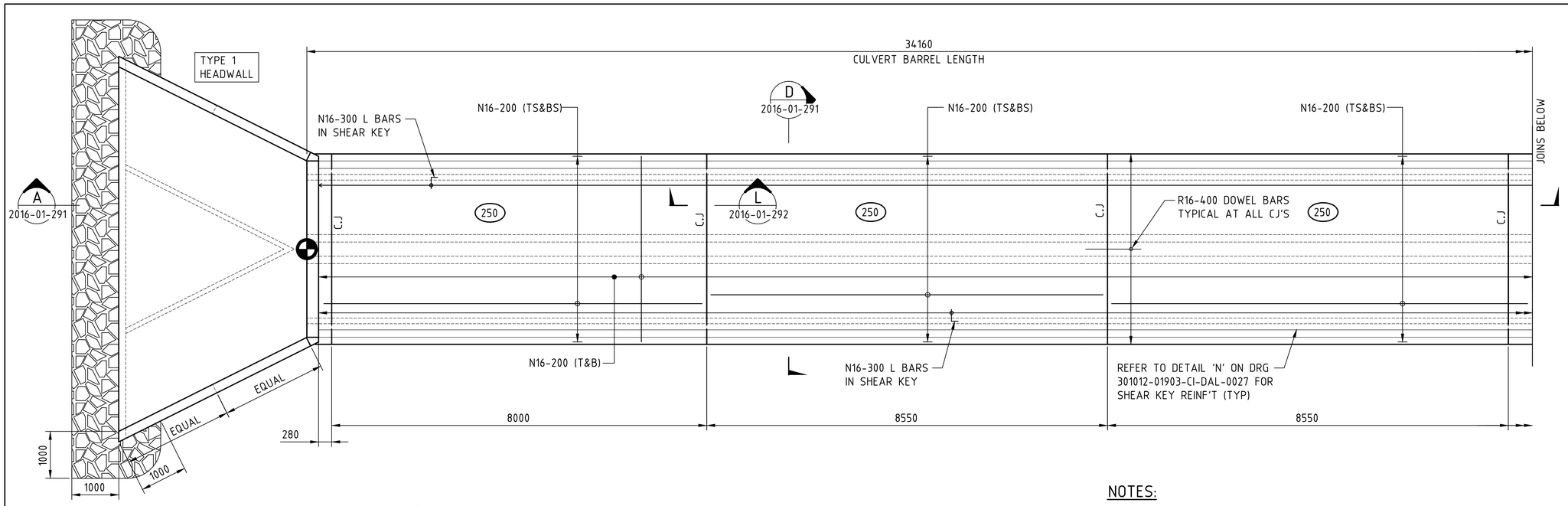
SCALES 1:100
A1

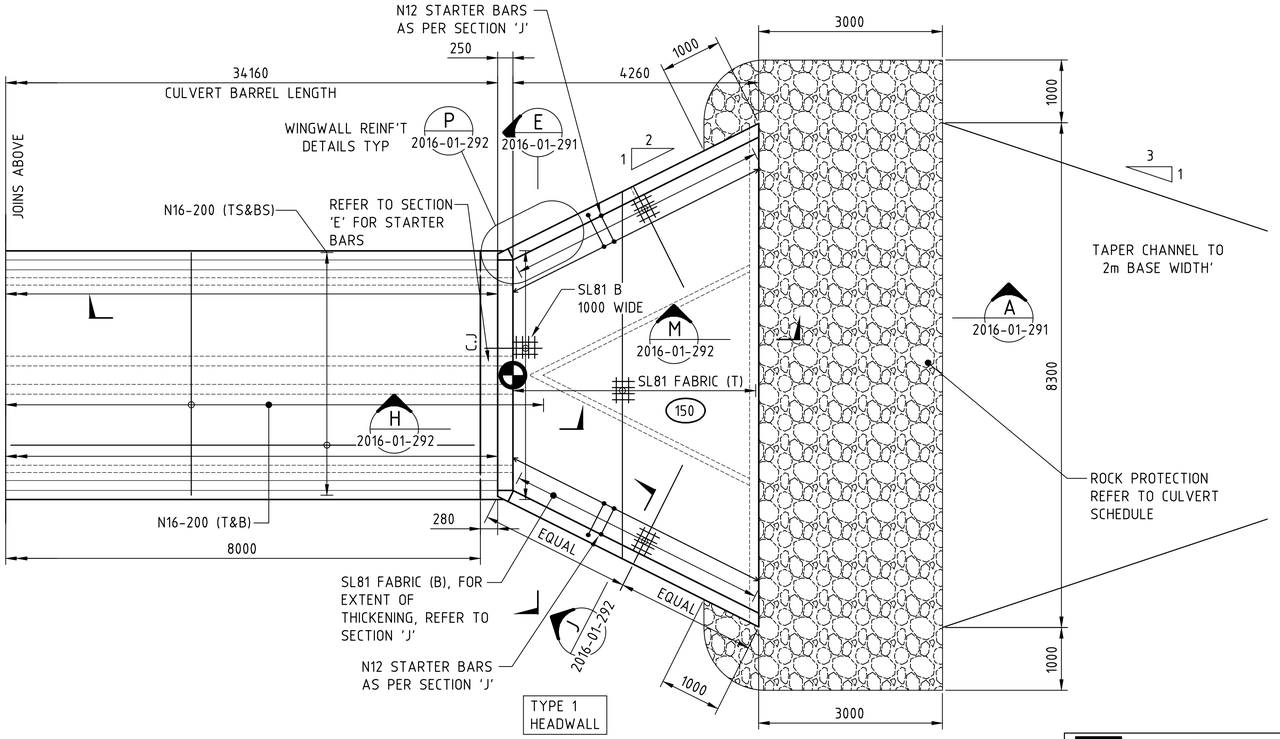
MRWA FILE NUMBER
APPROVED (MRWA)

KOJONUP PINGRUP ROAD (M021)
LAKE EWYLAMARTUP DRAINAGE CULVERT
SLK 58.30
CULVERT SECTION AND SCHEDULE

LOCAL AUTHORITY SHIRE OF KATANNING (308)
MRWA DRAWING NUMBER
2016-01-289-0



PLAN - CONCRETE LAYOUT
1:50



PLAN - CONCRETE LAYOUT - CONT'D
1:50

NOTES:

1. SAFE BEARING CAPACITY OF BASE SLAB BED SHALL NOT BE LESS THAN 150 kPa.
2. CONCRETE SHALL BE CLASS S40 WITH TYPE SR SULFATE RESISTING CEMENT AS PER AS3972 CONCRETE TO HAVE 20mm MAX AGGREGATE AND 80mm SLUMP.
3. ALL EXPOSED CORNERS OF CONCRETE SHALL HAVE A 20 CHAMFER.
4. BAR LAP LENGTH SHALL BE A 60D FOR HORIZONTAL BARS WITH >300mm CONCRETE CAST BELOW OR 45D UNLESS OTHERWISE SHOWN.
   FABRIC OVERLAP SHALL BE A MINIMUM OF TWO CROSS WIRES ON BOTH SHEETS UNLESS OTHERWISE SHOWN.
   MAIN REINFORCING WIRES SHALL RUN AT RIGHT ANGLES TO FLOW DIRECTION.
5. CUTTING AND BENDING OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH AS 3600
   REINFORCEMENT SHALL CONFORM TO:-
   N - 500 MPa REINFORCING BARS TO AS/NZS 4671.
   SL - 500 MPa MESH TO AS/NZS 4671.
   R - 250 MPa PLAIN BARS TO AS/NZS 4671 HOT DIP GALVANISED
   ABBREVIATIONS USED: N.F. - NEAR FACE
   F.F. - FAR FACE
   E.F. - EACH FACE
   T - TOP
   TS - TOP SECONDARY
   B - BOTTOM
   CJ - CONTROL JOINT
6. REINFORCEMENT DESIGNED TO AS 5100 BRIDGE DESIGN CODE USING GRADE 500 MPa.
7. CLEAR COVER TO REINFORCMENT SHALL BE:-
   a) SLAB AND APRONS - 55 FROM TOP OF CONCRETE
   - 65 FROM BOTTOM OF CONCRETE
   b) HEADWALLS AND WINGWALLS - 45 U.N.O.
8. CONCRETE FINISHES SHALL CONFORM TO THE FOLLOWING:
   8.1 2 INDICATES A FORMED CONCRETE SURFACE FINISH AND SHALL BE IN ACCORDANCE WITH AS 3610
   8.2 U2 INDICATES AN UNFORMED CONCRETE SURFACE FINISH (REFER TO THE CONCRETE SPECIFICATION)
9. PRECAST CONCRETE CULVERT SECTIONS SHALL BE SUPPLIED IN ACCORDANCE WITH MAIN ROADS CURRENT SPECIFICATION FOR THE SUPPLY OF PRECAST CONCRETE BOX CULVERTS.
10. REFER TO MANUFACTURERS SPECIFICATION FOR DETAILED DIMENSIONS AND PLACEMENT TOLERANCES FOR CULVERT UNITS TO DETERMINE OVERALL DIMENSIONS OF BASE SLAB, SHEAR KEY AND WINGWALL LOCATIONS.
11. THE PRECAST UNITS SHALL BE INSTALLED SQUARE TO THE SLOPE OF THE BASE SLAB.
12. EXTERNAL TRANSVERSE FACE JOINTS BETWEEN CULVERT UNITS SHALL BE PRIMED WITH BITAC PRIMER AND SEALED WITH 150 WIDE BITAC (OR SIMILAR APPROVED) PRIOR TO BACKFILLING.
13. PLASTIC CEMENT MORTAR SHALL BE 0.4 W/C RATIO & 3:1 SAND/CEMENT RATIO. DRY PACK CEMENT MORTAR SHALL HAVE 3:1 SAND/CEMENT RATIO.
14. BACKFILL MATERIAL IN THE 'ZONE OF SPECIAL COMPACTION' IS TO BE COMPACTED USING HAND EQUIPMENT TO 95% MAX DRY DENSITY.
15. CEMENT STABILISED BACKFILL SHALL COMPRISE SELECTED STABILISED FILL MATERIAL IN THE PROPORTION OF 100kg TYPE GP CEMENT TO 1 CUBIC METRE OF SELECTED FILL (APPLICABLE TO TRENCH METHOD ONLY).
16. SCOUR PROTECTION SHALL BE FACING CLASS ROCK. REFER TO GRADING TABLE ON DRAWING 2016-01-289-0.
17. ROCK PROTECTION, FOR GENERAL REQUIREMENTS REFER TO THE THE SPECIFICATION, GENERAL ARRANGEMENT AND CULVERT SCHEDULE DRAWINGS.
18. EPOXY TO BE RAMSET CHEMSET REO 502 OR APPROVED EQUIVALENT.

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REV	DATE	DESCRIPTION
1	15.09.17	RE-ISSUED FOR MRWA APPROVAL
0	21.08.17	ISSUED FOR MRWA APPROVAL
A0	11.02.16	ISSUED FOR USE

WORLEYPARSONS DRAWING NUMBER
301012-01903-CI-DAL-0025

AMENDMENTS

No.	DESCRIPTION	APPROVED & DATE

NOTES

DESIGN CRITERIA

1. DESIGN IN ACCORDANCE WITH AS1597.1 CLASS A.
2. DEAD LOADS AS PER CODE.
3. TRAFFIC LOADS:
   T44 STANDARD LOADING - 100%
   S1600 TRAFFIC DESIGN LOADS M1600
   TRAFFIC DESIGN LOADS W80 WHEEL LOAD.
4. EXPOSURE CLASSIFICATION B1 AS PER AS3600.
5. USE S40 WITH TYPE SR SULFATE RESISTING CEMENT AS PER AS3972.
6. SURCHARGE /CONSTRUCTION LOAD OF 20kPa ASSUMED.

METADATA

GROUND SURVEY STANDARD:
DATE OF CAPTURE: 14.05.2014
MAPPING SURVEY STANDARD:
DATE OF CAPTURE:
MAIN ROADS PROJECT ZONE: PCG 94
HEIGHT DATUM: AHD

WorleyParsons
resources & energy
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WWW.WORLEYPARSONS.COM
ABN 61 001 279 812

WP PROJECT No. 301012-01903
DESIGNED / DRAWN F.FIROOZ / L.VERSLUIS
VERIFIED L.MAY
DIRECTOR C.CHALMERS

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GREAT SOUTHERN REGION
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SCALES 1:50
A1

MRWA FILE NUMBER
APPROVED (MRWA)

KOJONUP PINGRUP ROAD (M021)
LAKE EWYLAMARTUP DRAINAGE CULVERT
SLK 58.30
CULVERT CONCRETE PLAN

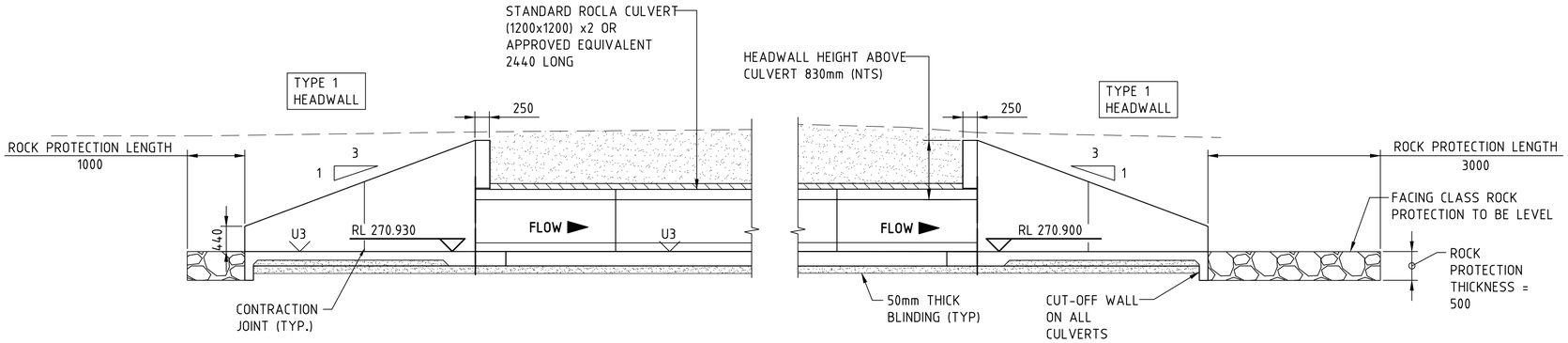
LOCAL AUTHORITY SHIRE OF KATANNING (308)
MRWA DRAWING NUMBER
2016-01-290-0

REV	DATE	DESCRIPTION
1	15.09.17	RE-ISSUED FOR MRWA APPROVAL
0	21.08.17	ISSUED FOR MRWA APPROVAL
A0	11.02.16	ISSUED FOR USE

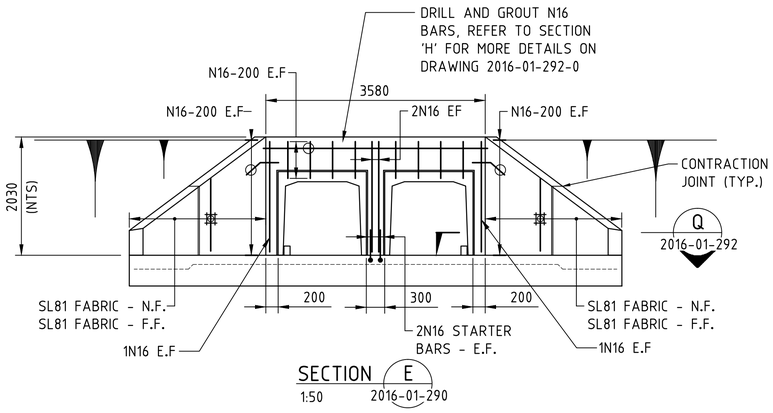
WorleyParsons resources & energy

AMENDMENTS

No.	DESCRIPTION	APPROVED & DATE

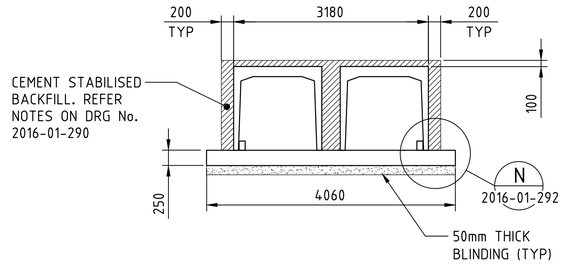


LONGITUDINAL SECTION A
1:50 2016-01-290



SECTION E
1:50 2016-01-290

HEAD WALL TYPE 1 ELEVATION



SECTION D
1:50 2016-01-290

CULVERTS / BASE SLAB
TRENCH METHOD EXCAVATION

NOTES

1. CULVERTS TO BE MRWA TRAFFICABLE CULVERTS TO EXPOSURE CATEOGORY B1.

METADATA

GROUND SURVEY STANDARD:
DATE OF CAPTURE: 14.05.2014
MAPPING SURVEY STANDARD:
DATE OF CAPTURE:
MAIN ROADS PROJECT ZONE: PCG 94
HEIGHT DATUM: AHD

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WWW.WORLEYPARSONS.COM
ABN 61 001 279 812

WP PROJECT No. 301012-01903
DESIGNED / DRAWN F.FIROOZ / L.VERSLUIS
VERIFIED L.MAY
DIRECTOR C.CHALMERS

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Telephone (08) 9892 0555 Fax (08) 9892 0577

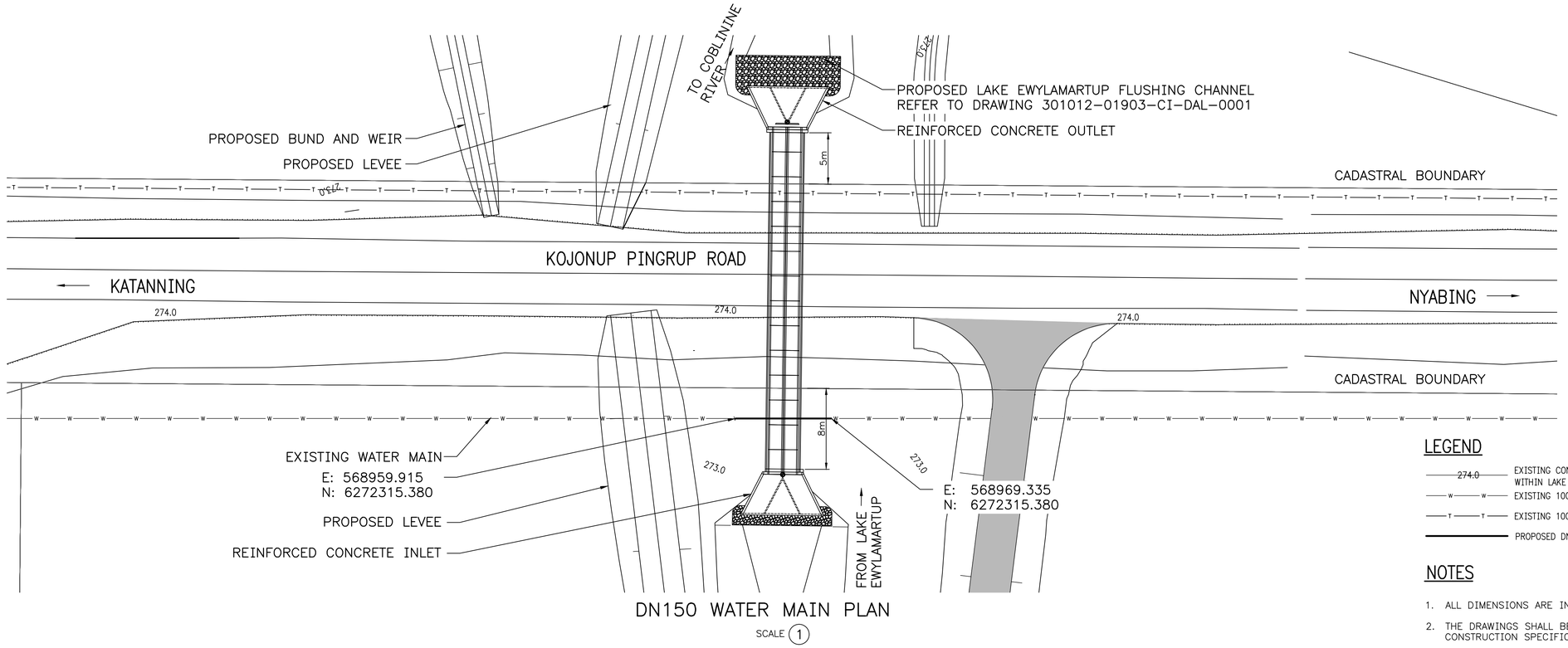
SCALES 1:50 | A1

MRWA FILE NUMBER
APPROVED (MRWA)

KOJONUP PINGRUP ROAD (M021)
LAKE EWYLAMARTUP DRAINAGE CULVERT
SLK 58.30
CULVERT AND HEADWALL STRUCTURES
SECTIONS AND REINFORCEMENT DETAILS
LOCAL AUTHORITY SHIRE OF KATANNING (308)

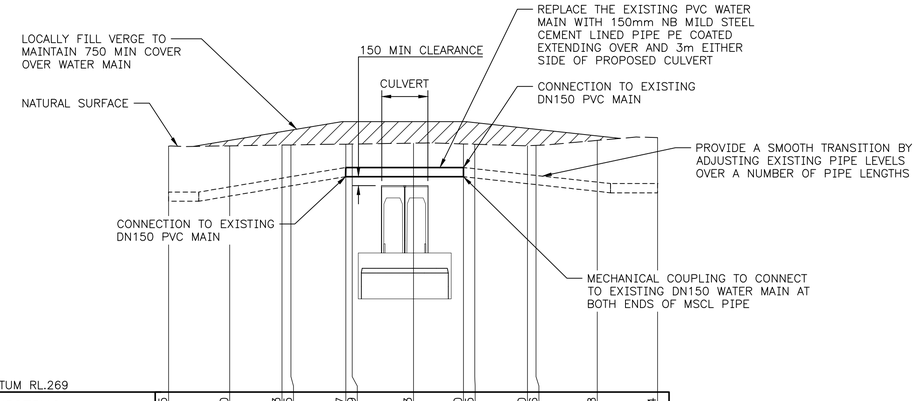
MRWA DRAWING NUMBER
2016-01-291-0

WORLEYPARSONS DRAWING NUMBER
301012-01903-CI-DAL-0026



DN150 WATER MAIN PLAN

SCALE (1)



DATUM RL.269

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DN150 WATER MAIN LONGITUDINAL SECTION

SCALE (1) HORIZONTAL (2) VERTICAL

LEGEND

- 274.0 — EXISTING CONTOURS (0.1m INTERVALS WITHIN LAKE ARE ESTIMATED)
- w—w — EXISTING 100 PVC WATER MAIN
- T—T — EXISTING 100 PVC WATER MAIN
- ——— PROPOSED DN100 PVC WATER MAIN

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. THE DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE CONSTRUCTION SPECIFICATION.
3. EXACT LOCATION OF UNDERGROUND SERVICES TO BE CONFIRMED PRIOR TO COMMENCEMENT OF EXCAVATION.
4. TOPSOIL TO BE STOCKPILED AND REPLACED AFTER LAYING THE PIPE.
5. PIPEWORK "AS CONSTRUCTED" INFORMATION TO BE RECORDED PRIOR TO BACKFILLING.
6. EXACT LOCATIONS AND LEVELS OF CONNECTION POINTS TO BE CONFIRMED ON SITE.
7. FOR CONNECTIONS TO THE EXISTING WATER MAIN, ARRANGEMENTS SHALL BE MADE WITH THE WATER CORPORATION FOR THE SHUTDOWN.
8. THE CULVERT OPERATES BY GRAVITY FLOW – ITS DESIGN LEVELS ARE CRITICAL TO ITS PERFORMANCE. THE LEVEL OF THE EXISTING WATER MAIN CROSSING THE CULVERT ALIGNMENT SHALL BE DETERMINED ON SITE. WHERE THE ALIGNMENTS CROSS, THE TOP OF CULVERT MAY BE AT A SIMILAR ELEVATION TO THE WATER MAIN. TO MAINTAIN 150mm MINIMUM CLEARANCE TO THE TOP OF THE CULVERT RAISE THE WATER MAIN IF NECESSARY.
9. CONNECT THE EXISTING PVC WATER MAIN TO EACH END OF THE REPLACEMENT MSCL SECTION USING APPROVED MECHANICAL COUPLINGS. THE MAXIMUM ALLOWABLE ANGULAR DEFLECTION AT EACH MECHANICAL COUPLING SHALL BE 2/3 OF THE VALUE RECOMMENDED BY THE MANUFACTURER.
10. ADJUST THE LEVELS OF THE EXISTING PIPES CONNECTING TO EACH END OF THE MSCL SECTION TO PROVIDE A SMOOTH TRANSITION. THE MAXIMUM DEFLECTION AT EACH SOCKETED PIPE JOINT SHALL NOT EXCEED 2°. BENDING OF THE PIPE BARREL IS NOT PERMITTED.

WorleyParsons resources & energy

REV	DATE	DESCRIPTION
1	31.08.17	ISSUED FOR WATER CORPORATION APPROVAL
0	22.08.17	ISSUED FOR WATER CORPORATION APPROVAL

PERTH ONE CALL SYSTEM DIAL 1100 DIAL BEFORE YOU DIG

WORLEYPARSONS DRAWING NUMBER
301012-01903-CI-DAL-0030

EXACT LOCATION OF UNDERGROUND SERVICES TO BE CONFIRMED PRIOR TO COMMENCEMENT OF EXCAVATION

(1) 5 4 3 2 1 0 5 10 15 m SCALE 1:250

(2) 1000 500 0 1000 2000 3000 mm SCALE 1:50

ISSUE	DATE	GRID	REVISION	DRN	REC	APPD

DESIGN SURVEY NONE | VERTICAL DATUM AHD | COORDINATE SYS MGA94–50 | ASCON SURVEY NONE | DES REF 301012-01903 | DES CALC | DES CHD | DRN A.WALKER | Q.C. CHD | NORTH POINT

RECOMMENDED
CONSULTANT PROJECT MANAGER
APPROVED
CONSULTANT PROJECT DIRECTOR

WATER CORPORATION

KATANNING NYABING ROAD
LAKE EWYLAMARTUP
CULVERT CROSSING – WATER MAIN DIVERSION
PLAN AND LONGITUDINAL SECTION SHEET 1 OF 1

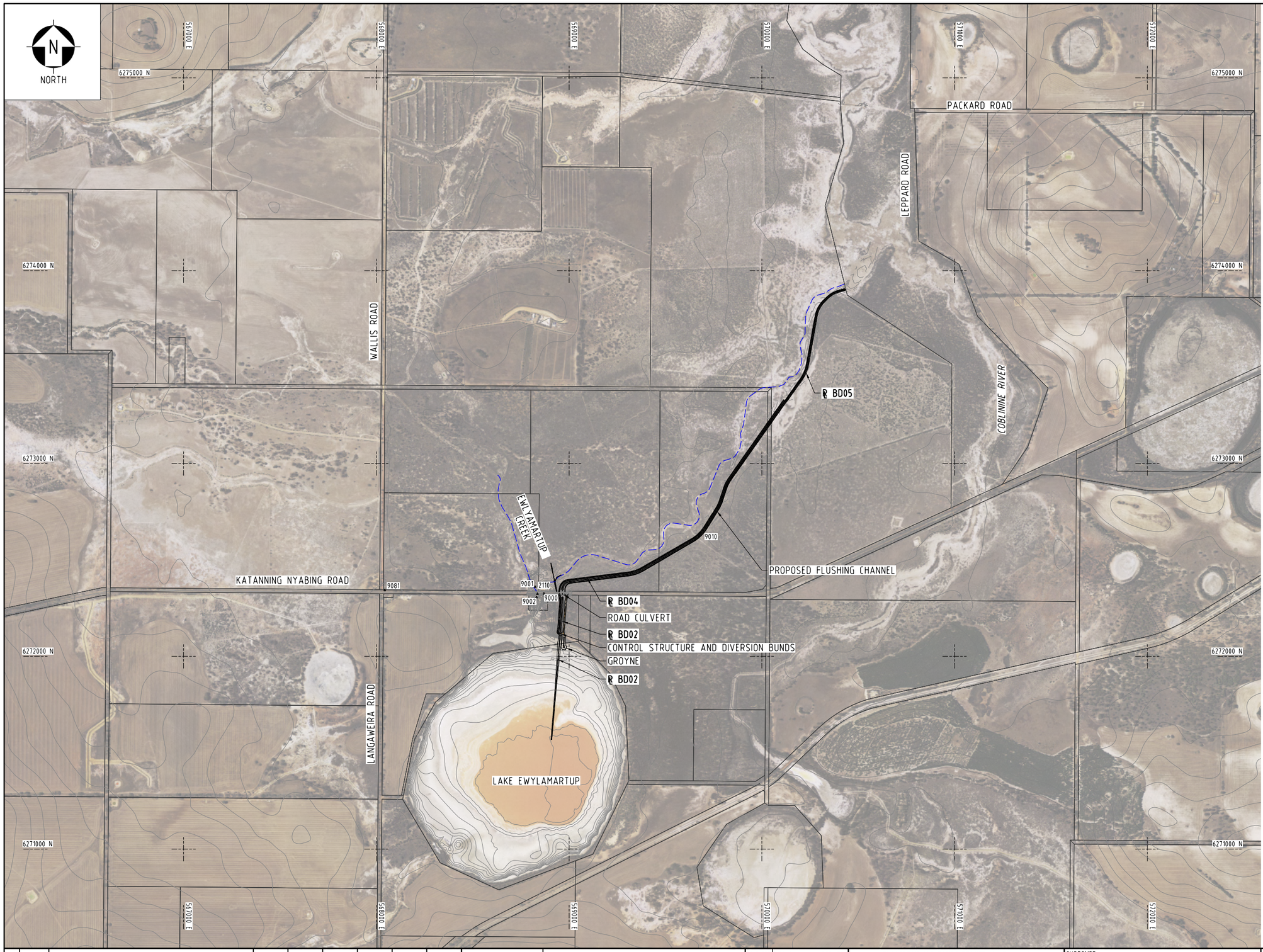
ORIGINAL SHEET SIZE A1

FILE | PLAN XXXXXX–X–X CAD | ISSUE 1

PROJECT | MF

566
810

301012-01903\CI\DWG\301012-01903-CI-DAL-0030 15:22 31/08/2017 levi.brown/AUPERT56D8BHG2S



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2. ONLY USE FIGURED DIMENSIONS. DO NOT SCALE OFF DRAWINGS.
3. REFER TO DRAWING 301012-01903-CI-DAL-0001 FOR FLUSHING CHANNEL PLAN AND PROFILE.
4. REFER TO DRAWING 301012-01903-CI-DRD-0008 FOR CONTROL STRUCTURE AND FLUSHING CHANNEL DETAIL.
5. REFER TO DRAWING 301012-01903-CI-DAL-0002 FOR EXCAVATION PLAN.
6. REFER TO DRAWING 301012-01903-CI-DAL-0004 FOR GROYNE SETOUT PLAN.
7. REFER TO DRAWING 301012-01903-CI-DRD-0001 FOR DIVERSION BUND, WEIR AND BYPASS CULVERT SETOUT PLAN.

LEGEND:

- APPROX LINE OF EXISTING EWLYAMARTUP CREEK
- ▵ 9010 — EXISTING SURVEY CONTOL POINTS
- EXISTING CONTOURS: 0.1m INTERVAL ESTIMATED WITHIN LAKE EWLYAMARTUP; 2.0m INTERVAL ELSEWHERE
- EXISTING CADASTRAL BOUNDARY

200 0 200 400 600 800 1000
SCALE OF METRES 1:10000

ISSUED FOR USE

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
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A1 SHEET SCALE 1:10,000

OneWay to zero harm

WORLEYPARSONS PROJECT No. 301012-01903

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

Government of Western Australia
Department of Regional Development

WorleyParsons
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DRD LIVING LAKES PROJECT STAGE 2
LAKE EWLYAMARTUP
OVERALL
GENERAL ARRANGEMENT PLAN

DRG No 301012-01903-CI-DGA-0005 REV 0

WORLEYPARSONS_A1

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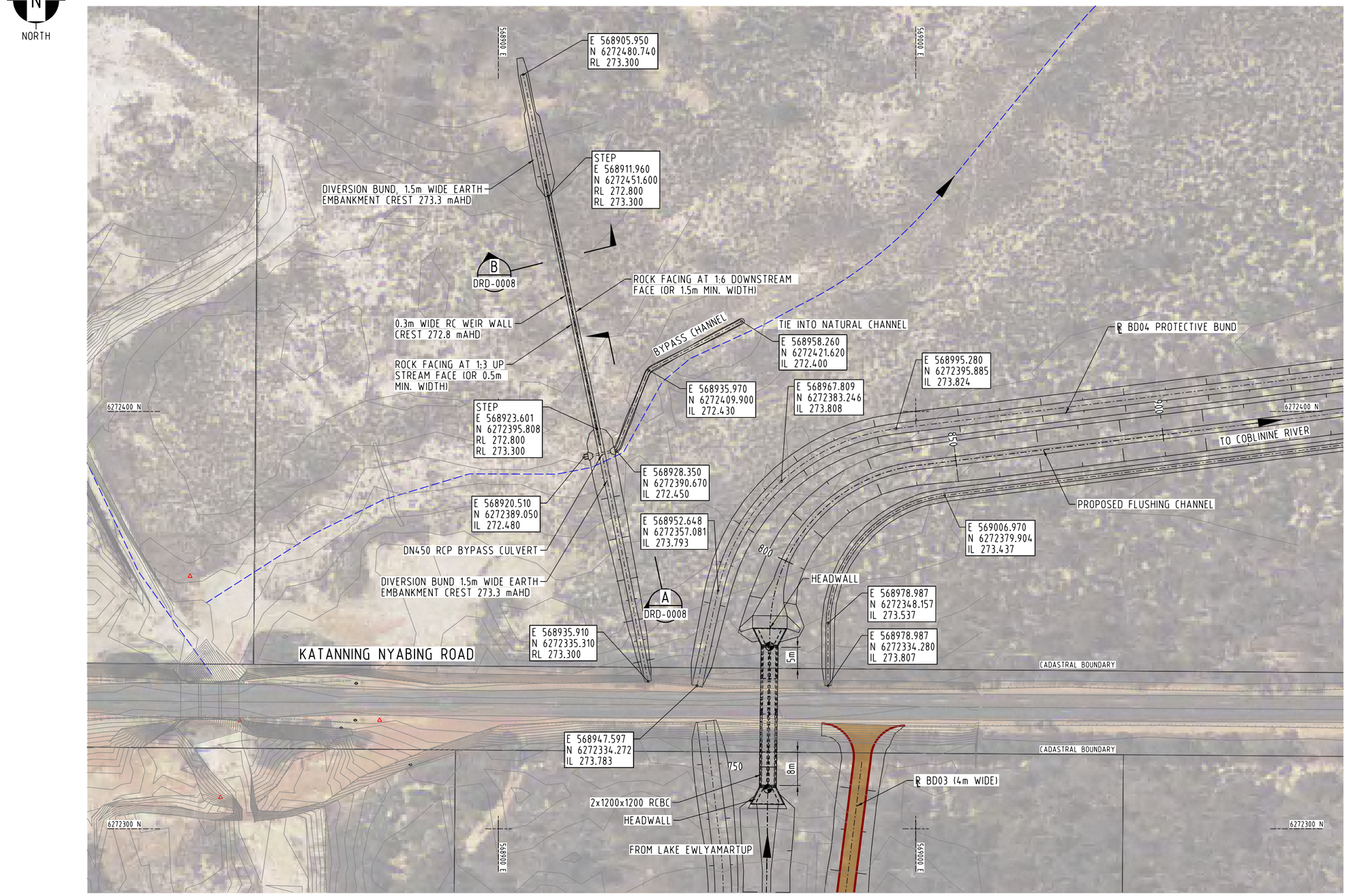

PLAN - CONTROL STRUCTURE, DIVERSION BUND AND OVERFLOW WEIR
1:500

NOTES:

1. HORIZONTAL DATUM: GDA'94
   MAP PROJECTION: MGA'94 ZONE 50
   VERTICAL DATUM: mAHD
2. ONLY USE FIGURED DIMENSIONS. DO NOT SCALE OFF DRAWINGS.
3. REFER TO DRAWING 301012-01903-CI-DAL-0001 FOR FLUSHING CHANNEL PLAN AND PROFILE
4. REFER TO DRAWING 301012-01903-CI-DAL-0022 TO 0027 FOR ROAD CULVERT AND CONTROL STRUCTURE DETAILS.
5. REFER TO DRAWING 301012-01903-CI-DRD-0008 FOR DIVERSION BUND, WEIR AND BYPASS CULVERT SECTIONS.
6. FOR BUND DETAILS REFER TO TYPICAL SECTION AND TABLE 1 ON DRAWING 301012-01903-CI-DRD-0008

LEGEND:

- EXISTING CONTOURS: 0.1m INTERVAL ESTIMATED WITHIN LAKE EWLYAMARTUP, 2.0m INTERVAL ELSEWHERE
- EXISTING CADASTRAL BOUNDARY
- APPROX LINE OF EXISTING EWLYAMARTUP CREEK
- 100mm CAPPING LAYER (TRAFFICABLE)

ISSUED FOR USE

10 0 10 20 30 40 50
SCALE OF METRES 1:500

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
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A1 SHEET SCALE 1:500

OneWay to zero harm

WORLEYPARSONS PROJECT No. 301012-01903

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

Government of Western Australia
Department of Regional Development

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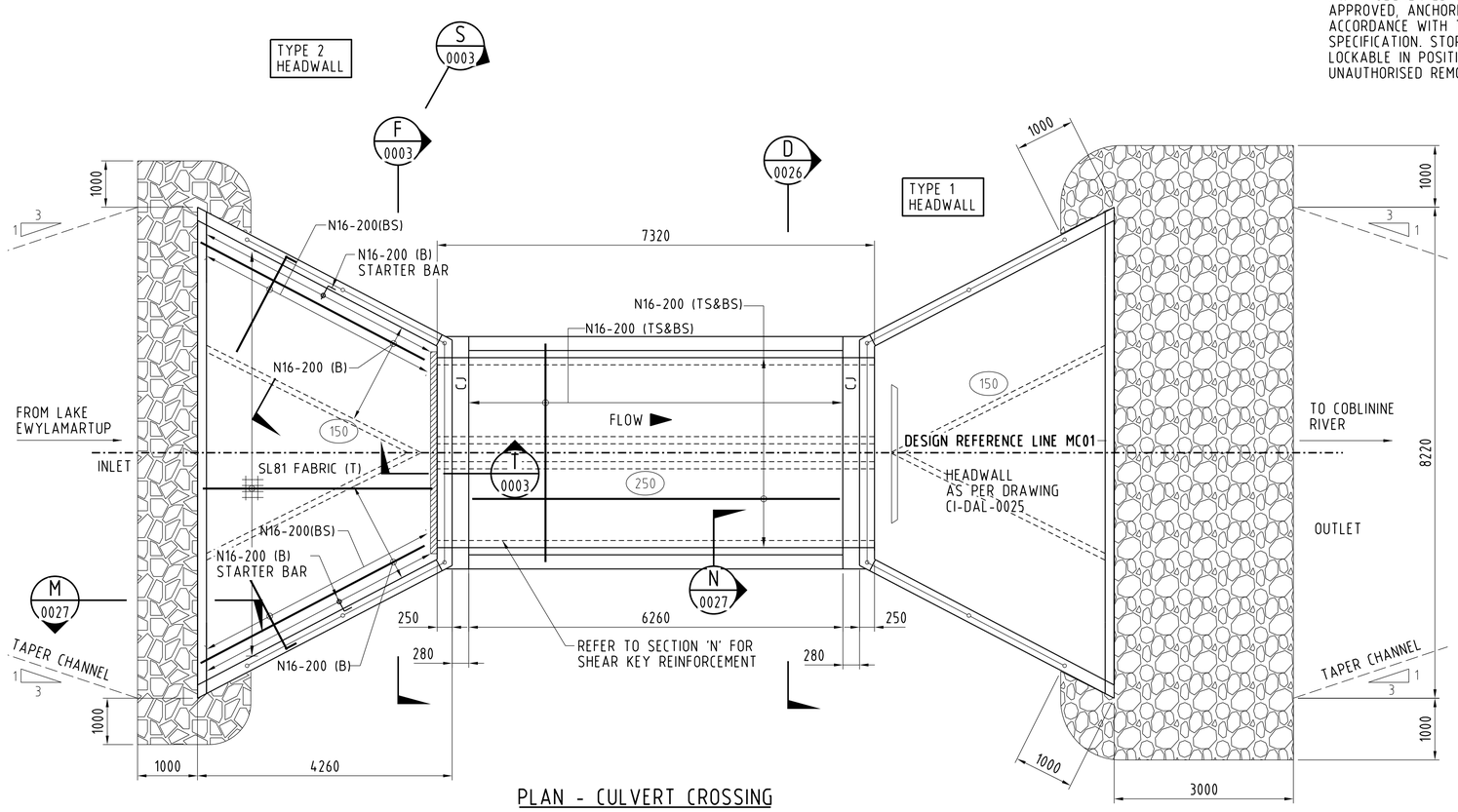
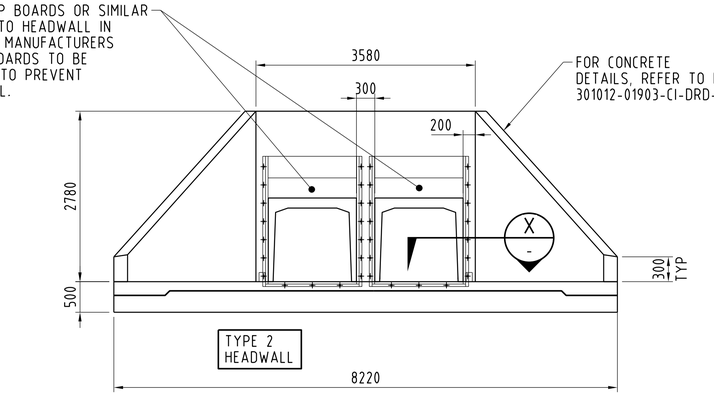
DRD LIVING LAKES PROJECT STAGE 2
LAKE EWLYAMARTUP
FLUSHING CHANNEL - DIVERSION BUND SETOUT PLAN

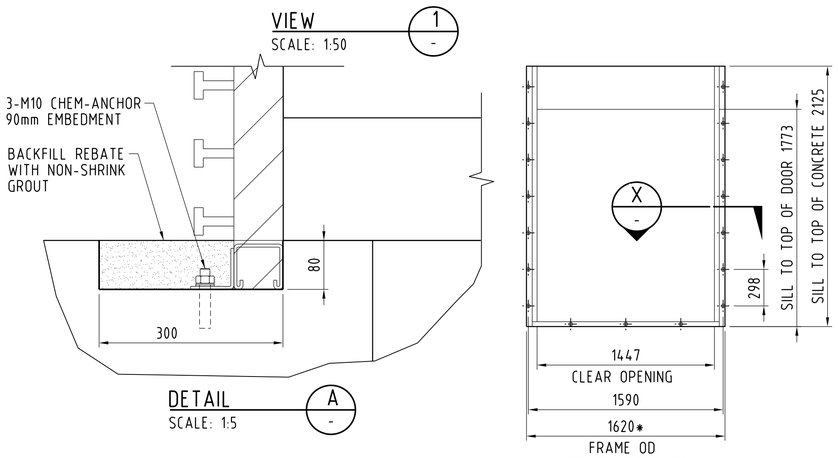
DRG No 301012-01903-CI-DRD-0001 REV 0

WORLEYPARSONS_A1



PLAN - CULVERT CROSSING
1:50





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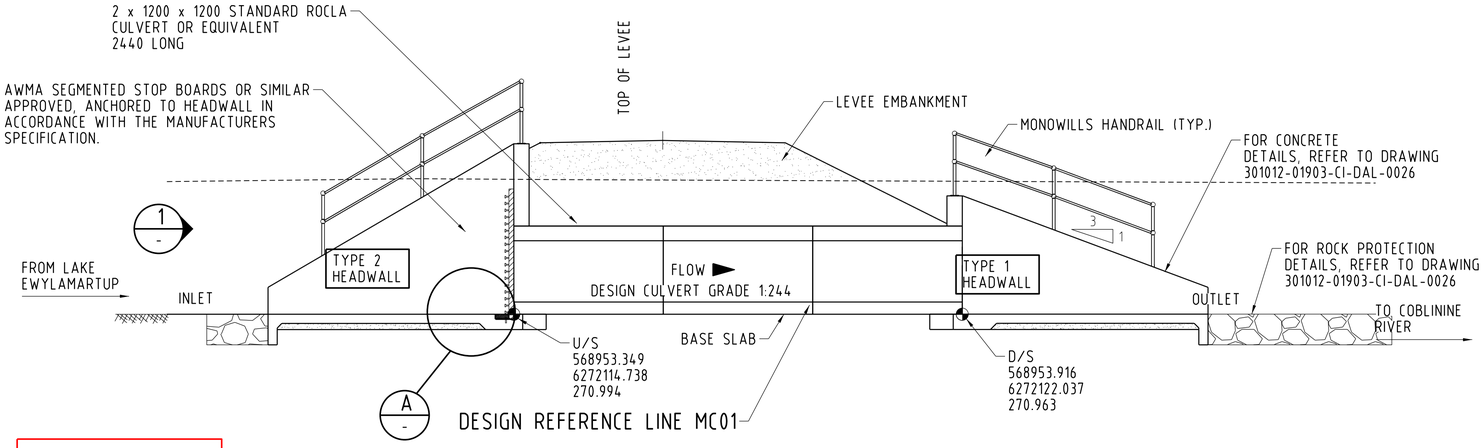
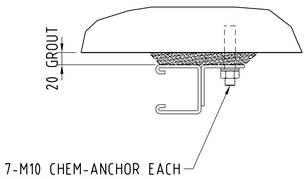
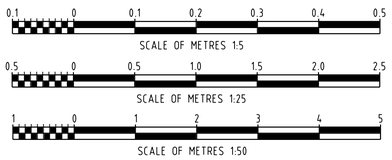


LONGITUDINAL SECTION - CULVERT CROSSING
1:50



GENERAL NOTES:

1. ALL DIMENSIONS IN MILLIMETRES UNO.
2. CULVERTS TO BE MRWA TRAFFICABLE CULVERTS TO EXPOSURE CATEGORY B1.
3. BACKING GROUT TO FRAME TO BE SHRINKAGE COMPENSATED CEMENTITIOUS GROUT.



NOTES:

1 THE 300 mm GAP BETWEEN THE PARALLEL BOX CULVERTS SHALL BE BACKFILLED WITH FLOWABLE CEMENT STABILIZED BACKFILL UP TO THE FULL HEIGHT OF THE BOX CULVERTS.

2 STOPBOARDS AND FRAMES SHALL BE FABRICATED FROM 316 STAINLESS STEEL AND FITTED WITH HIGH MOLECULAR WEIGHT POLYETHYLENE GUIDES AND SEALS.

3 STOPBOARDS SHALL COMPRISE 100 mm HIGH STOPBOARD SEGMENTS INSTALLED TO THE FULL FRAME HEIGHT SPECIFIED.

4 ANODES FOR CATHODIC PROTECTION SHALL BE SUPPLIED AND FITTED TO THE STOPBOARDS AND FRAMES AS SPECIFIED.

5 ANODES SHALL BE TO AS 2239 TYPE Z1, AS CAA (DZ2-52-15S 0.9 kg BOLT ON FLUSH-MOUNTED ANODES OR SIMILAR APPROVED. REAR FACE OF ANODES TO BE SUPPLIED EPOXY COATED.

6 EACH STOPBOARD SEGMENT SHALL BE FABRICATED TO INCLUDE TWO PAIRS OF M10 SS STUD HEX BOLTS SIZED TO PROVIDE SECURE ATTACHMENT OF TWO ANODES. LOCATE TO POSITION ANODES AT 1/3 AND 2/3 POINTS ALONG THE STOP BOARD LENGTHS.

7 EACH VERTICAL FRAME SHALL BE FABRICATED TO INCLUDE 3EA. PAIRS OF M10 SS STUD HEX BOLTS SIZED TO PROVIDE SECURE ATTACHMENT OF 3EA. ANODES. LOCATE TO POSITION ANODE MID-SECTIONS AT NOMINAL 0.25m, 0.75m AND 1.25m HEIGHTS ABOVE CULVERT FLOOR.

8 THE STUD HEX BOLT AND ANODE LOCATIONS SHALL BE ARRANGED TO AVOID COMPROMISING FRAME INSTALLATION AND NORMAL STOPBOARD OPERATION.

9 EACH ANODE SHALL BE SECURED TO THE STOPBOARD OR FRAME STUD HEX BOLTS WITH M-10 SS NUTS AND WASHERS. ABRADE ANODE INSERT TO CLEAN BRIGHT METAL PRIOR TO BOLT-DOWN. COAT ANODE INSERT & SS FASTENERS WITH 2-PART EPOXY AFTER BOLT-DOWN.

10 ALL ANODES SHALL BE SERVICEABLE AND REPLACEABLE IN-SITU.

ISSUED FOR USE

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
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0	06-JUL-16	ISSUED FOR USE	MI	DH	IW	IW	CC			

A1 SHEET SCALE AS SHOWN

OneWay to zero harm

WORLEYPARSONS PROJECT No. 301012-01903

ENGINEERING AND PERMIT STAMPS (As Required)

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Government of Western Australia
Department of Regional Development

WorleyParsons
resources & energy

DRD LIVING LAKES PROJECT STAGE 2
LAKE EWLYAMARTUP
FLUSHING CHANNEL CONTROL STRUCTURE
PLAN, SECTION AND DETAILS

DRG No 301012-01903-CI-DRD-0002 REV 1

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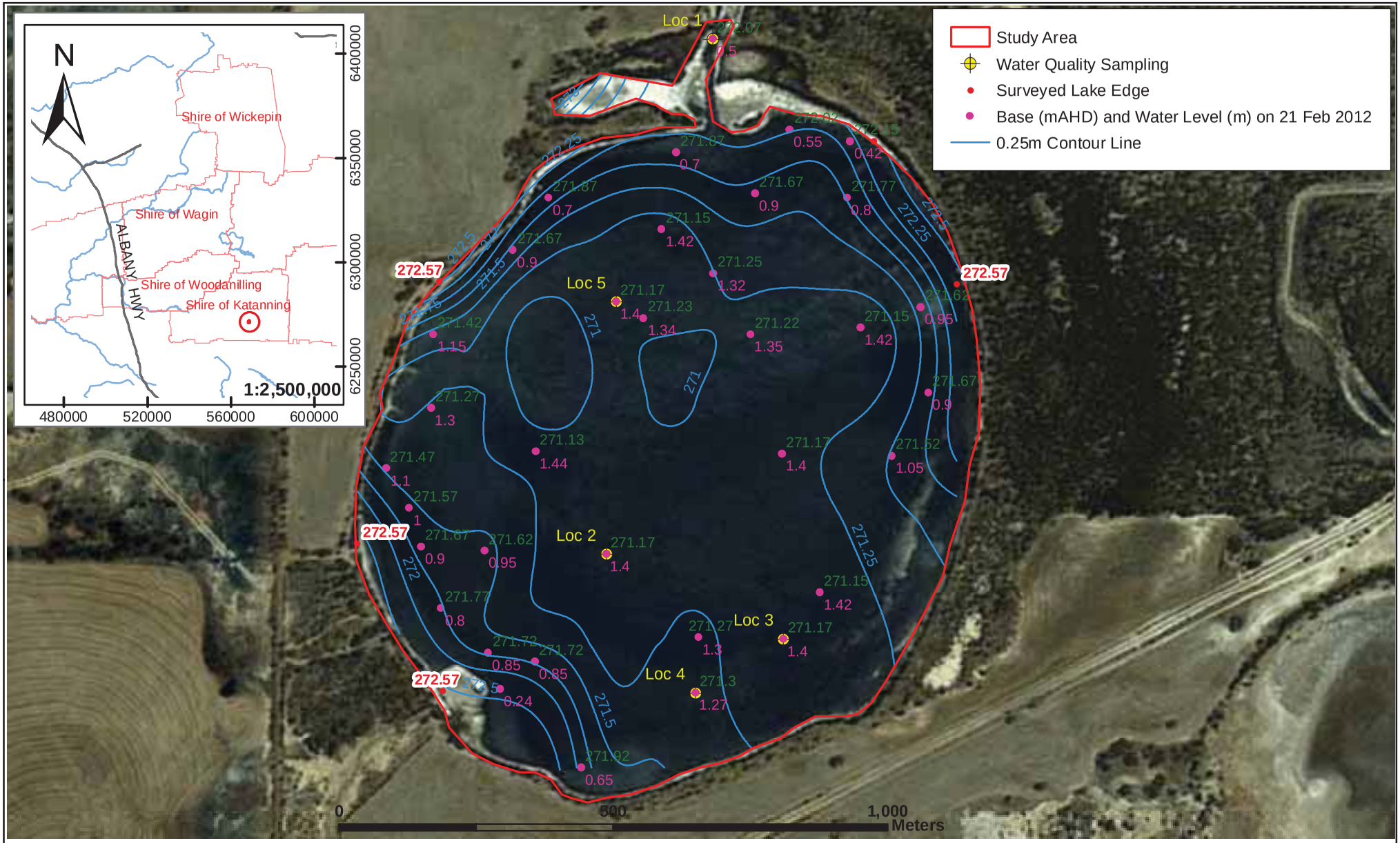

Data Source: JDA Survey on 20 Feb 2012, JBA Surveys (2012), Google Earth aerial photograph taken in 2008.

Job No. J4905
Scale:1:9,500

Department of Regional Development and Lands
Living Lakes Feasibility Study Stage 1: Part 2 Report

Figure 4.4: Ewlyamartup Lake: Lake and Bed Sampling Locations and Lake Bed Contours

10.1.2

Department of Regional Development and Lands

Living Lakes Project Stage 1: Part 2 Report

Feasibility Study of Lakes Towerrinning, Ewlyamartup and Yealering

JDA Consultant Hydrologists

With

Land Assessment Pty Ltd

Woodgis Environmental Assessment and Management

Advanced Choice Economics Pty Ltd

DISCLAIMER

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    2 Lake Water Quality
    3 Lake Bed Sediment
    4 Land Survey
    5 Geophysics
    6 Cost Estimation
2. Methodology – Modelling
    a. Monthly Water and Salt Lake Balance
    b. XP-Storm Hydraulic Model
3. Community Consultation: Attendance and Feedback

ATTACHMENTS (Bound Separately)

1. Living Lakes Feasibility Study: Environmental Report prepared by Land Assessment Pty Ltd and WoodGis Environmental Assessment and Management
2. Living Lakes Feasibility Study: Benefit Cost Analysis Report prepared by Advanced Choice Economics Pty Ltd

1. INTRODUCTION

1.1 Living Lakes Project Overview

The Liberal-National Government's Royalties for Regions 'Living Lakes' program proposes to enhance one or more existing lake systems to create permanent and accessible water bodies in the Wheatbelt and adjoining regions of Western Australia. Twenty-five lakes were initially nominated by community members and other interested parties in response to an expression of interest process led by the Department of Regional Development and Lands (RDL). Five of these lakes were subsequently withdrawn.

Part 1 of this study (JDA *et al,* 2011) assessed the remaining twenty nominations against the Living Lakes Plan objective and established selection criteria, providing a justification for a short-list of two or three lakes to be considered for further lake enhancement.

A Multicriteria Analysis (MCA) was used to prioritise the 20 lakes. This involved scoring each lake against a set of 12 criteria, developed by (JDA Consultant Hydrologists) in collaboration with RDL. The results of the MCA short-listed three lakes for further consideration in the Living Lakes Plan and a more in-depth feasibility study on each, detailed in this report.

1. Lake Towerrinning
2. Lake Ewlyamartup
3. Lake Yealering

1.2 Community Consultation

Community vision and support are a major part of the Living Lakes Initiative. Since November 2011 there have been two official Community Consultation Meetings with local stakeholders at each of the three lakes. As well as this there have also been numerous meetings and consultation with local stakeholders by the JDA team.

The first of the official meetings was in late November and early December 2011. The main objective of this initial consultation was to gather the opinions of the local Community and assess what they would like to gain from the Living Lakes Project. This also provided a platform for some preliminary ideas for the enhancement options to be explored in this study.

The second official Community Consultations were the Workshops presented on the 28 and 29 March 2012. These Workshops were an opportunity for the JDA team to present potential enhancement options to the public and gain feedback.

Following the March 2012 Workshop, a Draft Report was issued, feedback on which is presented in Appendix 3.

In addition Indigenous Consultation was conducted.

1.3 Overview of Lakes

A comparison of the 3 lakes in terms of water volume, salinity and salt load is shown in the volume versus concentration graph in Figure 1.1.

This figure shows an envelope of the range of variability of water volume and salinity in each of the lakes over the period 2003 to 2011, which is the standard period used in this report.

It can be seen that Lake Towerrinning has a volume of up to 4 Mm^3 when full and a salinity in the range of 5000 to 10,000 mg/L.

Lake Ewlyamartup on the other hand has a much lower volume range up to 1.2 Mm^3 and a higher salinity.

Lake Yealering regime varies over a much larger volume range up to 6 Mm^3 (including Outlet Swamp), is hypersaline generally, and has a time trend of increasing salt load over the period.

1.4 Scope of Report

Stage 1 of the study is divided into 2 parts. This report relates to Part 2 only.

Part 2 (Deliverable 5) – requires desktop, consultation and field work components.

In undertaking Part 2 of the study the Consultant Team lead by JDA Consultant Hydrologists were to:

- Include a review of the engineering solutions,
- Include an environmental, economic and social cost analysis and key constraints;
- Include a high level risk assessment and mitigation analysis on the preferred option for each lake;
- Outline the option for each lake identified, the preferred option for each lake and the supporting evidence for that option;
- Compile details of the Community Consultation Workshop for each lake encompassing the community vision for the lake, intended use for the lake, any conflicting positions within the community and the community plan/level of support for the development of the lake;
- Summarise the consultation undertaken with key state and local Government authorities such as Catchment Councils, Local Shires, Development Commisions and other State Government Departments.

The Environmental Report prepared by Land Assessment Pty Ltd and Woodgis Environmental Assessment and Management is Attachment 1 (bound separately).

The Cost Benefit Analysis Report prepared by Advanced Choice Economics Pty Ltd is Attachment 2 (bound separately).

1.5 Environmental Report

This report, prepared by Land Assessment Pty Ltd and WoodGis Environmental Assessment and Management (Attachment 1), describes the environmental setting and values of the three lakes (Lakes Towerrinning, Ewlyamartup and Yealering) that were selected during an earlier stage of the Living Lakes Project. It outlines environmental considerations and provides an assessment of 'environmental risk' relating to a number of lake-enhancement options that have been developed and evaluated in terms of hydrological feasibility.

The environmental considerations for each lake are based on a review of existing environmental information and supplemented by site-specific field survey and mapping of landform, soil and vegetation conditions.

The term 'environmental risk' refers to the assessment of the potential to adversely impact lake environmental values, and the associated potential for censure of proposed enhancement options during regulatory approval processes.

The environmental risk assessment for lake enhancement options is qualitative. As part of the Feasibility Study, the level of assessment undertaken could only be of a relatively superficial nature aimed at identifying 'make or break' issues. Any quantification of environmental impacts requires more detail on predicted hydrological changes following the adoption of one or more enhancement options.

Specific environmental considerations are identified in relation to the location, design and management of engineering structures associated with the lake enhancement options. None of these considerations are 'fatal flaws' to lake enhancement in their own right. In this environmental context the enhancement options are feasible.

1.6 Benefit Cost Analysis Report

The aim of the BCA report, prepared by Advanced Choice Economics Pty Ltd (Attachment 2) is to compare the social, recreational and economic benefits for regional communities of alternative design options for enhancement of Towerrinning, Ewlyamartup and Yealering Lakes.

The BCA uses Benefit Cost Index (BCI) as a tool for comparison.

The numerator is a Benefit Score which estimates the value of lake enhancement multiplied by the probability of risks associated with obtaining landholder support for construction, and environmental and Aboriginal cultural heritage impacts.

The denominator is the sum of construction costs and the present value of future maintenance costs over a 20 year time frame.

Interpretation of the BCI differs from that of a conventional Benefit Cost Ratio (BCR). In the case of a BCR, a number between 0 and 1 indicates the benefits are positive but are outweighed by the costs; and a number greater than 1 indicates that the benefits outweigh the costs. This interpretation does not apply to the BCI. The numerator of the BCI (the Benefit Score) is unrelated to the numerator (the Present Value of the Costs). The Benefit Score is scaled such that approximately half the options have a BCI less than 0, for ease of readability.

Information for the BCA is taken from conversations with the project team, members of the project Steering Committee, attendees at the Living Lakes Community Consultation Workshops at each of the

lakes, the Living Lakes Initiative Stage 1 on-line survey questionnaire results (JDA Consultant Hydrologists 2011), and significant literature review.

2. REVIEW OF EXAMPLES

The case studies described below for Lakes in Western Australia focus on examples of modification for recreational use, particularly water sports.

Champion Lakes – City of Armadale

This Project involved the excavation of 2.7 Mm^3 of spoil from Wright Lake to create an International Standards Rowing course, namely a permanent lined water body approx. 2m deep, 100m wide, 2 km long.

The lake is replenished with brackish groundwater sourced from an artesian aquifer, and excess water is pumped into a deeper aquifer using recharge bore (Bruce & Tame, 2004).

Lake Mears – Shire of Brookton

This paper represents an evaluation of the conceptual viability of solutions to manage salinity in Lake Mears, a small, poorly drained and saline ephemeral lake near Brookton, 180 km east of Perth. The most viable, immediately available options are implementation of either diversion bunds to restore the natural flooding and salt-flushing systems of the lake (the "flushing" option) or construction of a drain and gate structure to allow the lake to be drained into a stream downstream of the existing gates (the "drain" option).

The flushing option is overall the most favourable because it has less downstream environmental impacts, improved flood management, is simpler, cheaper and easier to install and operate. The water released will be of lower salinity than with the drain option, and it is probably more appealing to the wider community. The study demonstrates that engineering solutions for salinity management of high-value assets can satisfy a range of conflicting objectives while minimising downstream environmental impact and maximising beneficial effects.

Yenyening Lakes – Wheatbelt WA

The Yenyening Lakes consists of a series of interconnected wetland basins extending 15 km upstream of Qualandary Crossing. The Lake management options investigated by GHD (2007) focused on potential to the operating level of the gates at Qualandary Crossing and changes to the current arrangements for waterskiing.

Changes to the operating level at Qualandary Crossing can have a significant influence over the volume of storage within Yenyening Lakes and the frequency of discharge from the Yenyening Lakes to the Avon River. Hydrodynamic modelling undertaken during the project indicates that a reduction of the operating level at Qualandary Crossing below 210.8 mAHD would result in increased frequency of saline discharge from the Yenyening lakes to the Avon River, particularly during summer.

There has been a history of water skiing at Yenyening lakes and the current management of the lakes includes provisional gazettal of Ski Lake for water skiing.

`Water skiing does represent a threat to the environmental amenity of the Yenyening Lakes, and in particular to waterbird visitation.

Options investigated for managing water skiing within the Yenyening lakes included construction of an earthen wall (and bund) around Ski Lake to increase the depth of ski late beyond its current 1.6 m, and works to develop an offline ski lake (Racecourse lake).

The construction of an earthen wall around Ski Lake and associated works including the construction of outlet controls on all lakes and a diversion drain to supply water to the modified Ski Lake, was estimated to cost in the order of $3.0 million. Works associated with this option would be relatively invasive and present risks to the current nature conservation and cultural values of the Yenyening lakes and presents technical risks associated with design, construction, management and maintenance of a complex series of structures.

The development of an off-line Ski lake may provide a potentially workable option as an alternative to skiing on the main lakes, however will not completely remove the impact of skiing on the environmental amenity of the lakes.

The development of Racecourse Lake as a designated off-line ski lake is technically feasible and preliminary assessment indicates a cost in the order of $240,000 (NPV 50 years). However, the likely increased concentration of salt within a designated offline ski lake and an increase in the operating complexity of the Yenyening lakes represent potential obstacles to the adoption of this option.

GHD (2007) recommended:

- That the current operating level of the gates at Qualandary Crossing (211.0 mAHD) be maintained. It is considered that an operating level of 211.0 mAHD provides optimum operating level when considering environmental amenity, flood attenuation and protection of the Avon River from saline flows.

- That the potential for the development of the off-line ski lake be further investigated, through consultation with the Department of Environment and Conservation and the local community.

- Construction of an earthen wall around Ski Lake to provide a greater depth for waterskiing activities is not recommended, due to cost implications, physical impacts within the Yenyening Lakes environment and potential impact on large flow event through the wetland complex.

3. LAKE TOWERRINNING

3.1 EXECUTIVE SUMMARY

Lake Towerrinning is the largest area of permanent water in the Wheatbelt of WA. Its water regime is largely due to the rediversion works carried out in the early 1990's which increased the volume of water reaching the lake and therefore the water level of the lake.

Prior to these works, the lake rarely filled and had high salinity and salt load (Froend & McComb, 1991). The lake is now brackish (5000 to 10,000 mg/L) and overflows in almost all winters.

The water quality and lake level variation generally satisfy all stakeholders at present.

The lake itself as well as the Inlet Swamp and Outlet Swamp are described and analysed in the report.

The treatment of the lake in this report is in terms of "future-proofing", that is to identify factors which govern its present state and the effect on the lake, Inlet and Outlet Swamps if these factors were altered.

The on-going condition of the lake depends on the co-operation of a number of Private Landholders including those associated with the rediversion drain structure and downstream drain as well as the lake outlet control works.

The Inlet Swamp is a major water bird habitat. The Outlet Swamp is degraded and during summer contains stagnant water of poor quality with associated odour.

The most feasible Enhancement Options are general maintenance (rehabilitation) of the rediversion drain and structure and provision of a refined outlet from the Outlet Swamp to the Arthur River.

The Benefit Cost Analysis (BCA) analyses the benefit of Enhancement Options, relative to the current lake condition.

In addition a number of other recommendations are made to confirm the predictions made in this report.

3.2 Lake Setting

General

Lake Towerrinning is located in the Shire of West Arthur approximately 40km South-West of Arthur River Town site and 250 km South-East of Perth (see Figure 3.1).

Lake Towerrinning is approximately 180 ha in size when full, with a volume of 4 Mm^3. The contributing catchment is 12,500 ha and drains from Cordering in the North-West down to Moodiarup in the South-East, a distance of 22 km (George and Bennett 1992).

Land ownership around the lake is shown in Figure 3.2

Environmental Status

The environmental setting of the lake is described in Attachment 1, to which reference should be made.

Hydrology

The average long term annual rainfall (1898-2011) is 551.5 mm, taken from the BOM rain gauge at Darkan (30 km North of Lake, see Figure 3.1). The average annual rainfall from 2001-2011 is 490.8 mm, a fall of approximately 10% from the long term average.

Inflow to the lake is from two distinct contributing catchments that discharge via a single North-West inlet (see Figure 3.1).

In 1991 a rediversion structure was built 12 km North – West of the Lake Towerrinning at the confluence of Morlup and Cordering creeks as well as a W drain from the re-diversion to the Lake. This was designed to re-divert more fresh water from the upper part of the catchment down into the Lake. The re-diversion was put in place along with a set of boards to control water levels at the lake outlet. The boards are managed by Ian and Theresa Peirce who own the land on which the outlet sits.

The upper catchment has an area of 12,500 ha from which runoff converges in the Morlup (West) and Cordering Creeks (North-West) to the rediversion structure. The rediversion structure has a 100 mm diameter pipe at low elevation which is designed to divert low highly salines flows away from the lake. It has a nominal capacity of approx. 20 to 30 L/s.

The 850 mm diameter pipe culvert which discharges to the W drain leading to the lake has an invert elevation 239.6 mAHD. The spillway to the south away from the lake with a length of approximately 20 m has an invert elevation 240 mAHD.

The lower catchment, between the rediversion structure and the lake, has an area of 6,400 ha.

Lake Towerrinning has a maximum volume of approximately 4 Mm^3 at a water level of 218.75 mAHD, which can be attained by placement of boards at the outlet structure above the natural sill level of 218.5 mAHD.

Department of Environment and Conservation (DEC), provided JDA with historical water level and salinity data for the lake itself which show clear seasonal variations.

Since the rediversion structure was completed in 1991 the lake has never completely dried out.

Lake outflow occurs at the southern end to the Outlet Swamp and to Arthur River.

3.3 Literature Review

3.3.1 Published Reports

A review of published reports is included in Attachment 1, to which reference should be made.

3.3.2 Available Data

JDA requested data on water levels and Lake water quality from DEC Busselton office, and received a spreadsheet of water depths (m), with a conversion factor to mAHD, and lake salinity data over a period 1977 to 2011. The Lake water elevation data over this period contained many anomalous values, probably due to uncertainty regarding the staff gauge zero, and JDA has relied on only data for the 9 year period 2003 to 2011 (inclusive) in this report.

Salinity data was received by DEC in electrical conductivity (EC) units which JDA converted to concentration units mg/L.

In addition, a UWA Honours thesis contained water levels and salinity (Hazell, 2003).

Water depth data (m) recorded on a data logger at the rediversion structure during 1996 was supplied by Don Bennett, Department of Agriculture and Food, Bunbury.

3.4 Field Investigation Results

3.4.1 Lake Bathymetry

Lake bathymetry reflects the stage-area-volume relationship of a lake. On 20 February 2012 water depths (m) of Lake Towerrinning at multiple locations (recorded with GPS) were measured by JDA from a dinghy (Figure 3.3). The readings were then converted into mAHD applying the surveyed water level on that date of 218.3 mAHD. The lowest point measured on the lake bed was 215.75 mAHD corresponding to a maximum depth on that date of 2.55m.

The overflow level without boards in place, is 218.5 mAHD from survey. Figure 3.3 shows the contours of Lake Towerrinning bed. Surface area and volume at each 0.25m contour interval are presented in Table 3.1 and shown in Figure 3.4

3.4.2 Lake Water Quality

Detailed method of lake water quality monitoring, including parameters, water sampling and handling, and the guideline values utilised for comparison is provided in section 1.2 of Appendix 1.

Details of Lake Towerrinning water quality profiling results through the water column measured 20 February 2012 at 5 locations in Lake Towerrinning (Loc 1 to Loc 5), Inlet Swamp and Outlet Swamp are shown in Figure 3.5 and presented in Table 3.2.

PHYSICO-CHEMICAL

Temperature Profile

The lake surface water temperature ranged from 24.5^{o}C at Loc 4 to about 25.3^{o}C at Loc 2 averaging 24.9^{o}C, consistent with average daily air temperature. The Lake column is fully mixed with respect to temperature. Temperature of the Outlet Swamp was 30^{o}C, due to it being shallower than the lake itself. The range of all water temperatures is within the ANZECC and ARMCANZ (2000) guideline values (15^{o}C to 35^{o}C; see Table 3.2 and details in section 1.2 of Appendix 1).

pH Profile

The lake surface water pH was about 8.6, whereas the Inflow swamp and Outlet Swamp pH were both 8.7. All values were within the guideline of pH 5 to 9 (see Table 3.2 and details in section 1.2 of Appendix 1).

Salinity Profile

Lake electrical conductivity (EC) averaged 17.2 mS/cm, corresponding to salinity of 9,360 mg/L, fully mixed with respect to depth and location. Salinity of Inflow Swamp was higher (10,000 mg/L), and Outlet Swamp approaching sea water (30,000 mg/L). The measured salinity on 20 Feb 2012 is within the range of salinity measurement from 1980 to 1986 as reported in Froend & McComb (1991) and from 1977 to 2007 as reported in Van Wyk & Raper (2008).

The range of salinity and EC in the guideline values (<1,000 mg/L of TDS; Table 3-2) applies to freshwater lakes and so does not apply to Lake Towerrinning.

Oxidation Reduction Potential (ORP) Profile

In aqueous solutions oxidation reduction potential (ORP) or redox potential is a measure of the tendency of the solution to either gain or lose electrons when it is subject to change by introduction of a new substance. A solution with a higher ORP (more positive) than the new substance (contaminants) will have a tendency to gain electrons from the new substance (i.e. to be reduced by oxidizing the new substance); and *vice versa*.

The ORP values were generally greater than 60mVolt, which indicated that the water has high electron activity and is able to oxidize contaminants. Lower values were measured at the bottom layer (close to lake bed) at Locations 1 and 5.

Dissolved Oxygen Profile

All DO concentrations of Lake Towerrinning were greater than 6.5 mg/L, which equates to >80% saturation level (i.e. the guideline value in Table 3.2). This indicates reasonably good condition of lake water quality in term of oxygen levels.

Both DO concentrations and ORP profiles indicate Lake Towerrinning water has a high potential to oxidize organic material (or contaminants). The high levels of DO concentration and ORP at the bottom layer are able to bind dissolved nutrients, particularly phosphorus, in form of particulates to the lake sediments. This reduces the risk of excessive algal growth.

Turbidity Profile

The lake water was quite turbid (i.e. turbidity values were all greater than 10 NTU), increasing with depth, with a sharp increase close to the lake bed as a result of sediment disturbance due to wind-induced mixing.

There is no relevant guideline value.

A. IONS

The comprehensive ions concentration analyses are provided in Table 3.2, which indicates that the Lake Towerrinning water is Na-Cl (sodium-chloride) type of water. The guideline values for Na^{+} and Cl^{-} (see Table 3-2) applies to freshwater lakes and does not apply to Lake Towerrinning.

The concentration of other ions, i.e. NH_3^{+}, SO_4^{-}, NO_3^{-}, NO_2^{-}, SO_4^{-2}, and SiO_2^{-}) are less than the guideline values, except sulphate (SO_4^{-2}) in Outlet Swamp water. There is no guideline value for the rest of ions (Ca^{+2}, Mg^{+2}, K^{+}, PO_4^{-2}, CO_3^{-2},and HCO_3^{-}).

Silica (SiO_2^{-}) concentrations ranged from 10 to 11mg/L (average 10.2 mg/L). The (SiO_2) concentrations in inflow and outflow waters (2.1 mg/L and1.6 mg/L, respectively) were an order of magnitude less than the concentrations in the lake.

B. NUTRIENTS and CARBON

The complete water quality monitoring results are presented in Table 3.2, consists of water quality parameters (e.g. the concentration of nutrients, dissolved organic carbon, chlorophyll-*a* concentration) and algal density monitoring. The ANZECC and ARMCANZ (2000) and NHMRC (2011) trigger guidelines are also applicable, detailed in Appendix 1.

(a) Nitrogen

Total Nitrogen (TN) concentration ranged from 1.1 to 1.2 mg/L (average 1.1 mg/L). TN concentrations in the Inflow swamp and Outlet Swamp waters were about the same as the lake concentration. Almost 100% of the nitrogen species is insoluble (particulate) organic (TKN). There is no guideline value for TN and TKN concentrations. The measured TN concentration is within the range of concentration measured in 1986 (Froend & McComb (1991).

The dissolved nitrogen NO_x_N concentrations were all less than practical quantitation limit (PQL) 0.005 mg/L. The dissolved nitrogen NH_3_N concentrations were all above the ANZECC and ARMCANZ (2000) Guidelines for Recreational Water Quality: Primary Contact, but less than the NHMRC (2011) Australian Drinking Water Guideline (ADWG) value.

(b) Phosphorus

Total Phosphorus (TP) and dissolved phosphorus (PO_4_P) concentrations were all less than practical quantitation limit (PQL), i.e. 0.05 mg/L and 0.005 mg/L, respectively. There is no guideline value for TP and PO_4_P concentration.

The measured TP concentration is within the same order of the magnitude of the concentration measured in 1986 (Froend & McComb (1991)).

(c) Dissolved Organic Carbon

Dissolved organic carbon (DOC) is defined as the organic matter that is able to pass through a filter (generally size ranging from 0.45 to 0.22 µm). Major forms of DOC in freshwater ecosystems are tannin and lignin formed from plant decomposition, which contributes to brown lake water colour. DOC affects light penetration which is important for the ecosystem's phototrophic species. In wetland environments, DOC is considered one of the main sources of energy for algal growth.

Dissolved organic carbon (DOC) concentrations in Lake Towerrinning ranged from 4 to 16 mg/L (average 9.2 mg/L). There is no guideline value for DOC concentration. The DOC concentration of Inlet Swamp was less (5 mg/L) and Outlet Swamp was about 10 times the inflow concentration, i.e. 53 mg/L.

C. METALS

All metal concentrations were less than the practical quantitation limit (PQL), except selenium (Se).

Only selenium (Se) measured at 3 locations (Loc 1, Inlet Swamp, and Outlet Swamp) exceeded the guideline trigger. JDA has confirmed with the laboratory that these values are correct. These samples were taken in very shallow water and may be contaminated by bed sediment-bound Se.

Selenium is a naturally-occurring mineral. Trace amounts of Se (up to 0.01 mg/L) are essential for humans. Adverse effect of over ingesting/inhaling Se over long periods of time can result in excessive tooth decay, discolouration of skin and teeth, brittle hair, deformed nails, fatigue, and irritability. JDA recommends further samples be taken to confirm Se concentrations.

JDA recommends winter 2012 monitoring of selenium concentrations.

D. MICROBIOLOGY

High populations of algae were identified; total population is given in Table 3.2. The algal densities at all locations exceed the guideline values (20,000 cells/mL). Details on algae species is provided in Table 3.3, which indicates no potentially toxigenic Cyanobacteria species identified. Considerable populations of *Aphanothece, Cyanothece, Merismopedia* were identified; these are the most common cyanobacteria in wetlands.

There is no algal blooming (i.e. a rapid increase or accumulation in algal population in surface water of aquatic system) observed during investigation. However, it worth to note that optimum conditions for growth of cyanobacteria in surface water (cyanobacteria blooming) (Water Directorate, 2009) include:

- Slightly alkaline water (pH>8.5); this condition was observed (by a very small margin) on 20 Feb 2012.
- A readily available nitrogen (DIC) in form of (in preferred order) ammonia, nitrate, nitrite of >0.1 mg/L; this condition was not observed on 20 Feb 2012.
- Dissolved inorganic phosphorus (in form of FRP) of >0.03 mg/L; this condition was not observed on 20 Feb 2012.
- Water temperature of 15 to 25^{o}C, particularly long sunny days, and thermal stratification during calm water conditions (low flows) which allows the algal cells to migrate to the surface. This condition was not observed on 20 Feb 2012.
- TN and TP ratio (TN/TP) of <16 (often associated with eutrophication caused by increased fertilizer use; this condition was not observed on 20 Feb 2012, i.e. TN/TP ratio was >23.

Pathogen bacteria *Escherichia coli* populations were identified at less than 10 cfu/100 mL, which exceed the NHMRC (2011) Australia Drinking Water Standard (ADWS) guideline (0 cfu/100 mL). There is no ANZECC and ARMCANZ (2000) guideline value for *Escherichia coli*.

The Thermotolerant Coliforms were all (<10 cfu/100 mL) less than the ANZECC and ARMCANZ (2000) guideline value for Recreational Water (10 cfu/100 mL). The same density of Thermotolerant Coliforms was measured on 10 Mar 2010 (Shire of West Arthur, 2010).

3.4.3 Lake Bed Sediment

Details of Lake Towerrinning bed sediment analysis are provided in Table 3.4. There is no guideline value available for sediment quality.

A. Acid Sulfate Soils

Targets of the lake bed sediment investigation are Potential Acid Sulfate Soils (PASS) and Actual Acid Sulfate Soils (AASS). Details on the method are provided in section 1.3 of Appendix 1.

PASS are soils which contain iron sulphides and/or other sulfidic minerals that have not been oxidised by exposure to air (containing oxygen). The field pH of these soils in undisturbed state is neutral (i.e. 7 pH unit) to alkaline (i.e. 9 pH unit). These soils are invariably saturated with water in their natural state. Soil indicators for PASS include waterlogged soils, peat or peaty soils, coffee rock horizons, a sulphurous smell, e.g. “rotten egg” gas, soil field pH before oxidation (pH_F) of greater than 4 and soil field pH after oxidation with hydrogen peroxide (pH_{FOX}) of lower than 3.

ASS are soils which contain iron sulfides and/or other sulfidic minerals which have previously undergone some oxidation to produce sulphuric acid, which is indicated with field pH (pH_F) of lower than 4, sulphurous smell, oily looking bacterial surface scum, and often a yellow and/or red mottling (jarosite/iron oxide) in soil profile (DEC, 2009).

Soil investigation and *in-situ* pH soil tests were conducted on 20 February 2012 to identify the soil characteristics which can indicate the presence of PASS and AASS. Soil cores (50 cm length) were taken using soil auger boring; the soil logs show predominant clay soil on the eastern side of the lake. However between the lake and Outlet Swamp there is portion of sandy soil, which is more permeable to throughflow between the two water bodies.

All pH_F and pH_{FOX} were greater than 6.5 with low reaction to hydrogen peroxide. There is no indication of PASS and AASS in the soil samples.

Based on a combination of all three parameters, i.e. reaction strength, unit pH change, and final pH_{FOX} (see Table 1.3.3 in Appendix 1), there is no indication of actual or potential acid sulphate soils (AASS or PASS) presence at 50 cm depth below the lake bed.

Soil logs indicate that the lake bed sediment is predominantly clay.

B. Nutrients in Sediment

The lake bed sediment contains significant amount of nitrogen, ranging from 310 to 2,400 mg/kg (ppm by mass). The highest nitrogen mass was measured in Loc 2, which is about the deepest part of the lake. Inflow swamp contains far less nitrogen mass than the lake (130 mg/kg), and the Outlet Swamp nitrogen was 240 mg/kg.

Phosphorus mass in lake bed sediment was far less than nitrogen, ranged from <0.1 to 79 mg/kg.

C. Metals in Sediment

Table 3.4 indicates that the lake bed sediment is high in aluminium and iron.

3.4.4 Land Survey

Land survey was conducted by JBA Surveys 20 to 22 February 2012 at the direction of JDA. Areas relevant to the modelling of the enhancement options were surveyed for relative heights in mAHD (Australian Height Datum). For Lake Towerrinning, a feature survey was conducted at the re-diversion structure, as well as cross-sections along the length of the W drain to the Lake, lake water level along with the lake outlet structure and the Outlet Swamp (See Figure 3.6)

3.4.5 Geophysics

Numerous studies into the hydrogeology of the area have already been completed and are referred to in section 3.11. Futher Geophysical survey to establish the groundwater resource was not conducted for this study.

3.5 Community Consultation

3.5.1 Workshops at Moodiarrup

Lake Towerrinning Community Consultation Meetings were held at the Moodiarrup Hall on the 13 December 2011 and the Moodiarrup Sports Club on 29 March 2012. See Appendix (3) for list of attendees.

The meeting on 13 December was a round table discussion of the history of the Lake as well as an opportunity for the Community to express their vision for Lake Towerrinning.

Key points raised 13 December 2011:

- Current state of the re-diversion structure and W drain;
- Sediment build up in the W drain expecially at Inflow Swamp;
- Lake water quality;
- Management of Lake outlet;
- Future proofing;
- Degradation of Outlet Swamps and associated health risks;
- General satisfaction with the Lake condition and operation of rediversion structure and lake outlet.
- Salinity in Capercup Reserve
- Majority of diversion drain is on private property and so is only managed section by section.

- Possible Management structure to be set up.
- Lower end of catchment is beginning to flood.
- Problems with various culverts along the drain – potential risk to safety if one was to be eroded away.
- The lake has been closed a few times due to algal blooms and hypersaline conditions.

The Community Workshop held at the Moodiarrup Sports Club on 29 March 2012 was a formal presentation of the preliminary consultants results to date of each of the proposed enhancement options.

Key points raised on 29 March 2012 were:

- Rainfall is decreasing, but runoff is increasing;
- Runoff rates in models;
- More surface water due to water table rise;
- Subsoil drainage out of Capercup Nature Reserve;
- Pre-rediversion models;
- Agreement existing system needs to be maintained.

3.5.2 Indigenous Consultation

RDL undertook consultation with the Gnaala Karla Booja Working Party (GKBWP) and Named Applicants. The Working Party represents the area covering Lake Towerrinning.

To date, two consultation meetings have been undertaken.

The first consultation meeting was held on 8 March 2012 at the Willow Pond Reception Centre, Canning Vale. The meeting involved a discussion on the project objective and provided an opportunity for the Working Party to provide feedback on the project and advise ways in which they would like to be involved in the initiative. The Working Party expressed a strong interest for the project to include interpretive signage and for the cultural heritage of the lakes to be acknowledged.

A second consultation meeting was held on 6 June 2012 at the Seashells Resort, Mandurah. The meeting involved a presentation from JDA Consultant Hydrologists (JDA) on the most suitable enhancement options for the lakes. The meeting provided an opportunity for the Working Party to provide feedback on the proposed options, prior to the finalisation of the report.

Feedback received (12 June 2012) from SWALSC, on behalf of the Working Party, advised that the presentation was well received by the group and the Working Group requested for the Living Lakes project team to:

- ensure that continual consultation with the Working Party is undertaken;
- provide more details on the proposed designs / engineering methods;

- consider restrictions on boats;
- provide more information on how much revegetation will be done around the lakes.

3.6 Daily XP-Storm Hydraulic Model Calibration

3.6.1 Rediversion Structure to Lake

A daily XP-Storm model of the rediversion structure during 1996 was setup using the following datasets:

- Rediversion structure storage capacity;
- Daily Darkan rainfall data applied to the catchment;
- Catchment area above the rediversion structure of 12,500 ha;
- Rediversion structure outlet pipe to lake 825 mm diameter at 239.6 mAHD:
- Rediversion structure weir 20 m long at 240 mAHD;
- Water depth data received from Don Bennett, Department of Agriculture and Food, Bunbury.

Note that salinity is not included in this model.

The model was calibrated by adjusting rainfall runoff coefficients to match recorded water levels.

A runoff coefficient of 16% to 20% for winter months and a lower value 2% in summer months provides a good calibration to the observed water level variation in the rediversion structure.

Lower or higher values of runoff coefficient result in lower or higher values than observed in the rediversion structure.

JDA recommends winter 2012 data logger water level monitoring of rediversion structure water level to improve the estimation of volumes entering the rediversion drain.

Figure 3.7 shows the recorded water levels and calibrated model output.

A transmission loss of water occurs by infiltration into the bed of the W drain between the rediversion structure and the lake, reducing the effective lake inflow from 16% to a smaller percentage of upstream catchment rainfall.

Calibration of the salt and water balance model (see Section 3.7 below) indicates the percentage is approximately 4%.

The associated salt load also infiltrates, so there is no change in salinity between the rediversion structure and the lake. This is consistent with measurements along the rediversion drain by Hazell (2003).

Table 3.5 summarises culverts between the rediversion structure and Lake Towerrinning itself.

3.6.2 Lake Outlet to Arthur River

An XP model was set up using the surveyed cross-sections of the outlet channel between the Lake and Outlet Swamp together with the natural surface elevation between the Outlet Swamp and the Arthur River.

This model is used to assess enhancement option ET6 which is to refine the outlet from the Outlet Swamp to Arthur River. Figure 3.8 shows the long-section from the Lake outlet to the Arthur River including sets of culverts at Darkan South Road.

3.7 Daily Salt and Water Balance Model of Lake Calibration and Prediversion ET0

3.7.1 Lake Calibration

The model was run over the period 1 January 2003 to 29 February 2012.

The initial conditions on 1/1/03 are:

- Lake water level of 218.4 mAHD;
- Lake salt load 14,000 t.

Inflow salinity varies from a minimum of 2000 to a maximum of 4000 mg/L.

The model shows that the average annual lake inflow volume (2003 to 2011) is 3.3 Mm^3. Table 3.6 presents a summary of Lake Towerrinning inflow volumes over the period 2003 to 2011 inclusive.

The average annual lake inflow volume (2003 to 2011) is 3.32 Mm^3/yr.

JDA recommends 2012 monitoring of inflow salinity to improve data on lake salt inflow variability.

For the calibration, the mean annual inflow to the rediversion structure is 2.13 Mm^3/yr, the mean annual outflow from the rediversion structure towards the lake is 2.03 Mm^3/yr, the contribution from the catchment between the rediversion structure and the lake is 1.19 Mm^3/yr; hence, mean annual flow into the lake is 3.22 Mm^3/yr (Table 3.6).

Figure 3.9 shows the calibration of Lake Towerrinning water levels and salinity indicating a good match to observed data especially, to the JDA measured data on 20/2/12.

Multiple combinations of initial conditions which are unknown on 1 January 2003 and the seasonal variation of inflow salinity, together with rainfall runoff coefficients for the upper and lower catchments were trialled. Figure 3.9 represents best fit to the data with physically realistic values of all parameters.

The calibrated model used in Figure 3.9 is referred to as the “calibrated” model for the existing condition of Lake Towerrinning, its catchment and outflow arrangement. All enhancement options are made with respect to this model, where appropriate.

Sections below describe the modelling of lake enhancement options, the location of which is shown on Figure 3.10.

3.7.2 Prior to Rediversion – ET0

The water and salt balance model has been run for the case of there being no rediversion structure and drain, that is corresponding to the situation which prevailed before construction of these works in the early 1990's.

Figure 3.11 shows the comparison between the present day conditions (calibration) and this scenario which is referred to as ET0 in the Report.

Figure 3.11c shows the change in the number of days per year certain water depths are reached under the calibration, and the pre-rediversion scenario (ET0).

3.8 Enhancement Option ET1: Increase Rediversion Capacity

3.8.1 Description

This enhancement option augments the volume of water entering the rediversion drain to the lake by adding an extra culvert to rediversion structure. The current pipe culvert has a nominal capacity (with flow velocity of 1m/s) of 540 L/s (0.54 m^3/s).

This option could potentially result in more rapid filling of the lake during early winter, greater flushing of salt from the lake and a longer period of high lake levels.

It will not necessarily result in higher lake levels during summer, during periods of no rainfall and with high evaporation rates.

Existing culverts under roads between the rediversion structure and the lake may need to be upgraded to convey the additional flow. A summary of culverts is provided in Table 3.5.

3.8.2 Daily XP-Storm Hydraulic Model Results

The XP-Storm model of the rediversion structure, described in Section 3.6.1, was modified to include the extra culvert and the model run with a daily time step over the simulation period 2003 - 2011. This simulation shows that the outflow culvert was usually only partially full with no spillway flow, so that the addition of a second culvert only marginally increases the total flow along the rediversion drain during periods of high upper catchment runoff.

3.8.3 Daily Salt and Water Balance Model Results

Except for the addition of a second culvert the rediversion structure, all of the modelled parameters are unchanged.

The daily salt and water balance model shows (Figure 3.12), as expected from results described Section 3.8.2 above, that the effect of the additional culvert is minimal both in terms of lake water balance and salinity.

This is because the existing culvert conveys the majority of incoming flows to the lake with only minor spillway overflows away from the lake.

The average annual lake inflow volume (2003 to 2011) is increased by 0.2 Mm^3, or 1%, to 3.42 Mm^3/yr.

This option increases by 1 (from 250 to 251) the average number of days per year with water depth greater than 2.5 m (Figure 3.12c).

3.8.4 Environmental Impact

The additional culvert to increase rediversion capacity has minimal effect on the lake water or salt balance and as such corresponding negligible environmental impact.

3.8.5 Cost Estimation

Table 3.7 presents the Cost Estimate for this Enhancement Option.

3.8.6 Benefit Cost Analysis

The results of the BCA for Lake Towerrinning are presented in Table 3.8. The highest BCI is coloured in blue and the lowest is coloured in red. A BCI that is negative indicates that the option is likely to have a negative impact on social, recreational and economic value of the lake.

The lake water related factor (W) is expressed as the additional number of days per year with a water depth of least 2.5 m.

The benefits of enhancing Lake Towerrinning are assumed to be in future-proofing the lake. Hence, the benefits are in saving the lake from a reduction in social, recreational and economic value. The differences across options are in the level of environmental and Aboriginal cultural heritage risk, expected support from landholders, and construction and maintenance costs.

Option ET1 has a BCI of 1.7 which is a moderate value.

3.9 Enhancement Option ET2: Capercup Reserve Drain to Lake

3.9.1 Description

Capercup Nature Reserve is located some 10km North-West of Lake Towerrinning. Studies have categorised this area as prone to increasing salinity. The intention is to drain the shallow groundwater towards the lake through an open drain. This water table control may assist in managing salinity in the Reserve. The relatively small catchment contributing to the Reserve and the associated low flow rate is unlikely to have significant impact on the water quality in Lake Towerrinning itself.

To be effective, the drain will need to extend into or around the Reserve to lower the water table beneath the Reserve itself.

3.9.2 Daily Salt and Water Balance Model Results

The topographic catchment draining to Capercup Nature Reserve is approximately 14.3 km^2. A shallow groundwater discharge of 2.5% of average annual rainfall has been assumed as the volume of flow to be conveyed by the shallow open drain to Lake Towerrinning during a 6 month winter period, with no flow

during summer. This corresponds to an annual volume of 0.16 Mm^3/yr. The mean annual lake inflow volume (2003 to 2011) therefore increases from 3.22 to 3.38 Mm^3/yr.

The shallow groundwater discharge from Capercup Reserve has been modelled with salinity varying between 1000 and 10,000 mg/L. There is no data on the salinity of the shallow groundwater.

Figure 3.13 shows the modelled salinity in Lake Towerrinning over the period 2003 to 2011. The water levels in Lake Towerrinning are virtually unchanged from the existing situation. The salinity of the lake may decrease or increase marginally depending on the salinity of the Capercup flow. The change in lake salinity over the 9yr period 2003 to 2011 is of the order of +/- 500 mg/L.

This option increases by 5 (from 250 to 255) the average number of days per year with water depth greater than 2.5 m (Figure 3.13c).

3.9.3 Environmental Impact

The addition of the flow contribution of shallow groundwater from the Capercup Nature Reserve may result in a slight increase or decrease in the salinity of Lake Towerrinning depending on the salinity of the Capercup discharge.

Because the likely flow volume from Capercup is very small compared with total inflow to Lake Towerrinning, the effect is likely to be minimal.

The net result may be a marginal improvement in lake water quality (lower salinity) or a slight reduction in water quality (increase in salinity).

JDA recommends monitoring of Capercup Nature Reserve shallow groundwater salinity to improve estimation of the impact of discharge of this water to Lake Towerrinning.

3.9.4 Cost Estimation

Table 3.7 presents the Cost Estimate for this Enhancement Option.

3.9.5 Benefit Cost Analysis

Table 3.8 shows this Option as moderate BCI of 2.6.

3.10 Enhancement Option ET3: Dredging of Lake

3.10.1 Description

The lake bed dredging option investigated uses dredged material within the lake to create an island. An island of 320 m diameter at lake full, with 1 in 6 side slopes has been assumed, corresponding to a cut to fill volume of 0.27 Mm^3 over a lake bed area of 200 ha, an average excavation depth 0.14 m.

The change in lake bathymetry is shown in Figure 3.14 and presented Table 3.9.

Figure 3.14 shows that the lake area corresponding to the bed level 215.75 mAHD is unchanged, whereas at intermediate elevation of 217 and 218 mAHD there is a decrease in lake area of 9.4 and 8.6 ha respectively. At lake full level 218.75 mAHD, the lake volume is unchanged.

Dredging of the lake bed may remove an impermeable seal and lead to loss of water from the lake to the groundwater below. Further investigation of this risk is recommended prior to advancing this option.

3.10.2 Daily Salt and Water Balance Model Results

With the dredging option there will be a change in the number of days per year that the maximum lake depth exceeds the given value.

This is illustrated in Figure 3.15 where it can be seen that the average number of days per year with a water depth exceeding 2.5 m increases by 9 (from 250 to 259).

Figure 3.16 shows that the lake water levels (mAHD) and salinity are virtually unchanged after the dredging.

3.10.3 Environmental Impact

The environmental impact of the dredging proposal described above will include the creation of a island habitat providing nesting and breeding safety for fauna, as well as providing a larger area of deep open water for water based recreational activities including water skiing.

The existing vegetation around the perimeter of the lake will not be affected by the dredging operation and the increased water depth is unlikely to increase shore erosion by wave action.

There will be a short term increase in lake turbidity and remobilisation of nutrients from the lake bed during the dredging operation, and an unknown impact on lake benthic condition.

3.10.4 Cost Estimation

Table 3.7 presents the Cost Estimate for this Enhancement Option.

3.10.5 Benefit Cost Analysis

Table 3.8 shows this Option to have the lowest BCI of 0.0.

3.11 Enhancement Option ET4: Groundwater Replenishment

3.11.1 Description

George *et al*. (1994) examined the groundwater systems responsible for salinization in the lake Towerrinning catchment and found that groundwater is stored in three distinct hydrogeological units. That is, aquifers in the deep fluvio-lacustrine palaeochannel, in the weathered felsic and mafic rocks including the regional structures such as faults in the region and thirdly in the colluvial (hillside) and alluvial (valley) sediments.

The largest and deepest aquifer in the catchment exists in the Towerrinning palaeochannel, which is a remnant of an ancient river channel that is dissected by the Arthur-Blackwood River System. The palaeochannel runs in a general east to west direction beneath the Towerrinning and Darlingup Catchments. It ranges from 43 to 79 m deep and water within the channel is fresh (1 mS/cm).

Airborne magnetic surveys revealed the existence of two major faults in the region and along these faults were scores of dolerite and quartz dykes, minor faults and shear zones. Both faults run from NW to SE with the informally named Bowelling Fault lying to the west of the lake and Kojonup Fault running directly under lake Towerrinning. Drill-holes in these faults encountered waters ranging from of 6 to 20 mS/cm with water tables within 5 m below the surface. The faults were found to be major sources of recharge within the catchment, responding very rapidly after heavy rainfall (George *et al*, 1994).

Drill-holes in the colluvial and alluvial sediments revealed a variety of materials ranging in hydraulic conductivity from 0.05 m/day (low permeability) to 0.5 m/day (high permeability). Waters in these sediments were usually highly saline, ranging from 20 – 40 mS/cm (George *et al*, 1994). The majority of the valley consists of gravel over clay slopes and duplex valley soils (Scott *et al*, 1992). The valley salinities and waterlogging developed rapidly after the wet seasons in the 1960's and continued to increase with time, and it is the waterlogging of the duplex soils in the catchment that occurs during winter combined with the surface runoff that is the vehicle for moving salt towards the lake (George, & Bennet 1991).
Given the available surface water resources associated with the rediversion structure and downstream diversion drain, the option of exploiting fresh brackish or saline palaeochannel resources has not been further investigated for Lake Towerrinning.

3.12 Enhancement Option ET5: Rehabilitation of Rediversion Drain

3.12.1 Description

This option comprises the routine maintenance of the rediversion drain between the rediversion structure and Lake Towerrinning. Since construction of the drain in the early 1990's there is no documented history of any desilting or channel maintenance operations having been performed to ensure that the drain capacity remains at its design standard.

This option therefore comprises a grader operation along the 12 km drain to reshape the W drain to its design geometry. This operation will mean removal of some accumulated sediment from the W drain to be spread onto adjacent paddocks.

The existing culverts under roads which cross the drain (Table 3.5) are undersized relative to the rediversion drain structure culvert itself (825 mm diameter) and this option excludes upgrading of those culverts.

The degree to which the culverts reduce the flow rate of the drain and result in further transmission losses by infiltration and recharge to the shallow groundwater is unknown.

JDA recommends that monitoring in winter 2012 be performed to further define the need for these culverts to be upgraded.

3.12.2 Daily Salt and Water Balance Model Results

As described in Section 3.6.1 above, the estimated rainfall runoff coefficient for the catchment upstream of the rediversion structure is 16% in winter, 1% in summer.

It is estimated that a large proportion of this flow is lost by infiltration into the bed of the rediversion drain along the 12 km reach between the structure and the lake itself. A proportion of this loss is due to the rediversion drain having become silted over the 20 year period since original construction without any maintenance works having been performed.

For the purposes of modelling we have assumed that the transmission losses could be reduced by the maintenance works so that the effective runoff coefficient from the catchment above the rediversion drain increases from 4% to 8% of upper catchment rainfall.

The model was run from initial conditions on 1 January 2003 of water level and salinity as used in the calibrated model.

Figure 3.17 shows the water and salt balance model results 2003 to 2011, indicating that during the lake filling process, during early winter, a more rapid rise in water level than under existing conditions.

These results in a longer period of lake full associated with the earlier filling. The commencement of drying of the lake from full is virtually unchanged when rainfall inflow ceases at the end of winter.

Figure 3.17 shows that the lake would fill in winter 2010. Under current conditions the lake did not fill (see Figure 3.9). Figure 3.17 also shows a gradual reduction in lake salinity of the 9 yr period model so that at the end of 2011 the lake salinity approximates 5000 mg/L roughly half the measured value of 10,000 mg/L in February 2012. That is approximately 500 mg/L/yr reduction in salinity.

This option increases by 33 (from 250 to 283) the average number of days per year with water depth greater than 2.5 m (Figure 3.17c).

3.12.3 Environmental Impact

As described above the rehabilitation of the rediversion drain to its design geometry will result in areduced lake salinity and a longer period of high lake water levels.

This larger ouflow volume could be managed by improvements of the flushing of the Outlet Swamp to the Arthur River, which was part of the original lake proposal in the early 1990's (see Section 3.13 below).

The primary focus of this enhancement option is to reduce the salinity in the lake. The greater volume of water passing through the rediversion drain may result in some redistribution of the alluvial fan (Inlet Swamp) and deposit sediment further into the lake itself.

This option effectively returns the rediversion drain to its design configuration in the early 1990's, rather than proposing any deviation from that design.

3.12.4 Cost Estimation

Table 3.7 presents the Cost Estimate for this Enhancement Option.

3.12.5 Benefit Cost Analysis

Table 3.8 shows this Option to have the highest BCI of 5.4.

3.13 Enhancement Option ET6: Refine Outlet from Outlet Swamp to Arthur River

3.13.1 Description

The original concept for catchment works, including the rediversion drain, included improvement of the outlet from Lake Towerrinning through the Outlet Swamp to the Arthur River to cope with the additional lake flushing volume.

The option investigated in this report is for a excavated drain to connect the Outlet Swamp more efficiently with the Arthur River (see Figure 3.18).

Two different alignments have been considered, namely north and south. The south alignment requires less clearing of vegetation than the north alignment.

The new drainage channels would be excavated to have a continual fall from the bed of the Outlet Swamp at 217.5 mAHD through to the Arthur River at approximately 214 mAHD, allowing the Outlet Swamp to be completely flushed at intervals to remove accumulated nutrients and algae.

As a management measure, control boards could be installed within the structure (as at lake Towerrinning itself) to allow the Outlet Swamp to contain water at most times. Such boards would be located on private property and under private control, unless otherwise negotiated.

The new outlet from the Outlet Swamp to the Arthur River would not contain all flows, so that some overflow will occur onto the adjacent floodplain as presently occurs.

3.13.2 Daily XP-Storm Hydraulic Model Results

Figure 3.19 shows a long-section of the bed invert from Lake Towerrinning outlet at 218.2 mAHD through the Outlet Swamp beneath Darkan South Road culverts to Arthur River. It is clear that the Outlet Swamp has a depth of approximately 0.5 m, at overflow. The XP model was run from 2003 to 2011 with daily time-step to show the variation in water level with the 2 proposed alignments of Outlet Swamp drain.

The Drain has been nominally sized with 3m bed width with 1 in 3 side slopes, and has a maximum excavation depth of approximately 1m below the existing natural surface. Figure 3.19 shows the maximum water level in the drain over the simulation period 2003 to 2011.

The daily hydraulic model shows that the culverts have adequate capacity to convey all flows between 2003 and 2011 without overtopping of the road embankment.

JDA recommends winter 2012 data logger water level monitoring of Outlet Swamps, to better understand the current water level variation.

3.13.3 Environmental Impact

Once constructed, the drain would allow control over the water quality in the Outlet Swamp, particularly to prevent the concentration of salt and nutrients. The lower salinity of the Outlet Swamp will assist creation of a fresher eco-system to support more abundant water based fauna.

The south alignment would have less impact on native vegetation and require less clearing.

This option has no effect on the number of days per year with water depth greater than 2.5 m.

3.13.4 Cost Estimation

Table 3.7 presents the Cost Estimate for this Enhancement Option.

3.13.5 Benefit Cost Analysis

Table 3.8 shows this Option to have the minimum BCI for the lake of 0.0.

3.14 Enhancement Option ET7: Modify Outlet Structure from Lake to Outlet Swamp

3.14.1 Description

The placement of boards on the lake outlet was established to an agreed level in the early 1990's based on the following criteria:

- Impact on fringing vegetation;
- Impact on Caravan Park on-site wastewater disposal systems;
- Reasonable summer water depth for all water based activities.

There is only anecdotal information on the placement and removal of wooden boards which create the lake full level above the 218.5 mAHD natural surface high point in the outlet channel.

The enhancement option considered was to modify the outlet structure from the lake to the Outlet Swamp to allow higher lake water levels to be maintained.

Due to the lack of data on the actual lake levels that are currently being achieved by placement and removal of the boards, it is not possible to quantify the current arrangement, and therefore not possible to analyse any alternative to it.

JDA recommends winter 2012 data should be collected on the heights and dates of placement and removal of the boards at the outlet structure.

3.14.2 Environmental Impact

If the lake outlet structure was modified to achieve higher maximum water levels than existing, there are possible adverse impacts on the fringing vegetation around the lake. This vegetation depends on fresh local rainfall recharge around the root zone, rather than the lake water itself.

There is also the potential for increased inundation and decreased productivity of adjacent farmland as well as issues with access across the landholding on the western side of the lake, together with possible effects on the Caravan Park effluent disposal system.

3.15 Outcomes

The outcomes of the assessment of Enhancement Options are presented in Table 3.10.

In addition, JDA recommends winter 2012 monitoring as follows:

- Water level monitoring using dataloggers of rediversion structure (Section 3.6.1), Outlet Swamp (Section 3.13.2) and the lake itself (Section 3.14.1).
- Monitoring of lake outlet board settings to allow better understanding of the lake outflow hydraulics (Section 3.14.1).
- Measurement of lake selenium which was found to exceed guideline value (Section 3.4.2).
- Salinity of lake inflow by collecting monthly runoff samples at intervals along the rediversion drain and lake itself – to provide better understanding of lake inflow salinity variability (Section 3.7).
- Capercup Nature Reserve shallow groundwater salinity on a monthly basis to improve understanding of the effect of draining this water to Lake Towerrinning (Section 3.9.3).
- Monthly visual monitoring of rediversion drain ponding behind culverts between rediversion structure and lake itself (Section 3.12.1).

4. LAKE EWLYAMARTUP

4.1 EXECUTIVE SUMMARY

Lake Ewlyamartup is a hypersaline lake with poor water quality which suffers from a lack of flushing due to a combined inflow and outflow creek.

The Enhancement Option outcomes provide for greater flushing of the lake, while increasing lake levels, which will reduce lake salinity and algal risk.

Other recommendations are made to confirm predictions made in this report.

4.2 Lake Setting

General

Lake Ewlyamartup is within the Shire of Katanning (Figure 4.1), approximately 17 km east of Katanning.

Land ownership surrounding Lake Ewlyamartup is shown in Figure 4.3.

Environmental Status

The environmental setting of the lake is described in Attachment 1, to which reference should be made.

Hydrology

Annual rainfall for Katanning is shown in Figure 4.2, along with average monthly rainfalls. This rainfall station has data back to 1891, with 120 years of rainfall data. The average annual rainfall over this period is 478 mm. The average over the last ten years (2002 to 2011) is 470 mm, indicating that current rainfall is not significantly different from the long term.

The catchment area of the lake is 50,700 ha (Figure 4.1) which converges into a creek which enters the north side of the lake, through a culvert beneath the Katanning to Nyabing Road.

This inflow creek bifurcates north of the road, from the south flowing arm which discharges to the lake, into an east flowing arm which is referred to as the downstream section. The lake has no separate outflow channel, but overflows along this downstream channel, when the lake water level reaches the high point on the downstream section of 272.56 mAHD.

Mudgway (2011) reported on modelling of Lake Ewlyamartup over the period 1975 to 2008 using inflow data derived from the Large Scale Catchment Modelling project (LASCAM) by UWA.

The last LASCAM dataset has average annual runoff from the 507 km^2 catchment of 15.2 Mm^3/yr representing 30 mm depth of runoff over the catchment.

With an average annual rainfall of 470 mm/yr this represents 6% of rainfall becoming runoff.

There is no gauging of Lake Ewlyamartup catchment to verify this value, and all modelling results are highly dependent on this assumption.

Mudgway (2011) found that a large proportion of this catchment runoff bypasses the lake. This is consistent with the average annual runoff of 15.2 Mm^3/yr and the lake volume of only 1.2 Mm^3.

Mudgway (2011) concludes that a bund is required across the downstream channel to prevent these bypass flows from occurring, together with a flushing channel along the eastern margin of the lake, discharging downstream to join the Coblinine River.

Two particular options are advocated by Mudgway (2011) referred to as G32 and G41, with different bund elevations on the downstream channel and different elevations of flushing channel invert from the lake.

In both options a gated structure is proposed (top of gate 272.85 mAHD), with gate opened February to July and closed August to January.

These 2 options are further analysed in this report as Enhancement Options EE5 and EE6 respectively.

4.3 Literature Review

4.3.1 Published Reports

A review of published reports is included in Attachment 1, to which reference should be made.

4.3.2 Available Data

DEC does not hold any data for Lake Ewlyamartup. The Lake Ewlyamartup Working Group based in Katanning has provided JDA with lake salinity data from 2006 to 2010, but no water level data.

On 21 February 2012 JDA survey included a measurement of lake salinity (38,000 mg/L) and a water level of 272.57 mAHD (just at overflow level), following high December 2011 rainfall.

4.4 Field Investigation Results

4.4.1 Lake Bathymetry

Lake bathymetry reflects the stage-area-volume relationship of a lake. On 21 February 2012 water depths (m) of Lake Ewlyamartup at multiple locations (recorded with GPS) were measured by JDA from a dinghy. The readings were then converted into mAHD applying the surveyed water level on that date of 272.57 mAHD. The lowest point measured on the lake bed was 271 mAHD corresponding to a depth of 1.57 m. The overflow of the lake is 272.56 mAHD from survey, defined by a high point on the downstream channel.

Figure 4.4 shows the contours of the Lake Ewlyamartup bed.

Surface area and volume at each 0.25 m contour interval are presented in Table 4.1 and shown in Figure 4.5. The lake has a volume of 1.162 Mm^3 at a full depth of 1.5 m (272.56 mAHD) with a surface area of 106 ha. The average depth when full is 1.1m.

4.4.2 Lake Water Quality

Details of Lake Ewlyamartup water profiling results through the water column measured 21 February 2012 at 5 locations in Lake Ewlyamartup (Loc 1 to Loc 5) are shown in Figure 4.6 and tabulated in Table 4.2.

A. PHYSIO-CHEMICAL

Temperature Profile

In Lake Ewlyamartup, the measured temperature profiles indicate a strong light absorption in the first half meter. The surface water temperature ranged from about 24.5^{o}C at Loc 2 to about 26^{o}C at Loc 3, as shown in Figure 4.6(1). The lowest temperature (about 23.2^{o}C) was observed in the bottom layer at Loc 2. The 1.5^{o}C difference of the surface water temperature may indicate the spatial variation of light absorption in Lake Ewlyamartup.

The range of all temperatures is within the ANZECC and ARMCANZ (2000) guideline values (15^{o}C to 35^{o}C; see Table 4.2).

pH Profile

Measurements of pH in Lake Ewlyamartup (Figure 4.6(2)) indicate all values exceeded the upper limit of the guideline range of 5 to 9 (see Table 4.2).

Salinity Profile

Lake Ewlyamartup is a hypersaline lake with salinity levels surpassing that of ocean water (35,000 mg/L). Figure 4.6(3) shows Lake Ewlyamartup EC and salinity were approx. 57 mS/cm and 37,000 mg/L, respectively. This salinity reading is within range of salinity measured from 1991 to 2010 reported in Restoring Lake Ewlyamartup (Lake Ewlyamartup Working Group and Katanning LCDC, 2010).

The range of salinity and EC in the guideline values (<1,000 mg/L of TDS; see Table 4-2) is considered irrelevant to apply to Lake Ewlyamartup.

Oxidation Reduction Potential (ORP) Profiles

In aqueous solutions oxidation reduction potential (ORP) or redox potential is a measure of the tendency of the solution to either gain or lose electrons when it is subject to change by introduction of a new substance. A solution with a higher ORP (more positive) than the new substance (contaminants) will have a tendency to gain electrons from the new substance (i.e. to be reduced by oxidizing the new substance); and *vice versa*.

Figure 4.6(4) shows the ORP values were generally greater than 55 mV, which reflected that the water has great electron activity to oxidize contaminants.

Dissolved Oxygen Profile

Figure 4.6(5) shows that DO concentrations of Lake Ewlyamartup were generally greater than 6.5 mg/L, which equates to >80% saturation level (i.e. the guideline value in Table 4.2). This indicates reasonably good condition of lake water quality in term of oxygen levels.

Both DO concentrations and ORP profiles indicate Lake Ewlyamartup water has a great potential to oxidize organic material (or contaminants). The high levels of DO concentration and ORP at the bottom layer will be able to bind the dissolved nutrients, particularly phosphorus, in form of particulates and stay in the lake sediments. This will reduce the risk of excessive algal growth.

Turbidity Profile

Figure 4.6(8) shows that Loc 1 (inflow area) was more turbid (27 to 30 NTU) than other locations. The turbidity profiles in Figure 4.6(8) indicate that the water is slightly turbid (i.e. turbidity was all greater than 10 NTU). Generally, the water turbidity increases with depth with a sharp increase close to the lake bed as a result of sediment disturbance due to wind-induced mixing. This sharp increase of turbidity was not observed in Lake Ewlyamartup.

There is no guideline value relevant to apply.

B. IONS

The comprehensive ions concentration analyses are provided in Table 4.2, which indicates that the Lake Ewlyamartup water is Na-Cl (sodium-chloride) type of water. An appreciable concentration of Mg-SO_4 (magnesium-sulfate) ion is also identified. The guideline values for Na^+, Cl^- and SO_4^{-2} (see Table 4-2) applies to freshwater lakes and does not apply to Lake Ewlyamartup.

The concentration of other ions (i.e. NH_3^+, NO_3^-, NO_2^-, and SiO_2^-). are less than the guideline values. There are no guideline values for the other ions (Ca^{+2}, Mg^{+2}, K^+, and PO_4^{-2}).

Silica (SiO_2) concentrations in the lake ranged from 0.4 to 2.8 mg/L (average 2.2 mg/L). The (SiO_2) concentrations in inflow water (13 mg/L) were an order of magnitude less than the concentrations in the lake.

C. NUTRIENTS AND CARBON

(a) Nitrogen

Four species of nitrogen were measured – Total Nitrogen (TN), Total Kjeldahl Nitrogen (TKN), Ammonium (NH_4^+_N) and Nitrate (NO_3_N). TN accounts for all organic and inorganic nitrogen in all forms (dissolved and particulate). TKN is the insoluble organic form of Nitrogen which can be resulted from detritus (inanimate cells). Ammonium and Nitrate are the soluble form that is readily available for plant uptake. By the act of a decomposer (e.g. aerobic and anaerobic bacteria and fungi) in the lake sediment, TKN is decomposed into ammonium (ammonification) which is then oxidised into Nitrites (NO_2_N) and Nitrates (NO_3_N) by nitrifying bacteria.

Total Nitrogen (TN) concentration ranged from 1.4 to 2.1 mg/L (average 1.6 mg/L), which is within the range of the adopted guideline values. TN concentration in inflow swamp was 0.5 mg/L. Almost 100% of the nitrogen species is insoluble (particulate) organic (TKN).

(b) Phosphorus

Two Phosphorus (P) variables were measured: Total Phosphorus (TP) and Filterable Reactive Phosphorus (FRP; or PO_4_P). TP accounts for all phosphorus species including FRP, Dissolved Organic Phosphorus, Particulate Organic Phosphorus and Inorganic Phosphorus. Hence, the difference between

the measured TP and FRP concentrations is the total amount of organic phosphorus (dissolved and particulate) and inorganic particulate phosphorus.

FRP is the soluble form of inorganic phosphorus which is directly linked to algal growth. Internal sources of FRP in the water column include (1) P-sediment release, (2) mineralisation of Dissolved Organic Phosphorus and (3) de-sorption of particulate inorganic P from the water column.

Total Phosphorus (TP) concentration ranged from 0.06 to 0.13 mg/L (average 0.08 mg/L). Almost 100% of the phosphorus species is insoluble (particulate) organic. There is no guideline value for TP and PO_4_P concentration.

(c) Dissolved Organic Carbon

Dissolved organic carbon (DOC) is defined as the organic matter that is able to pass through a filter (generally size ranging from 0.45 to 0.22 µm). Major forms of DOC in freshwater ecosystem are tannin and lignin formed from plant decomposition, which contributes to the brown lake water colour. DOC affects light penetration which is important for the ecosystem's phototrophic species. In wetland environments, DOC is considered one of the main sources of energy for algal growth.

DOC concentrations ranged from 38 to 61 mg/L (average 52 mg/L), which is a high concentration for a wetland environment. The effect of DOC in absorbing light penetration is very obvious; during the monitoring the Secchi depth was only about 0.2 m.

D. METALS

Table 4.2 shows that all metals concentrations in Lake Ewlyamartup were less than the practical quantitation limit (PQL), except aluminium (Al) and selenium (Se). Selenium (Se) exceeded the guideline trigger value by 2 to 3 times. Trace amounts of Se (up to 0.01 mg/L) are essential for humans.

JDA recommends further monitoring of aluminium and selenium concentrations in winter 2012.

E. MICROBIOLOGY

The algal densities at all locations were less than the guideline values (see Table 4.2. Details on algae species is provided in Table 4.3, which indicates no potentially toxigenic Cyanobacteria species identified.

There was no algal bloom (i.e. a rapid increase or accumulation in algal population in surface water of aquatic system) observed during investigation. Optimum conditions for growth of cyanobacteria in surface water include:

- Slightly alkaline water (pH>8.5); this condition was observed on 21 Feb 2012.
- A readily available nitrogen (DIC) in form of (in preferred order) ammonia, nitrate, nitrite of >0.1 mg/L; this condition was not observed on 21 Feb 2012.
- Dissolved inorganic phosphorus (in form of FRP) of >0.03 mg/L; this condition was not observed on 21 Feb 2012.

- Water temperature of 15 to 25°C, particularly long sunny days, and thermal stratification during calm water conditions (low flows) which allowing the algal cells to migrate to the surface.

- TN and TP ratio (TN/TP) of <16 (often associated with eutrophication caused by increased fertilizer use; TN/TP ration on 21 Feb 2012 was 19.Lake Bed Sediment

Details of Lake Ewlyamartup bed sediment analysis (taken from 2 locations) are provided in Table 4.4. There is no guideline value available for sediment quality.

A. Acid Sulfate Soils

Targets of the lake bed sediment investigation are Potential Acid Sulfate Soils (PASS) and Actual Acid Sulfate Soils (AASS). Details on the method are provided in section 1.3 of Appendix 1.

PASS are soils which contain iron sulphides and/or other sulfidic minerals that have not been oxidised by exposure to air (containing oxygen). The field pH of these soils in undisturbed state is neutral (i.e. 7 pH unit) to alkaline (i.e. 9 pH unit). These soils are invariably saturated with water in their natural state. Soil indicators for PASS include waterlogged soils, peat or peaty soils, coffee rock horizons, a sulphurous smell, e.g. “rotten egg” gas, soil field pH before oxidation (pH_F) of greater than 4 and soil field pH after oxidation with hydrogen peroxide (pH_{FOX}) of lower than 3.

ASS are soils which contain iron sulfides and/or other sulfidic minerals which have previously undergone some oxidation to produce sulphuric acid, which is indicated with field pH (pH_F) of lower than 4, sulphurous smell, oily looking bacterial surface scum, and often a yellow and/or red mottling (jarosite/iron oxide) in soil profile (DEC, 2009).

Soil investigation and *in-situ* pH soil tests were conducted on 21 Feb 2012 to identify the soil characteristics which can indicate the presence of PASS and AASS. Soil cores (50 cm length) were taken using soil auger boring; the results show predominant sandy-clay soil.

All pH_F and pH_{FOX} were greater than 6.5 with low reaction to hydrogen peroxide. At Loc 1 pH_{FOX} increased (from 6.7 to 7.6 unit pH) after peroxide application. There is no physical indication of PASS and AASS in the soil samples; no samples sent for SPOCAS suite test.

Based on a combination of all three parameters, i.e. reaction strength, unit pH change, and final pH_{FOX}) (see Table 1.3.3 in Appendix 1), there is no indication of actual or potential acid sulphate soils (AASS or PASS) presence at 50 cm depth below lake bed.

Soil logs indicate that the lake bed sediment is predominantly clay.

There was no $pH_{F)}$ or pH_{FOX} less than 5.5 observed for Lake Ewlyamartup bed sediment samples (see Attachment 1 for details of the method). Therefore, there was no indication of Actual or Potential Acid Sulfate Soils presence on the three lakes; no samples sent for SPOCAS suite test.

B. Nutrients in Sediment

The lake bed sediment contains significant amount of phosphorus, ranging from 160 to 1,900 mg/kg (ppm by mass); see Table 4.4. The nitrogen mass is far less ranging from 67 to 350 mg/kg.

C. Metals in Sediment

Table 4.4 indicates that the lake bed sediment is rich with aluminium (Al) and iron (Fe).

4.4.3 Land Survey

Land survey was conducted by JBA Surveys on 22 to 23 February 2012. Areas relevant to the modelling of the enhancement options were surveyed for relative heights in mAHD (Australian Height Datum). For Lake Ewlyamartup cross-sections were taken along the outflow on the North – Eastern edge of the Lake. As well as this spot heights were taken along a possible flushing channel route. Water levels as well as sections of the bank were taken around the Lake (see Figure 4.7).

4.4.4 Geophysics

Under direction from JDA, ground-based geophysical surveys were conducted by FUGRO in February and March 2012. The surveys were conducted to locate any palaeochannels in the area that could provide a potential groundwater resource to provide supplementary water to Lake Ewlyamartup.

The survey involved two components, an initial Gravity Survey followed by a TEM survey. The Gravity Survey was performed along two 10 km lines (Denoted Lines 3000 and 4000) on Figure 4.8a determined by JDA based on a review of the the geology of the area.

The Gravity Survey showed that two particular low value zones, suggestive of greater depth to basement rock, indicative of a possible palaeochannel.

The results from the gravity component were used to refine the survey to smaller sections for the TEM survey. These sections were from distance 5500m to 7000 m on Line 3000, and distance 9000 m to 10000 m on Line 4000 (see Figure 4.8a).

TEM results are shown plotted on Figure 4.8b to d which shows deeper area to basement (base of inferred alluvium). The geophysical surveys indicated greater depths to bedrock centred at station 5850 on Line 3000 (indicated depth to bedrock of 35m) and at Stations 9375 and 9925 on Line 4000 (indicated depth 60 m). These sites would be targets for drilling, if a supplementary water source should be required from groundwater.

4.5 Community Consultation

4.5.1 Meetings at Katanning

Lake Ewlyamartup Community Consultation meetings were held at the Katanning Shire Office on the 13 December 2011 and the Katanning Leisure Centre on 28 March 2012. See Appendix (3) for list of attendees.

The meeting on 13 December was a round table discussion of the history of the lake as well as a chance for the Community to express their vision for Lake Ewlyamartup.

Key points raised 13 December 2011:

- Water Quality;

- Lake Ewlyamartup Working Group (LEWG) works are well advanced; Process has reached the approvals phase however an engineering concept plan is required before any works can be completed.
- A Heritage survey has been undertaken previously by the Department of Indigenous Affairs.
- Some dredging works were commenced but work was halted.
- Restoring Lake Ewlyamartup;
- Data collected thus far is insufficient and only approximate;
- Vesting changes and Government Easements.
- No data on first flush.
- Sediment build up in the Lake Bed

The Community Workshop held at the Katanning Leisure Centre on the 28 March 2012 was a formal presentation of the preliminary consultant results to date of each of the proposed enhancement options.

Key points raised 28 March 2012:

- Is there already Stage 2 Funding;
- Runoff rates used in modelling (1% vs 6%).
- Only interested in something that is low maintenance, low impact and most cost effective.
- Downstream impacts need to be investigated before works can be done.
- More survey needed downstream.

4.5.2 Indigenous Consultation

RDL has undertaken consultation with the Wagyl Kaip and Southern Noongar Future Acts Sub Committee (FASC). FASC represents the area covering Lake Ewlyamartup. To date, two consultation meetings have been undertaken.

The first consultation meeting was held on 21 March 2012, at the South West Aboriginal Land and Sea Council (SWALSC) offices in Cannington. The meeting involved a discussion on the project objective and provided an opportunity for the committee to provide feedback and advise how they would like to be involved in the initiative. The information was received favourably by the subcommittee and subsequent feedback received from SWALSC (15 May 2012), on behalf of the FASC, confirmed that the subcommittee would like to receive regular project updates and confirmed the committee's request for interpretative signage to be considered as part of the project.

The second consultation meeting was held on 21 June 2012 at the New Lodge Motel, Katanning. The meeting involved a presentation from RDL on the most suitable enhancement options for the lakes. The meeting provided an opportunity for the subcommittee to provide feedback on the proposed options, prior to the finalisation of the report.

Key points raised at the meeting included:

- The lake is of significant importance to the community

- Restrictions on power boating to be considered
- The group expressed a strong interest in being involved in the project going forward

4.6 Daily XP-Storm Hydraulic Model Calibration

Based on recorded flow information at Department of Water gauging stations in the Wheatbelt, located on similar large catchments, JDA considers the percentage of rainfall which becomes runoff is nearer to 1% than the 6% assumed by the LASCAM model used by Mudgway (2011) referred to above.

A higher rainfall runoff coefficient of between 5 and 10% may apply to smaller catchments, such as those on individual farms draining to hillside dams where the opportunity for detention storage is much reduced.

In this report an XP-Storm daily hydraulic model has been setup using cross-sections of the downstream channel together with the lake analysed as a basin. A schematic of the model is shown in Figure 4.9.

Using 1% of daily rainfall as catchment runoff, the model has been run for the period 2003 to 2011.

The catchment runoff has been corrected for lake evaporation and has 1% rainfall runoff during winter and 0% during summer.

A large proportion of the inflow, which averages 2.4 Mm^3/yr, bypasses the lake, as expected, given the lake volume of 1.1 Mm^3. The lake fills up above the overflow level, resulting in outflow from the lake in late winter.

JDA modelling therefore shows that the lake fills every year, as does Mudgway (2011) and that the shallow depth (approx. 1 m) results in the lake almost drying out completely most summers.

4.7 Daily Salt and Water Balance Model of Lake Filling Calibration

A daily water and salt balance model was established using the following:

- The measured lake bathymetry;
- Assume 1% catchment rainfall runoff in winter;
- Salinity varying seasonally between a minimum of 2,500 and a maximum of 35,000 mg/L.

The initial conditions as of 1 January 2003 were assumed to be as follows:

- Water level 272.0 mAHD (1m depth);
- Initial salt load 20,000 t corresponding to an initial salinity of 20,000 mg/L.

Figure 4.10a/b shows the calibration to the available salinity and water level data.

Figure 4.11 shows the location of Enhancement Options.

4.8 Enhancement Option EE1: Diversion

4.8.1 Description

One option for the improvement of lake water quality is the construction of a diversion structure, which directs low flows downstream to Coblinine River, while allowing higher flows to discharge into the lake. Lower flows with higher salinities will be diverted away from Lake Ewlyamartup, while higher flows with lower salinities will flow to the lake and reduce lake salinity.

This option was presented by the Lake Ewlyamartup Working Group in the report Restoring Lake Ewlyamartup – Engineering Concept Plan (Maesepp, 2010). In this study, three potential sites for a diversion structure were investigated (see Figure 4.12). Site A is located on Unallocated Crown Land while Sites B and C are located on private land.

In this report, Site C was not considered as the discharge point shown in Figure 4.12 is constrained by the existing topography. Survey indicates that the natural surface at the discharge location is approximately 0.4 m above the invert of the channel at Site C. To discharge from Site C would require connection to the downstream channel downstream of cross-section 11 (Figure 4.13). This would require a channel at least 500 m long and would need to cross the Katanning-Nyabing Rd.

Sites A and B are discussed in detail below.

4.8.2 Daily XP-Storm Hydraulic Model Results

Site A would be located approximately 600m upstream from the Katanning-Nyabing Rd. Maesepp (2010) (Figure 4.13) shows discharge to the east, however discharging to the downstream channel near cross-section 11 (south east from Site A) would reduce the required channel length but still provide a gradient for flow.

Survey by residents Mark Anderson, Tim Harris and Stephen Conning at this location in May 2010 indicates that the channel invert is 0.22m higher than that at the Katanning-Nyabing Rd, giving an estimated invert of 272.45 mAHD at Site A.

An XP-Storm model was set up to simulate a diversion structure at this location. A 450 mm diameter pipe of 10 m length was modelled with an invert of 272.45 mAHD. Downstream of the pipe, a 600 m channel of 1 m base width and 1 in 3 side slopes was used to connect to the downstream channel, where the channel invert is 272.3 mAHD. An overflow weir level of 272.55 mAHD was used to restrict flow to the lake. As the purpose of the structure is to divert low flows, the weir has been set only 0.1 m above the channel invert.

Simulation of the diversion structure for an average rainfall year indicates that one third of the flow from the catchment would be diverted away from the lake to the downstream channel. The remaining 67% of flow over the spillway is sufficient to fill Lake Ewlyamartup, with runoff bypassing the Lake in late winter when the lake is full. However as the diversion pipe results in lower flows to the lake, filling of the lake occurs over a longer time period, with the result that the lake is full for a shorter period of time.

Site B would be located approximately 150 m upstream from the Katanning-Nyabing Rd (Figure 4.13). Based on the available survey the channel invert at this location is estimated at 272.3 mAHD. As this level is lower than the high point on the downstream channel (272.56 mAHD), a diversion structure would need to connect downstream of this point.

To minimise the length of a diversion channel, the invert of the diversion pipe could be set above the channel invert at Site B to achieve a gradient for flow. This would need to be 272.5 mAHD as a minimum, and could connect to the downstream channel at cross-section 4 (invert 272.4 mAHD), a length of approximately 180 m. However this would result in ponding in the upstream channel, potentially to a depth of 0.3 to 0.4 m. This would result in water backing up at least 400 m upstream, and possibly breaching the upstream channel banks and flooding of adjacent land.

If the diversion pipe invert is set to the existing channel invert, then the diversion channel would need to extend to cross-section 9 (330 m) to achieve zero gradient. Ideally the channel should extend to cross-section 10 (400 m) which would result in a longitudinal slope of 0.0002, or cross-section 11 (500 m) which would have a longitudinal slope of 0.0004. This final configuration was modelled.

An XP-Storm model was set up to simulate the proposed diversion structure at Site B. A 225 mm diameter pipe of 10 m length was modelled with an invert of 272.3 mAHD. Downstream of the pipe, a 500 m long channel with 1 m base width and 1 in 3 side slopes was used to connect to the downstream channel, where the channel invert is 272.1 mAHD. An overflow weir level of 272.4 mAHD was used to restrict flow to the lake. As the purpose of the structure is to divert low flows, the weir has been set only 0.1 m above the channel invert.

This simulation modelled an average rainfall year and indicated that 41% of flow from the catchment would be diverted away from the lake, with the remaining flow discharging over the weir. This is sufficient to fill Lake Ewlyamartup, with runoff bypassing the Lake in late winter when the lake is full. However as for Site A, the diversion pipe results in lower flows to the lake, so filling of the lake occurs over a longer time period, with the result that the lake is full for a shorter period of time.

With regard to impact of the diversion structure on lake salinity, there is no data on the seasonal variation of catchment runoff flow salinity. This prevents an assessment on the relative impact of diversion of lake salt load inflow.

JDA recommends winter 2012 monitoring of stream flow salinity which will indicate whether high salinity occurs at low flows.

4.9 Enhancement Option EE2: Flushing

4.9.1 Description

The second enhancement option investigates the option of a new outlet from Lake Ewlyamartup as shown at the location on Figure 4.11. This new outlet would become the primary outflow point from the lake, separating the inflow and outflow location as currently exists. This would allow greater flushing of the lake, enforcing inflow to the lake to travel a distance within the lake before discharging. A bund could be constructed within the lake to further increase the circulation within the lake.

A flushing channel alone, without alteration to the inflow channel, will not achieve desired outcomes and has not been further considered by JDA. This is because without alteration to the inflow channel water will still bypass the lake.

A flushing channel with alteration to the inflow channel is described in Enhancement Options EE5 and EE6 below.

4.10 Enhancement Option EE3: Dredging of Lake

4.10.1 Description

There are an infinite number of combinations of dredging options relating to area of lake bed and depth of dredging.

This Report analyses a single option only namely 50,000 m^3 excavation to 0.5 m depth over 10 ha of the lake bed.

The dredged material would be used to form an island 190 m diameter at full water level with 1 in 6 side slopes extending from approximately 271.3 to 272.6 mAHD.

This option is for dredging of the lake bed to form an island within the lake. There is no specific location within the lake for the dredging and island described in this option because other factors such as access to the shoreline, boat launching area etc. may determine the location. The lake bathymetry shows no preferable location (Figure 4.4).

Dredging of the lake bed may remove an impermeable seal and lead to loss of water from the lake to the groundwater below. Further investigation of this risk is recommended prior to advancing this option.

4.10.2 Daily Salt and Water Balance Model Results

Figure 4.15 shows output of the daily water and salt balance model indicating virtually no change to either water level or salinity with this option.

However the period of time that different maximum depths of water would occur will change with the dredging option and this is illustrated in Figure 4.15c for the option modelled as described above.

Figure 4.15c shows the change in the number of days that the lake depth is greater than specified values compared with calibration case with respect to the dredged area only for the modelled option.

For example the water depth within the dredged area will be >1.5 m for 219 days per year on average compared with 79 days per year currently: an additional 140 days per year (Figure 4.15c).

4.10.3 Environmental Impact

The environmental impact of the dredging proposal described above will include the creation of an island habitat providing nesting and breeding safety for fauna, as well as providing a larger area of deep open water for water based recreational activities including water skiing.

The existing vegetation around the perimeter of the lake will not be affected by the dredging operation and the increased water depth is unlikely to increase shore erosion by wave action.

There will be a short term increase in lake turbidity and remobilisation of nutrients from the lake bed during the dredging operation, and an unknown impact on lake benthic condition.

4.10.4 Cost Estimation

Table 4.5 presents the Cost Estimate for this Enhancement Option.

4.10.5 Benefit Cost Analysis

Table 4.6 presents results of the Cost Benefit Analysis.

The lake water related factor (W) is expressed as the additional number of days per year with a water depth of least 1.5 m. The highest BCI is coloured blue and lowest red.

This water depth is not related to any specific water based recreation activity but has been conveyed to JDA by Stakeholders as an approximate minimum depth for water skiing. This depth is not reliably met at Lake Ewlyamartup at present. Table 4.6 shows this Option to have a moderate BCI of 1.1.

4.11 Enhancement Option EE4: Groundwater Replenishment

4.11.1 Description

This option involves sourcing groundwater to supplement Lake levels.

The geophysical survey described in Section 4.4.5 shows some evidence for the existence of a palaeochannel which could be the target for a groundwater drilling exploration program, after this study is completed.

The existence of a paleochannel with a significant storage of fresh water at this stage is still unknown, as is the water quality (fresh, brackish, saline).

Groundwater as a source of Lake replenishment water could be further investigated by a targeted drilling program, should the other Enhancement Options investigated and recommended in this report not be implemented.

4.11.2 Environmental Impact

The environmental impact on the lake if groundwater was found and pumped from bores would depend on the water quality of the pumped water. At this stage it is not possible to be definitive, on this water quality which could only be proven by a groundwater drilling program.

4.12 Enhancement Option EE5: Lake Ewlyamartup Working Group (LEWG) OPTION G32

4.12.1 Description

The Ewlyamartup Enhancement option EE5 refers to a combination of flushing channel and restricted bypass which were assessed as option G32 in Restoring Lake Ewlyamartup Component 2 – Analysis of Options Report, March 10, 2011 (Mudgway, 2011).

The flushing channel is a method of increasing the outflow from the lake. The flushing channel is assumed to have a trapezoidal cross-section with 3m bed width, 1:3 (V:H) side slope and invert level 271.9 mAHD.

The restricted bypass will increase the inflow to the lake by construction of a bund on the inlet channel to the lake across the downstream channel with 15 m opening width, a trapezoidal cross-section with 1:6 (V:H) side slope and sill elevation 272.8 mAHD.

The alignment of flushing channel from lake Ewlyamartup and the proposed location of bund are shown schematically in Figure 4.16. along with longitudinal profile of the flushing channel.

The G32 combination of flushing channel and restricted bypass methods for increasing the inflow to the lake and outflow from the lake is modelled using XP-Storm.

G32 includes construction of a gated structure along the flushing channel with top of gates 272.85 mAHD and gates open February to July, closed August to January. This operation of the gates will allow flushing of the lake during early winter and retention of a higher lake level (greater depth of water) during late winter and spring.

This option increases by 70 (from 79 to 149) the average number of days per year with water depth greater than 1.5 m (Figure 4.18c).

4.12.2 Daily XP-Storm Hydraulic Model Results

The XP-Storm model was used to derive a discharge rating curve for the flushing channel when the gate is open (February to July). This is shown in Figure 4.17.

4.12.3 Daily Salt and Water Balance Model Results

Results of the water and salt balance modelling are shown in Figure 4.18. These indicate reduced salinity in the lake, from hypersaline to greatly brackish (approximately 5000 to 10,000 mg/L).

The lake level is seen to be higher in most winters (by approximately 0.3 m) and to fill to a similar level to existing in summer, due to removal of boards in February each year, followed by evaporation loss.

Figure 4.18c shows the change in the number of days that certain depths are exceeded compared with calibration.

4.12.4 Environmental Impact

Lake salinity is greatly reduced from hypersaline to brackish (5000 to 10,000 mg/L) and winter Lake levels are higher by 0.3m.

Summer levels are similar to present.

The option represents a distinct improvement in the water regime of the lake and will assist in the gradual change to a brackish ecosystem.

4.12.5 Cost Estimation

Table 4.5 presents the Cost Estimate for this Enhancement Option.

4.12.6 Benefit Cost Analysis

Table 4.6 shows this Option to have the highest BCI of 1.4. This option provides significant benefits (70 additional days per year when the lake is 1.5 m or greater than), with low environmental and Aboriginal Cultural Heritage risk, high expected support for construction by landholders and relatively low costs.

4.13 Enhancement Option EE6: Lake Ewlyamartup Working Group (LEWG) OPTION G41

4.13.1 Description

The Ewlyamartup Enhancement options EE6 refers to a combination of flushing channel and restricted bypass which were assessed as option G41 in Restoring Lake Ewlyamartup Component 2 – Analysis of Options Report, March 10, 2011.

G41 differs from G32 described in Section 4.12.1 above with a lower level of flushing channel invert of 271.5 mAHD compared with 271.9 mAHD.

The alignment of flushing channel from Lake Ewlyamartup and the proposed location of bund are the same as G32 shown schematically in Figure 4.16 along with longitudinal profile of flushing channel.

The G41 combination of flushing channel and restricted bypass methods for increasing the inflow to the lake and outflow from the lake is modelled using XP-Storm.

G41 includes the same gated outlet as described in G32 above.

4.13.2 Daily XP-Storm Hydraulic Model Results

The XP-Storm model was used to derive a discharge rating curve for the flushing channel. This is shown in Figure 4.19.

4.13.3 Daily Salt and Water Balance Model Results

Results of the water and salt balance modelling are shown in Figure 4.20. These indicate greatly reduced winter salinity in the lake, although summer salinity remains high due to evaporation. The lake level is lower than at present throughout the year.

Figure 4.20c shows the change in the number of days that certain depths are exceeded compared with calibration.

This option is expected to provide a negative impact on the value of the lake, by reducing the number of days in which the lake is 1.5 m or greater in depth by 67 days (from 79 to 12) in an average year.

4.13.4 Environmental Impact

Lake salinity is reduced in winter, although not by so much as in option EE5, Lake level is lower than at present.

4.13.5 Cost Estimation

Table 4.5 presents the Cost Estimate for this Enhancement Option.

4.13.6 Benefit Cost Analysis

Table 4.6 shows this Option to have the lowest BCI of -0.9.

4.14 Outcomes

Outcomes based on the hydrological and environmental considerations are presented in Table 4.7.

In addition, JDA recommends winter 2012 monitoring as follows:

- Repeat measurement of selenium and aluminium concentration which were detected at above guideline values (Section 4.4.2);
- Stream inflow salinity measurement to indicate whether a first flush effect occurs (Section 4.7.3).

5. LAKE YEALERING

5.1 EXECUTIVE SUMMARY

Lake Yealering is a shallow, hypersaline lake within the town site of Yealering which has a severe odour problem when partially full and empty.

The lake Enhancement Option outcomes include bunding of Outlet Swamps to increase lake flushing from the Wogolin Gully and Boyning Gully Creeks and a controlled structure at the lake outlet to increase lake water level.

These 2 options combined will result in approximately 0.5 m greater water depth at most times of the year.

The increase in maximum water level may have a significant impact on fringing vegetation through prolonged inundation.

5.2 Lake Setting

General

Lake Yealering is located within the townsite of Yealering within the Shire of Wickepin (see Figure 5.1).

Land ownership in the catchment is shown in Figure 5.2.

Environmental Status

The environmental setting of the lake is described in Attachment 1, to which reference should be made.

Hydrology

The lake area is approximately 200 ha with an additional 600 ha comprising the salt lakes to the east and south.

The lake receives inflow from the southern extremity from a catchment of 39,000 ha some of which fills the south and east salt lakes as the lake itself fills.

The outflow channel for the lake is on the northwest side beneath the railway and Wickepin to Corrigin Road.

This overflow channel joins the Avon River South Branch which flows in a northerly direction.

In very wet years it is reported that the Avon River South Branch can reach a higher level around the lake itself and flow back up the overflow channel beneath the road and railway culverts and into the lake.

The highest recorded lake depth was 2.56 m in 1983 (Read, 2006). This corresponds to a water level of 271.56 mAHD assuming that the reported depth was relative to the bed of the lake at 269.0 mAHD.

There is a staff gauge in the lake which is read by DEC. JDA confirms that the datum of this gauge is 269.0 mAHD.

The lake is relatively shallow, in most years does not fill completely, and dries out during summer months by evaporation.

Inflow to the lake is from small tributaries that discharge first into winter wet flats.

Inflow to Lake Yealering is from Wogolin and Boyning Gully catchments south east of the lake which discharge through Outlet Swamps.

The lake fills first partially then back fills these smaller Outlet Swamps.

Yarling Brook, Cuneenying Brook and Walellemining Brook catchments are confluent and flow into Lake Yealering through the outlet on the northwestern side of the lake when the stream flow level is higher than the lake level.

Otherwise streamflow from Cuneenying Brook is to the Avon River.

Read (2006) describes that more than 50% of the inflow to the lake is from the southern catchments of Wogolin and Boyning.

The lake has an approx. area of 200 ha and the Outlet Swamps an additional 600 ha, 800 ha total. Read (2006) reports that the lake is hypersaline and that the fresher inflows are from the Wogolin and Boyning catchments rather than from the Cuneenying Brook. The overflow point is along the outlet channel high point at 270.75 mAHD, from survey.

5.3 Literature Review

5.3.1 Published Reports

A review of published reports is included in Attachment 1, to which reference should be made.

5.3.2 Available Data

JDA requested data on water levels and Lake water quality from DEC Busselton Office, and received a spreadsheet of water depths (m), with a conversion factor to mAHD, and Lake salinity data over a period 1978 to 2010.

5.4 Field Investigation Results

5.4.1 Lake Bathymetry

Lake Bathymetry

Lake bathymetry reflects the stage-area volume relationship of a lake. On the 22 of February 2012 water depths (m) of Lake Yealering at multiple locations (recorded with GPS) were measured by JDA from a dinghy. The readings were then converted into mAHD applying the surveyed water level on that date of 269.5 mAHD. The lowest point measured on the lake bed was 269 mAHD corresponding to a depth of 0.5 m. The overflow level along the north west shore of the lake is 270.75 mAHD from survey. Figure 5.3

shows the contours of Lake Yealering bed. Surface area and volume at each 0.25 m contour interval are presented in Table 5.1 and shown in Figure 5.4

5.4.2 Lake Water Quality

Details of Lake Yealering water profiling results (measured at 3 locations)on 22 February 2012 are shown in Figure 5.5 with descriptions provided below; a resume is given in Table 5.2. The water depth at Lake Yealering observed on this date was 0.5 m. Due to shallow water depth the profiles reading were only conducted for 2 depth points.

A. PHYSICO-CHEMICAL

Temperature Profile

In Lake Yealering the surface water temperature ranged from 29.8^{o}C to 30.8 ^{o}C (Figure 5.5(1)); all temperatures were within the ANZECC and ARMCANZ (2000) guideline values (15^{o}C to 35^{o}C; see Table 5.2).

pH Profile

Measurements of pH in Lake Yealering (Figure 5.5(2)) indicate all values were within guideline range of 5 to 9 (see Table 5.2).

Salinity Profile

Lake Yealering is a hypersaline lake with salinity levels surpassing that of ocean water (35,000mg/L). Figure 5.5(3) shows electrical conductivity (EC) and salinity of Lake Yealering water were approx. 315 mS/cm and 173,000 mg/L, respectively. The measured salinity on 22 Feb 2012 is above the maximum salinity measured in period 1985 to 2004, i.e. 150,000 mg/L (Appendix 1 of Upper Avon River Recovery Plan; DoW, 2006).

The ranges of salinity and electrical conductivity in the guideline values (<1,000 mg/L of TDS; see Table 5.2) are irrelevant to apply to a hypersaline lake.

Oxidation Reduction Potential (ORP) Profiles

In aqueous solutions oxidation reduction potential (ORP) or redox potential is a measure of the tendency of the solution to either gain or lose electrons when it is subject to change by introduction of a new substance. A solution with a higher ORP (more positive) than the new substance (contaminants) will have a tendency to gain electrons from the new substance (i.e. to be reduced by oxidizing the new substance); and *vice versa*.

Figure 5.5(4) shows the ORP value at Loc 1 was only 10 mV, whereas other locations were all greater than 80 mV which reflected that the water has signicant electron activity to oxidize contaminants.

Dissolved Oxygen Profile

Figures 5.5(5) and 5.5(6) show that DO concentrations of Lake Yealering were all less than 6.5 mg/L, which equates to >80% saturation level (i.e. the guideline value in Table 5.2). This indicates that the lake has limited dissolved oxygen to oxidize contaminants. The oxidation potential shown in ORP profiles (see above discussion) are sourced from other oxidators which can be nitrogen oxides, metals, etc.

Turbidity Profile

Figure 5.5(8) shows that Lake Yealering water is very turbid (i.e. turbidity was all greater than 10 NTU); measured turbidity was about 60 NTU.

There is no guideline value relevant to apply.

B. IONS

The comprehensive ions concentration analyses are provided in Table 5.2, which indicates that the Lake Yealering water is Na-Cl (sodium-chloride) type of water. An appreciable concentration of Mg-SO_4 (magnesium-sulfate) ion also identified. The guideline values for Na^+, Cl^- and SO_4^{-2} (see Table 5-2) applies to freshwater lakes and does not apply to Lake Yealering.

The concentration of ammonia (NH_3^+) exceeded the guideline value. Naturally-occuring ammonia is produced from decay process of nitrogenous matter, as a result of low oxygen (see Dissolved Oxygen discussion above).

The concentration of other ions (i.e. NO_3^-,NO_2^- and SiO_2^-) are less than the guideline values. There is no guideline value for the rest of ions (Ca^{+2}, Mg^{+2}, K^+, and PO_4^{-2}).

Silica (silicon dioxide or SiO_2) concentrations in the lake averaged 6 mg/L, less than the guideline value.

C. NUTRIENTS AND CARBON

(a) Nitrogen

Four species of nitrogen were measured – Total Nitrogen (TN), Total Kjeldahl Nitrogen (TKN), Ammonium (NH_4^+_N) and Nitrate (NO_3_N). TN accounts for all organic and inorganic nitrogen in all forms (dissolved and particulate). TKN is the insoluble organic form of Nitrogen which can be resulted from detritus (inanimate cells). Ammonium and Nitrate are the soluble form that is readily available for plant uptake. By the act of a decomposer (e.g. aerobic and anaerobic bacteria and fungi) in the lake sediment, TKN is decomposed into ammonium (ammonification) which is then oxidised into Nitrites (NO_2_N) and Nitrates (NO_3_N) by nitrifying bacteria.

Total Nitrogen (TN) concentration averaged 12mg/L, which is considered high. Almost 100% of the nitrogen species is insoluble (particulate) organic (TKN). The ammonium (NH_4^+_N) concentrations is high due to decomposition of the organic material.

(b) Phosphorus

Two Phosphorus (P) variables were measured: Total Phosphorus (TP) and Filterable Reactive Phosphorus (FRP; or PO_4_P). TP accounts for all phosphorus species including FRP, Dissolved Organic Phosphorus, Particulate Organic Phosphorus and Inorganic Phosphorus. Hence, the difference between the measured TP and FRP concentrations is the total amount of organic phosphorus (dissolved and particulate) and inorganic particulate phosphorus.

FRP is the soluble form of inorganic phosphorus which is directly linked to algal growth. Internal sources of FRP in the water column include (1) P-sediment release, (2) mineralisation of Dissolved Organic Phosphorus and (3) de-sorption of particulate inorganic P from the water column.

Total Phosphorus (TP) concentration ranged from 0.18 to 0.21 mg/L (average 0.18 mg/L. Almost 100% of the phosphorus species is insoluble (particulate) organic. There is no guideline value for TP and PO_4_P concentration.

(c) Dissolved Organic Carbon

Dissolved organic carbon (DOC) is defined as the organic matter that is able to pass through a filter (generally size ranging from 0.7 to 0.22 µm). Major forms of DOC in freshwater ecosystem are tannin and lignin formed from plant decomposition, which contributes to the brown lake water colour. DOC affects light penetration which is important for the ecosystem's phototrophic species. In wetland environment, DOC is considered one of main source of energy for algal growth.

DOC concentrations ranged from 200 to 210 mg/L (average 205 mg/L), which is considerably high concentration for a wetland environment. The effect of DOC in absorbing light penetration is very obvious; during the monitoring the Secchi depth was only about 0.2 m.

D. METALS

Table 5.2 section D shows that all metals concentrations in Lake Yealering were less than the practical quantitation limit (PQL), except for manganese (Mn) and selenium (Se).

The measured Manganese (Mn) concentrations exceeded the guideline trigger value by 2 to 3 times.

The measured Selenium (Se) concentrations exceeded the guideline trigger value by 6 to 7 times. Trace amounts of Se (up to 0.01 mg/L) are essential for humans.

JDA recommends winter 2012 monitoring of selenium and manganese concentrations.

E. MICROBIOLOGY

Table 5.2 section E shows that the algal densities at all locations exceeded the guideline values. The chlorophyll-*a* concentrations were all greater than 25 µg/L (which is normally considered as an upper limit for an eutrophic lake).

Details on algae species is provided in Table 5.3, which indicates no potentially toxigenic Cyanobacteria species identified. However, potentially toxic Dinoflagetllates (*Prorocentrum* sp.) were identified at low density (250 cells/mL). Marine unicellular harmless Cyanobacteria *Synechococcus* were abundant.

There was no algal bloom (i.e. a rapid increase or accumulation in algal population in surface water of aquatic system) observed during investigation on 22 February 2012.

Optimum conditions for growth of cyanobacteria in surface water (cyanobacteria blooming) (Water Directorate, 2009) include:

- Slightly alkaline water (pH>8.5); this condition was not observed on 22 Feb 2012.
- A readily available nitrogen (DIC) in form of (in preferred order) ammonia, nitrate, nitrite of >0.1mg/L; this condition was not observed on 22 Feb 2012.
- Dissolved inorganic phosphorus (in form of FRP) of >0.03 mg/L; this condition was not observed on 22 Feb 2012.

- Water temperature of 15 to 25°C, particularly long sunny days, and thermal stratification during calm water conditions (low flows) which allowing the algal cells to migrate to the surface. This condition was not observed on 22 Feb 2012.

- TN and TP ratio (TN/TP) of <16 (often associated with eutrophication caused by increased fertilizer use; this condition was not observed on 22 Feb 2012, i.e. TN/TP ratio was 72.

5.4.3 Lake Bed Sediment

Details of Lake Yealering bed sediment analysis are provided in Table 5.4. There is no guideline value available for sediment quality.

A. Acid Sulfate Soils

Targets of the lake bed sediment investigation are Potential Acid Sulfate Soils (PASS) and Actual Acid Sulfate Soils (AASS). Details on the method are provided in section 1.3 of Appendix 1.

PASS are soils which contain iron sulphides and/or other sulfidic minerals that have not been oxidised by exposure to air (containing oxygen). The field pH of these soils in undisturbed state is neutral (i.e. 7 pH unit) to alkaline (i.e. 9 pH unit). These soils are invariably saturated with water in their natural state. Soil indicators for PASS include waterlogged soils, peat or peaty soils, coffee rock horizons, a sulphurous smell, e.g. “rotten egg” gas, soil field before oxidation (pH_F) of greater than 4 and soil field pH after oxidation with hydrogen peroxide (pH_{FOX}) of lower than 3.

ASS are soils which contain iron sulfides and/or other sulfidic minerals which have previously undergone some oxidation to produce sulphuric acid, which is indicated with field pH (pH_F) of lower than 4, sulphurous smell, oily looking bacterial surface scum, and often a yellow and/or red mottling (jarosite/iron oxide) in soil profile (DEC, 2009).

Soil investigation and *in-situ* pH soil tests were conducted on 20 Feb 2012 to identify the soil characteristics which can indicate the presence of PASS and AASS. Soil cores (50 cm length) were taken using soil auger boring; the results show that the lake bed sediment is predominantly clay.

All pH_F and pH_{FOX} were greater than 6.5 with almost no reaction to hydrogen peroxide. There is no physical indication of PASS and AASS in the soil samples; no samples sent for SPOCAS suite test.

Based on a combination of all three parameters, i.e. reaction strength, unit pH change, and final pH_{FOX}) (see Table 1.3.3 in Appendix 1), there is no indication of actual or potential acid sulphate soils (AASS or PASS) presence at 50 cm depth below lake bed.

B. Nutrients

The lake bed sediment contains high amount of nitrogen TN 230 to 2,500 mg/kg (ppm by mass); see Table 5.4. The highest nitrogen mass was measured in Loc 1, which is approx. the deepest part of the lake. The total phosphorus ranged from 21 to 220 mg/kg.

C. Metals

Table 5.4 indicates that the lake bed sediment is rich with aluminium and iron.

5.4.4 Land Survey

Land survey was conducted by JBA Surveys late February 2012 at the direction of JDA. Areas relevant to the modelling of the enhancement options were surveyed for relative heights in mAHD (Australian Height Datum). For Lake Yealering, cross sections were taken of the outlet drain to the North West as well as spot heights around the Lake edge and within the Backswamps. Relevant culverts and road levels were also surveyed. (See Figure 5.6).

5.4.5 Geophysics

Under direction from JDA, ground-based geophysical surveys were conducted by FUGRO in February and March 2012. The surveys were conducted to locate any palaeochannels in the area that could provide a potential groundwater resource to provide supplementary water to Lake Yealering.

The survey involved two components, an initial Gravity Survey followed by a TEM survey. The Gravity Survey was performed along two 10 km lines (Denoted Lines 1000 and 2000) on Figure 5.7a determined by JDA based on a review of the the geology of the area

The Gravity Survey showed low value zones, suggestive of greater depth to basement rock, indicative of a possible palaeochannel.

The results from the gravity component were used to refine the survey to smaller sections for the TEM survey. These sections were from distance 2500 m to 3500 m on Line 1000, and distance 3500 m to 4500 m on Line 2000 (See Figure 5.7a).

TEM results are shown plotted on Figure 5.7 b to d which shows deeper area to basement (base of inferred alluvium). The geophysical surveys indicated greater depths to bedrock centred at Stations 2900-2950 on Line 1000 (indicated depth to bedrock of 50m), at Station 5900 on Line 1000 (indicated depth 65m) and at Stations 9375 and 9925 on Line 4000 (indicated depth 60 m). These sites would be targets for drilling, if a supplementary water source should be required from groundwater.

5.5 Community Consultation

5.5.1 Meeting at Yealering

Lake Yealering Community Meetings were held at the Yealering Town Hall on 14 December 2011 and 29 March 2012. See Appendix (3) for list of attendees.

The meeting on the 14 December was a round table discussion of the history of the lake as well as a chance for the Community to express their vision for Lake Yealering.

Key points raised 14 December 2011:

- Swimming area on the edge of the lake;
- Broken banks;
- Dries out very quickly in summer.
- Dry lake has strong odour in summer;

- Water Quality.
- Railway trenches alongside the Lake have increased silt/sediment build up in the Lake
- More permanent lake body would have huge benefits for the township.
- Outlet Swamps could be bunded off.
- Works have been done before but without proper knowledge and thus have had negative impacts on adjacent land.
- Outlet drain is major concern.

The Community Workshop on 29 March 2012 was a formal presentation of the Consultant results to date of each of the proposed enhancement options.

Key points raised 29 March 2012:

- Overflow level was refuted. However there is an overflow point in the reserve to the west.
- Downstream effects need to be considered
- Dries rapidly but last portion dries very slowly.
- Water observed to be flowing out of Lake in December was actually flowing in from the west.
- Water enters lake from Avon River in the summer.

5.5.2 Indigenous Consultation

RDL has undertaken consultation with the Gnaala Karla Booja (GKB) Working Party and Named Applicants. The Working Party represents the area covering Lake Yealering.

To date, two consultation meetings have been held.

The first consultation meeting was held on 8 March 2012 at the Willow Pond Reception Centre, Canning Vale. The meeting involved a discussion on the project objective and provided an opportunity for the Working Party to provide feedback on the project and advise ways in which they would like to be involved in the initiative. The Working Party expressed a strong interest for the project to include interpretive signage and for the cultural heritage of the lakes to be acknowledged.

A second consultation meeting was held on 6 June 2012 at the Seashells Resort, Mandurah. The meeting involved a presentation from JDA Consultant Hydrologists (JDA) on the most suitable enhancement options for the lakes. The meeting provided an opportunity for the Working Party to provide feedback on the proposed options, prior to the finalisation of the report.

Feedback received (12 June 2012) from SWALSC, on behalf of the Working Party, advised that the presentation was well received by the group and the Working Group requested for the Living Lakes project team to:

- ensure that continual consultation with the Working Party is undertaken;

- provide more details on the proposed designs / engineering methods;
- consider restrictions on boats;
- provide more information on how much revegetation will be done around the lakes.

5.6 Daily XP-Storm Hydraulic Model Calibration

An XP-Storm model of the lake outlet channel was set up using surveyed cross-sections XS-1 to XS-14 as shown on Figure 5.8 a to h.

These extend from the lake outflow between Corrigin to Wickepin Road and railway to downstream of the confluence with Cuneenying Brook.

The cross-sections and long sections (Figures 5.8 and 5.9 respectively) show a high point at XS-6 of 270.75 mAHD.

The highest recorded lake level of 271.6 mAHD in 1983 is also shown.

It is clear that this highest water level will overflow the existing surveyed channel substantially.

Lake water level by datalogger to better understand catchment inflow rates.

5.7 Daily Salt and Water Balance Model Calibration

The daily water and salt balance model was established for the southern catchment of 63,700 ha assuming winter runoff of 3.6% of rainfall and zero summer runoff.

The inflow salinity concentration was varied 2,500 to 10,000 mg/L and the model runs between 2003 and 2011.

Figure 5.10 shows the calibration with an initial condition of 30,000 initial salt load of 30,000 t and initial water level of 270.2 mAHD.

Figure 5.10 shows that the lake salinity is well matched by the calibrated model particularly the salinity measurement by JDA on 1/2/12 of 173,000 mg/L (hypersaline).

The water level is also fairly well matched. Figure 5.10 shows overflow at 270.85 mAHD in approximately 3 years out of 9, including 2011 winter.

That is most winters the lake does not fill to overflow.

Figure 5.10 also shows that the lake dries to 269.0 mAHD in most years, correspondingly the salinity reaches the salting point of 300,000 mg/L.

Figure 5.10 also shows that the salt load is increasing fourfold over the period modelled due to insufficient flushing of the lake.

The location of the Enhancement Options is shown in Figure 5.11.

5.8 Enhancement Option EY1: Bund within Outlet Swamp

5.8.1 Description

Figure 5.11 shows the proposed location of bunds to focus the southern catchment inflow from Wogolin and Boyning Gully into the lake and prevent it spilling over into the Outlet Swamps on the south and eastern side.

Figure 5.12 shows the revised bathymetry.

An extension of the existing bund from the boundary of Private Property and Reserve will be required to the lake itself. These Outlet Swamps will still receive incident rainfall and runoff from their local catchment.

Low points on the lake perimeter would also need to be raised.

A channel to drain ponded water on the western side of this bund through to the outflow at the north-west corner of the lake may also be required to prevent excessive waterlogging in this area.

This Enhancement Option is analysed separately from any change to the outlet channel itself.

5.8.2 Daily Salt and Water Balance Model Results

Figure 5.13 shows the output of the daily salt and water balance model showing considerable reduction in the rate of salt load increase.

The bunds effectively remove three-quarters of the total water surface area by preventing access of water to the Outlet Swamps.

The resulting lake inflow is increased with more frequent overflow occurring.

The maximum water level is higher for longer periods.

The minimum summer water level is also higher.

The lake depth is increased by up to 0.5m most of the year.

Figure 5.13c shows the change in the number of days that different depths are exceeded, relative to calibration.

This option increases by 87 (from 84 to 171) the average number of days per year with water depth greater than 1.5 m (Figure 5.13c).

5.8.3 Environmental Impact

The higher maximum water level is above the level of 271.0 mAHD at which some impact on the fringing vegetation is likely to occur due to increased duration of inundation.

This option reduces the rate of increase of salinity in the lake which is a positive step.

The Outlet Swamps will not receive so much water but still receive incident rainfall and local catchment runoff. The impact on them is considered to be low.

5.8.4 Cost Estimation

Table 5.5 presents the Cost Estimate for this Enhancement Option.

5.8.5 Benefit Cost Analysis

The results of the BCA for Lake Yealering are presented in Table 5.6.

The highest value is colour blue and the lowest value red.

The lake water related factor (W) is expressed as the additional number of days per year with a water depth of least 1.5 m.

This water depth is not related to any specific water based recreation activity but has been conveyed to JDA by Stakeholders as an approximate minimum depth for water skiing. This depth is not reliably met at Lake Yealering at present.

The Enhancement Option with the highest BCI of 2.4 is EY1 – Bund within Backswamp to focus inflow to the lake. This option provides significant benefits (87 additional days per year when the lake is 1.5 m or greater), although these benefits come with moderate risk of environmental and Aboriginal Heritage impacts, moderate expected support for construction by landholders, and moderate construction and maintenance costs.

5.9 Enhancement Option EY2: Improvement of Outlet

5.9.1 Description

This option involves installing a gated structure in the outlet channel between the lake and Corrigin to Wickepin Road with an invert level of 270.75 mAHD, the same as the existing high point further down the channel.

Figure 5.14 shows a schematic of the gate and weir structure.

We have modelled the effect of installing gates with overflow level 271.2 mAHD between August and January, with the gates being open February to July. A spillway is incorporated at 271.6 mAHD.

A channel to drain ponded water on the western side of the lake through to the outflow at the north-west corner may also be required to prevent excessive waterlogging in this area.

5.9.2 Daily XP-Storm Hydraulic Model Results

The XP-Storm model was used to generate a rating curve (graph of water level versus discharge) for the outflow channel, with the gate open.

5.9.3 Daily Salt and Water Balance Model Results

Figure 5.15 shows that the water levels are, for example in 2003, unaffected by the installation of the gates in August. This is because the lake level in that year was already above 271.2 mAHD being a relatively wet year and the low capacity of the outflow channel retaining the high water level through the winter period.

In other years, such as 2004 with less rainfall the lake level did not reach 270.75 mAHD and therefore installation of the gates had no effect. Figure 5.15 therefore shows that this gate option would, on its own, have no impact on water levels.

Figure 5.15 shows that if the gates are installed August to January for example 2003 the lake outflow is prevented so that salinity increases. Because the evaporation rate greatly exceeds the capacity of the outflow channel the effect on water level and salinity is marginal.

Figure 5.15c shows the change in the number of days that the various lake depths are compared with calibration.

This option increases by 4 (from 84 to 88) the average number of days per year with water depth greater than 1.5 m (Figure 5.15c).

5.9.4 Environmental Impact

This outlet controls structure results in negligible change in lake water levels and salinity.

This is because in years when the lake inflow is sufficient to raise the lake level to the proposed top of gate 271.2 mAHD, the lake is already full and overflowing. However, the flow capacity of the outlet channel is relatively small so that the gate is effectively sitting in stagnant water.

The gate will not appreciably affect the rate of falling water level in wet years because most of the water is lost by lake evaporation, rather than outflow along the outlet channel.

5.9.5 Cost Estimation

Table 5.5 presents the Cost Estimate for this Enhancement Option.

5.9.6 Benefit Cost Analysis

Table 5.6 shows that the BCI for this Option has a moderate value of 0.6.

5.10 Enhancement Option EY3: Dredging of Lake

5.10.1 Description

There are an infinite number of combinations of dredging options relating to area of lake bed and depth of dredging.

This Report analyses a single option only namely 50,000 m^3 excavation to 0.5 m depth over 10 ha of the lake bed.

The dredged material would be used to form an island 160m diameter at full water level with 1 in 6 side slopes extending from approximately 269.3 to 271.4 mAHD. Figure 5.16 shows the revised bathymetry, and is presented in Table 5.7.

Dredging of the lake bed may remove an impermeable seal and lead to loss of water from the lake to the groundwater below. Further investigation of this risk is recommended prior to advancing this option.

This option is for dredging of the lake bed to form an island within the lake.

This option is for dredging of the lake bed to form an island within the lake. There is no specific location within the lake for the dredging and island described in this option because other factors such as access to the shoreline, boat launching area etc. may determine the location. The lake bathymetry shows no preferable location (Figure 5.3).

The surface area at bed level 269.0 mAHD is unchanged, whereas at intermediate elevations of 269.5 and 270.5 there is a decrease in lake area of 1.9 and 1.6 ha respectively. At lake full level 270.75 mAHD the lake volume is unchanged.

Dredging of the lake bed may remove an impermeable seal and lead to loss of water from the lake to the groundwater below. Further investigation of this risk is recommended prior to advancing this option.

5.10.2 Daily Salt and Water Balance Model Results

Figure 5.17 shows that there is virtually no difference in the water and salt balance associated with this Option.

With this dredging option there will be a change in the number of days per year that a certain water level of the lake exceeds given water depth.

This is graphically illustrated in Fig. 5.17c.

This option increases by 140 (from 84 to 224) the average number of days per year with water depth greater than 1.5 m (Figure 5.17c).

5.10.3 Environmental Impact

The environmental impact of the dredging proposal described above will include the creation of a island habitat providing nesting and breeding safety for fauna, as well as providing a larger area of deep open water for water based recreational activities including water skiing.

The existing vegetation around the perimeter of the lake will not be affected by the dredging operation and the increased water depth is unlikely to increase shore erosion by wave action.

There will be a short term increase in lake turbidity and remobilisation of nutrients from the lake bed during the dredging operation, and an unknown impact on lake benthic condition.

5.10.4 Cost Estimation

Table 5.5 presents the Cost Estimate for this Enhancement Option.

5.10.5 Benefit Cost Analysis

Table 5.6 shows the BCI of 0.7 for this Option is close to the minimum value of 0.6.

This option is expected to provide (approximately 140 additional days per year when the lake is 1.5m or greater) over the 10 ha dredged area, but with significant risk of environmental and Aboriginal heritage impacts, at a relatively high cost.

5.11 Enhancement Option EY4: Groundwater Replenishment

5.11.1 Description

The ground based geophysics described above shows some evidence of the existence of palaeochannel in the vicinity of Lake Yealering.

The potential quality and quantity of groundwater which might be obtainable from palaeochannels in this vicinity, if present, is unknown, but could be investigated by exploration drilling if required.

5.11.2 Environmental Impact

The environmental impact on the lake if groundwater was found and pumped from bores would depend on the quality of the pumped water, which could only be proven by a groundwater drilling program.

5.12 Enhancement Option EY5: Gated System on Outlet Drain

5.12.1 Description

This option is similar to Enhancement Option EY2 but places a gated outlet system further downstream along the outflow channel, beyond the confluence of Cuneenying Brook.

In the past modification of the flow direction and levels in this vicinity has been attempted using sandbags and remnants of this system are evident today.

The previous attempts allowed the flow from Cuneenying Brook to be diverted into the lake occasionally and for the lake level to be raised accordingly.

JDA understands that due to waterlogging within Cuneenying Brook catchment that this system was not retained.

Option EY5 has not been further investigated in this report due to a preference for a gated structure upstream of the road and railway (Option EY2) which would have no impact on these major assets.

However Option EY5 should be considered as a longer term measure should the other options be implemented and require supplementation.

5.13 Outcomes

Enhancement Option outcomes based on the hydrological and environmental considerations are presented in Table 5.8.

In addition, JDA recommends winter 2012 monitoring as follows:

- Repeat measurement of selenium and manganese concentration which were detected at above guideline values (Section 5.4.2);
- Lake water level by datalogger to better understand catchment inflow rates.

6. BETWEEN LAKES BENEFIT COST ANALYSIS

A comparison of BCA results between lakes is provided in Table 6.1. The table includes all options that are considered to be technically feasible, ranking them by BCI, where the option with the highest BCI is given a rank of 1, and option with the lowest BCI is given the lowest rank of 10. The top two ranked options are associated with Lake Towerrinning – ET5 and ET2. These options provide moderate increases in social, recreational and economic values of the lake (Benefit Score = 135 – 1,604) but at relatively low construction cost ($24,300 – $137,700). Hence, they provide significant results for money spent.

The third ranked option is associated with Lake Yealering – EY1 (Bund within backswamps). This option is considered to provide the highest benefit of all options across all lakes (Benefit Score = 2,624) but with some risks (support from landholders, and environmental/Aboriginal heritage risk) and for a relatively higher cost ($524,772). All options that rank lower than EY1 have significantly lower BCI's. The highest ranked option for Lake Ewlyamartup (EE5 – Option G32) is ranked fifth with relatively moderate benefits at a relatively moderate cost but with low associated risk.

7. CONCLUSIONS

- Enhancement Option outcomes and recommendations for Lakes Towerrinning, Ewlyamartup and Yealering are presented at the end of Chapters 3, 4, 5 respectively, based on Hydrological Analysis (this Report) and the Environmental Report (Attachment 1).

- It is recommended that following any decision to implement Enhancement Options at one or more of the lakes, RDL initiate a 'Proponent Referral' under Section 38 of Part IV of the EP Act to enable the EPA to make its determination on the need and level of any required environmental assessment and associated regulatory approvals.

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10.1.2

TABLES

10.1.2

LAKE TOWERRINNING

TABLE 3.1: LAKE TOWERRINNING BATHYMETRY

Level (mAHD)	Surface Area (m^2)	Volume (Mm^3)
215.75	477,000	0
216.00	662,000	0.143
216.25	839,000	0.330
216.50	1,017,000	0.562
216.75	1,159,000	0.834
217.00	1,282,000	1.139
217.25	1,388,000	1.473
217.50	1,503,000	1.834
217.75	1,562,000	2.217
218.00	1,620,000	2.614
218.25	1,709,000	3.030

Note: Surface area and volume are rounded-up to nearest 1,000m^2 and 1,000m^3, respectively

TABLE 3.2: LAKE TOWERRINNING WATER QUALITY MONITORING RESULTS (20/2/2012)

Parameter	Unit	PQL[1]	Guideline Value[2]	JDA Monitoring on 20 Feb 2012							
				Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Lake Avg	Inlet Swamp	Outlet Swamp
A. Physicochemical											
Temperature	°C	0.01	15 to 35[2]	25.08	25.26	24.9	24.53	25.15	24.984	23.89	29.93
pH	pH unit	NA	5 to 9[2]; 6.5 to 8.5[3]	8.6	8.6	8.6	8.7	8.7	8.64	8.8	9.1
EC	mS/cm	1	NA[5]	18	17	17	17	17	17	18	57
TDS	mg/L	1	≤1,000; NR[4]	9,300	9,300	9,300	9,500	9,400	9,360	10,000	30,000
TSS @103-105°C	mg/L	1	NA[5]	<1	<1	28	16	36	26	32	48
Turbidity	mg/L	1	NA[5]	24 to 28	24 to 25	24 to 27	24 to 31	24 to 40	24 to 27	19.4	39
Total Hardness	mg/L	1	≤500[2,3]; NR[4]	2,700	2,800	2,700	2,700	2,700	2,720	3,000	7,700
B. Ions											
Ca^{+2}	mg/L	0.1	NA[5]	180	180	180	170	160	174	180	450
Mg^{+2}	mg/L	0.1	NA[5]	560	570	560	550	560	560	610	1,600
Na^{+}	mg/L	0.5	≤300[2]; 180[3];NR[4]	2,200	2,300	2,200	2,200	2,200	2,220	2,500	6,800
K^{+}	mg/L	0.1	NA[5]	16	17	16	16	16	16.2	19	68
NH_3^{+}	mg/L	0.01	≤0.01[2]; ≤0.5[3]	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04
PO_4^{-2}	mg/L	0.01	NA[5]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CO_3^{-2}	mg/L	5	NA[5]	<5	<5	<5	14	<5	14	31	80
HCO_3^{-}	mg/L	5	NA[5]	180	180	190	160	190	180	160	170
Cl^{-}	mg/L	1	≤400[2]; ≤250[3]; NR[4]	5,600	5,400	5,300	5,500	5,500	5,460	6,000	18,000
SO_4^{-2}	mg/L	1	≤400[2]; ≤500[3]; NR[4]	310	300	280	310	300	300	290	950
NO_3^{-}	mg/L	0.1	≤44[2]; ≤50[3]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
NO_2^{-}	mg/L	0.1	≤3.3[2,3]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1
SiO_2^{-}	mg/L	0.1	NA[5]	10	11	11	10	10	10.4	2.1	1.6

Notes:

1) Practical Quantitation Limit (PQL) or Limit of Reporting, defined as the lowest concentration at which an analyte can be detected in a sample within a reasonable degree of accuracy and precision.
2) ANZECC and ARMCANZ (2000), Chapter 5: Guidelines for Recreational Water Quality and Aesthetic: Primary Contact.
3) Australian Government National Health and Medical Research Council Natural Resource Management Ministerial Council (2011), National Water Quality Management Strategy: Australian Drinking Water Guidelines (ADWG) 6. Guideline values are provided for Health (H) and Aesthetic (A).
4) Not relevant to apply. (NR)
5) Not available. (NA)

TABLE 3.2: LAKE TOWERRINNING WATER QUALITY (CONT.)

Parameter	Unit	PQL[1]	Guideline Value[2]	JDA Monitoring on 20 Feb 2012							
				Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Lake Avg	Inlet Swamp	Outlet Swamp
C. Nutrients and Carbon											
TN	mg/L	0.1	NA[5]	1.1	1.2	1.2	1.2	1.1	1.16	1	1.3
TKN	mg/L	0.1	NA[5]	1.1	1.2	1.2	1.2	1.1	1.16	1	1.3
NO_x_N	mg/L	0.005	≤10[2]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
NH_3_N	mg/L	0.005	≤0.008[2]; ≤0.4[3]	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04
TP	mg/L	0.05	NA[5]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06
PO_4_P as FRP	mg/L	0.005	NA[5]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Diss. Organic Carbon	mg/L	1	NA[5]	14	16	6	6	4	9.2	5	53
D. Metals											
Al	mg/L	0.02	NA[5]	0.02	0.03	0.03	0.03	0.02	0.026	0.03	0.04
As	mg/L	0.03	≤0.05[2]; ≤0.007[3]	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cd	mg/L	0.002	≤0.005[2];	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	mg/L	0.005	≤0.05[2),3]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fe	mg/L	0.02	≤0.3[2]	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	0.07
Pb	mg/L	0.02	≤0.05[2]; ≤0.01[3]	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mn	mg/L	0.005	≤0.1[2]; ≤0.05[3]	0.088	0.093	0.09	0.075	0.076	0.0844	<0.005	<0.005
Hg	mg/L	$5X10^{-5}$	≤0.001[2);3]	$<5X10^{-5}$	$<5X10^{-5}$	$<5X10^{-5}$	$<5X10^{-5}$	$<5X10^{-5}$	$<5X10^{-5}$	$<5X10^{-5}$	$<5X10^{-5}$
Se	mg/L	0.02	≤0.01[2),3]	**0.03**	<0.02	<0.02	<0.02	<0.02	<0.02	**0.03**	**0.04**
Zn	mg/L	0.01	≤5[2]; ≤3[3]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	mg/L	0.005	≤1[2]; ≤2[2]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
E. Microbiology											
Algal Density	cells/mL	1	≤20,000[2]	**2,173,300**	**2,671,200**	**2,611,000**	**3,334,000**	**1,575,600**	**2,473,020**	**722,750**	**17,000**
Nuisance Cyanobacteria	cells/mL	1	≤15,000[3]	0	0	0	0	0	0	0	0
Escherichia coli	cfu/100mL	1	0[4]	<10	<10			<10	<10		<10
Thermotolerant Coliform	cfu/100mL	1	<150[3]	<10	<10			<10	<10		<10

1) Practical Quantitation Limit (PQL) or Limit of Reporting, defined as the lowest concentration at which an analyte can be detected in a sample within a reasonable degree of accuracy and precision.
2) ANZECC and ARMCANZ (2000), Chapter 5: Guidelines for Recreational Water Quality and Aesthetic: Primary Contact.
3) Australian Government National Health and Medical Research Council Natural Resource Management Ministerial Council (2011), National Water Quality Management Strategy: Australian Drinking Water Guidelines (ADWG) 6.
4) Not relevant to apply;
5) Not available

TABLE 3.3: LAKE TOWERRINNING ALGAE IDENTIFICATION AND DENSITY (20/2/12)

Species Name	Unit	Algal Density (20 Feb 2012)				
		Loc 1	Loc 2	Loc 3	Loc 4	Loc 5
Bacillariophyceae						
Flagilaria sp.	cells/mL	13,500	13,000	15,500	14,900	11,400
Chlorophyceae						
Ankistrodesmus sp.	cells/mL	27,700	36,700	30,700	30,300	36,700
Cyanobacteria						
Aphanothece spp.	cells/mL	1,362,000	2,220,000	1,776,000	2,420,000	653,000
Cyanothece sp.	cells/mL	17,300	18,800	18,500	19,500	16,000
Merismopedia sp.	cells/mL	361,000	273,500	393,000	502,000	411,000
Planktolyngbya limnetica	cells/mL	228,800	203,700	246,800	193,000	245,000
Snowella sp.	cells/mL	163,000	105,500	130,500	154,300	202,500
Total Density	**cells/mL**	**2,173,300**	**2,871,200**	**2,564,800**	**3,288,800**	**1,575,600**

TABLE 3.4: LAKE TOWERRINNING SEDIMENT MONITORING RESULTS

Parameter	Unit	PQL[1)]	JDA Monitoring on 20 Feb 2012				
			Loc 1	Loc 2	Loc 4	Inflow Swamp	Outlet Swamp
A. Acid Sulfate Soils							
pH_F	pH unit	NA	6.88	6.71	6.88	NA	NA
pH_{FOX}	pH unit	NA	6.68	6.63	6.76	NA	NA
Moisture	%	NA	23	67	16	15	19
B. Nutrients							
TN	mg/kg	1	230	2,400	310	130	240
TP	mg/kg	1	5	79	36	<0.1	52
C. Metals							
Al	mg/kg	10	32,000	24,000	4,400	11,000	12,000
As	mg/kg	2	2	3	<2	<2	3
Cd	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cr	mg/kg	1	39	29	7	12	52
Fe	mg/kg	10	88,000	20,000	7,100	15,000	87,000
Pb	mg/kg	1	20	15	7	11	27
Mn	mg/kg	1	9	130	66	10	21
Hg	mg/kg	0.1	<0.1	0.3	<0.1	<0	<0.1
Se	mg/kg	5	<5	<5	<5	<5	<5
Zn	mg/kg	5	<5	7	<5	<5	6
Cu	mg/kg	1	6	34	1	5	5

Notes:

1) Practical Quantitation Limit (PQL) or Limit of Reporting, defined as the lowest concentration at which an analyte can be detected in a sample within a reasonable degree of accuracy and precision.

TABLE 3.5: LAKE TOWERRINNING DIVERSION DRAIN CULVERTS

LOCATION	CULVERT TYPE	SIZE (mm)	No.	INVERT LEVEL (mAHD)	NOTES
REDIVERSION STRUCTURE	P	825mm	1	239.6	
SCOTT ROAD	P B	325mm 1250 x 450mm	2 1	237 237	
PRIVATE PROPERTY	P	375mm 450mm	4 1	233.9 233.9	
PRIVATE PROPERTY	B	1800 x 700mm	1	230.1	
CAPERCUP RD SW	B	3800 x 750mm	1	227.9	Bridge over farm track.
PRIVATE PROPERTY	P	375mm 675mm	2 2	226.7 226.7	
CAPERCUP RD SW	P B	450mm 1250 x 750mm	5 1	225.4 225.4	

Notes 1: P = pipe, B = box.

TABLE 3.6: LAKE TOWERRINNING SUMMARY OF INFLOWS

ENHANCEMENT OPTION	BRIEF DESCRIPTION	FLOW TO REDIVERSION STRUCTURE REACHING LAKE (Mm^3/yr)	FLOW BETWEEN REDIVERSION STRUCTURE & LAKE (Mm^3/yr)	TOTAL FLOW REACHING LAKE (Mm^3/yr)	NOTES
EXISTING		2.13	1.19	3.32	
ET1	Increased culverts rediversion structure	2.13	1.19	3.32	Neglible increase in lake inflow
ET2	Capercup Reserve	2.13	1.35	3.38	Assumes 0.16 Mm3/yr flow from Capercup
ET3	Lake dredging	2.13	1.19	3.32	
ET4	Groundwater replenishment	–	–	–	Not modelled
ET5	Rehabilitation rediversion drain	4.06	1.19	5.25	Assumes 2 x diverted water
ET6	Refine outlet from Outlet Swamp to Arthur River	2.13	1.19	3.32	
ET7	Modify outlet structure from lake to Outlet Swamp	2.13	1.19	3.32	

Notes: 1. Average flow 2003 to 2011 in Mm^3/yr
2. Average annual rainfall = 560 mm/yr.

TABLE 3.7: LAKE TOWERRINNING ENHANCEMENT OPTION COST ESTIMATES												
	Excavation (Trench 1m) m3			Excavation (Trench 1-2m) m3			Dredging (m3)	Construction	CAPITAL COST ($)	CAPITAL ADJUSTED COST ($)*1.25[3]	CAPITAL ADJUSTED COST ($) 2012[4]	ANNUAL MAINTENANCE COSTS ($)[1]
	Sand	Light Soil	Clay	Sand	Light soil	Clay			2009		2012	2012
Unit Cost ($)[2]	27	30	40	30	32	44	10					
ET1 Increase Rediversion Capacity												
Unit												
Total Cost								10,000		12,500	13,500	1,350
ET2 Capercup Reserve Drain to Lake												
Unit		600										
Total Cost		18,000							18,000	22,500	24,300	2,430
ET3 Dredging of Lake												
Unit							240,000					
Total Cost							2,400,000		2,400,000	3,000,000	3,240,000	324,000
ET4 Groundwater Replenishment												
Unit												
Total Cost									NF	NF	NF	NF

TABLE 3.7: LAKE TOWERRINNING ENHANCEMENT OPTION COST ESTIMATES (CONT.)												
	Excavation (Trench 1m) m^3			Excavation (Trench 1-2m) m^3			Dredging (m^3)	Construction	CAPITAL COST ($)	CAPITAL ADJUSTED COST ($)*1.25[3]	CAPITAL ADJUSTED COST ($) 2012[4]	ANNUAL MAINTENANCE COSTS ($)[1]
	Sand	Light Soil	Clay	Sand	Light soil	Clay			2009		2012	2012
Unit Cost ($)[2]	27	30	40	30	32	44	10					
ET5 Rehabilitation of Rediversion Drain												
Unit		34000										
Total Cost		**102,000**							**102,000**	**127,500**	**137,700**	**13,770**
ET6 Refine Outlet from Outlet Swamp to Arthur River												
Unit		4000										
Total Cost		**120,000**							**120,000**	**150,000**	**162,000**	**16,200**
ET7 Modify Outlet Structure from Lake to Outlet Swamp												
Unit												
Total Cost									**NF**	**NF**	**NF**	**NF**

Notes:
1. Annual Maintenance cost = 10% of Capital cost
2. Unit cost values taken from Rawlinsons 2009
3. Adjusted cost is Capital*1.25 based on Towerrinning Location Adjustment (Rawlinsons 2009)
4. Consumer Price Index Adjusted for 2012 (1.08)
5. NF = Not Feasible

TABLE 3.8: LAKE TOWERRINNING: ENHANCEMENT OPTIONS BENEFIT COST ANALYSIS

BENEFIT VARIABLES		Units	ET1	ET2	ET3	ET4	ET5	ET6	ET7
Daily value of lake when >2.5m deep	(D)	(0 - 100)	60	60	60	60	60	60	60
Additional days when lake is >2.5m deep	(W)	(-365 - 365)	1	5	9	N.F.	33	N.F	
Social, recreational and economic value of enhancement	(V=D*W)	(-36,500 – 36,000)	60	300	540		1,980		
Environmental and Aboriginal heritage risk	(E)	(0 - 1)	0.9	0.9	0.1	0.9	0.9	0.7	0.5
Support for construction by landholders	(A)	(0 - 1)	0.9	0.5	0.9	0.5	0.9	0.5	0.5
Time lag until majority of anticipated benefits occur	(L)	(0 - 100 years)	0	0	0	2	0	0	0
Discount factor for benefits	(DFB)	(0 - 1)	1.0	1.0	1.0	0.9	1.0	1.0	1.0
Benefit Score	**(BS)**	**(-36,500 - 36,000)**	**49**	**135**	**49**		**1,604**		

COST VARIABLES		Units	ET1	ET2	ET3	ET4	ET5	ET6	ET7
Short-term cost of project (over 3 - 5 years)	(C)	($thousand)	14	24	3,240	N.A.	138	162	N.A.
Annual maintenance cost	(M)	(Propn of C)	0.1	0.1	0.1		0.1	0.1	
Annual maintenance cost	(M)	($thousand)	1	2	324		14	16	
Present value of maintenance costs over 20 years	(PV(M))	($thousand)	16	28	3,729		158	186	
Present Value of the Costs	**(PVC)**	($thousand)	**29**	**52**	**6,969**		**296**	**348**	

BENEFIT COST INDEX		ET1	ET2	ET3	ET4	ET5	ET6	ET7
Index (BCI = BS/PVC)	**(BCI)**	**1.7**	**2.6**	**0.0**		**5.4**		

TABLE 3.9: LAKE TOWERRINNING DECREASE IN LAKE AREA – ET3

WATER LEVELS (mAHD)	EXISTING LAKE AREA (ha)	DECREASE IN LAKE AREA (ha)
215.75	47.5	0
216.00	66.2	0
217.0	128.2	9.4
218.0	162	8.6
218.75	195	8.2

TABLE 3.10: LAKE TOWERRINNING - SUMMARY OF ENHANCEMENT OPTIONS, LIKELY IMPACTS AND RISK ASSESSMENT

ENHANCEMENT NO.	BRIEF DESCRIPTION	EXPECTED CHANGE IN LAKE WATER LEVEL	EXPECTED CHANGE IN LAKE WATER QUALITY	LIKELY QUALITATIVE IMPACT ON VEGETATION AND WILD LIFE	ENIVIRONMENTAL* RISK ASSESSMENT (LOW / MODERATE / HIGH)	No. EXTRA DAYS PER/YR >2.5m WATER DEPTH[3]	OUTCOMES
ET1	Increase culverts at rediversion structure	Negligible	Salinity: Negligible Other: Negligible	Negligible	Low	1	This Option does not meet project objectives of increasing lake hydro-period or improving water quality.
ET2	Capercup Nature Reserve Drain	Negligible	Salinity: Negligible Other: Negligible	Negligible	Low	5	This Option does not meet project objectives of increasing lake hydro-period or improving water quality. However it does provide the opportunity to prevent further degradation of Capercup Nature Reserve, a biodiversity asset within this catchment.
ET3	Lake dredging	Negligible change in water level (mAHD), but increase in lake depth.	Salinity: Negligible Other: Short-term increase in turbidity, and resuspension of nutrients during dredging operation.	Uncertain due to unknown impacts on benthic habitat.	High	9	This Option meets project objectives of increasing lake hydro-period but will not improve long-term water quality. Short-term there will be water quality issues associated with the dredging operation. In addition there is the risk that dredging the lake bed may remove a low permeability seal and result in leakage of lake water to the underlying groundwater. This risk needs to be further investigated should this Option be considered further.
ET4	Groundwater replenishment	NF	NF	NF	NF	NF	Previous studies of groundwater availability in palaeochannels indicated insufficient resource to meet project objectives of increasing lake hydro-period or improving water quality.
ET5	Rehabilitation of rediversion drain	More rapid rise in early winter water level, but maximum water level unchanged.	Salinity: Decreased Other: Negligible	Possible redistribution of Inflow Swamp sediment and extension further into the lake.	Low	33	This Option meets project objectives of increasing lake hydro-period and will reduce lake salinity.

Notes: 1 Scenario ET0 (see Section 3.7.2) represents the lake state prior to rediversion works constructed in the 1990's and indicates there were only 68 days per year when the water depth was >2.5m compared with 250 days per year under the current scenario.
3 Refer Figures 3.12c, 3.13c, 3.16c and 3.17c.

TABLE 3.10: LAKE TOWERRINNING - SUMMARY OF ENHANCEMENT OPTIONS, LIKELY IMPACTS AND RISK ASSESSMENT (CONTD)

ENHANCEMENT NO.	BRIEF DESCRIPTION	EXPECTED CHANGE IN LAKE WATER LEVEL	EXPECTED CHANG IN LAKE WATER QUALITY	LIKELY QUALITATIVE IMPACT ON VEGETATION AND WILD LIFE	ENIVIRONMENTAL* RISK ASSESSMENT (LOW / MODERATE / HIGH)	No. EXTRA DAYS PER/YR >2.5m WATER DEPTH	OUTCOMES
ET6	Refine outlet from Outlet Swamp to Arthur River	No impact on lake water level. Ability to flush Outlet Swamp and control its water level between empty and existing regime. Modelled option allows for complete emptying of Outlet Swamp: partial emptying may be sufficient alternative.	Salinity: None Other: None Reduced salinity, nutrient concentration and algal risk in Outlet Swamp.	Depends on setting and operation of Swamp Outlet. If outlet used to periodically flush Outlet Swamp (reducing salinity), then gradual change in fringing vegetation towards more freshwater dominated species (eg Melalueca Cuticularis to Melalueca Rhaphiophylla).	Low: if southern route. Moderate: if northern route. Subject to likely qualitative impact (previous column)	NF	This Option does not meet project objectives of increasing lake hydro-period and improving water quality, but enhances the Outlet Swamp, considered an integral part of the Lake Towerrinning system.
ET7	Modify outlet structure from Lake to Outlet Swamp	NF	NF	NF	NF	NF	This Option would not meet project objectives of increasing lake hydro-period or improving lake water quality as the current manual operation of the outlet produces near optimum condition. To alleviate safety issues with the current manual operation, a mechanical or automated system of gates could be installed.

Notes: *) Environmental includes consideration of aboriginal/cultural heritage issues.
2. Refer to Environmental Report (Attachment 1) for further details of Environmental Risk Assessment.
NF – Not Feasible

10.1.2

LAKE EWLYAMARTUP

TABLE 4.1: LAKE EWLYAMARTUP BATHYMETRY

Level (mAHD)	Surface Area (m^2)	Volume (Mm^3)
271.00	30,000	0
271.25	505,000	0.067
271.50	756,000	0.225
271.75	880,000	0.249
272.00	962,000	0.659
272.25	1,000,000	0.904
272.50	1,062,000	1.162

Note: Surface area and volume are rounded-up to nearest 1,000m^2 and 1,000m^3, respectively

TABLE 4.2: LAKE EWLYAMARTUP WATER QUALITY MONITORING RESULTS (21/2/12)

Parameter	Unit	PQL[1)]	Guideline Value	JDA Monitoring on 21 Feb 2012						
				Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Lake Avg	Inflow
A. Physico-chemical										
Temperature	°C	0.01	15 to 35[2)]	24.78	24.4	26.07	24.44	24.96	24.93	35
pH	pH unit	NA	5 to 9[2)]; 6.5 to 8.5[3)]	**9.5**	**9.4**	**9.5**	**9.5**	**9.6**	**9.5**	**9.2**
EC	mS/cm	1	NA[5)]	73	71	69	71	70	70	60
TDS	mg/L	1	≤1,000; NR[4)]	39,000	37,000	38,000	38,000	39,000	38200	34,000
TSS @103-105°C	mg/L	1	NA[5)]	48	24	28	60	32	38.4	44
Turbidity	NTU	1	NA[5)]	15 to 16	13 to 16	15 to 17	17 to 19	15 to 16	15 to 17	27 to 30
Total Hardness	mg/L	1	≤500[2),3)]; NR[4)]	5,200	7,400	6,000	5,600	7,300	6300	7,000
B. Ions										
Ca^{+2}	mg/L	0.1	NA[5)]	390	550	460	440	540	476	400
Mg^{+2}	mg/L	0.1	NA[5)]	1,000	1,500	1,200	1,100	1,400	1240	1,500
Na^{+}	mg/L	0.5	≤300[2)]; ≤180[3)];NR[4)]	8,800	13,000	10,000	9,400	12,000	10640	10,000
K^{+}	mg/L	0.1	NA[5)]	45	67	53	48	65	55.6	57
NH_3^{+}	mg/L	0.01	≤0.01[2)]; ≤0.5[3)]	**0.03**	**0.08**	**0.08**	**0.03**	**0.03**	**0.05**	**0.02**
PO_4^{-2}	mg/L	0.01	NA[5)]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CO_3^{-2}	mg/L	5	NA[5)]	68	70	85	85	82	78	14
HCO_3^{-}	mg/L	5	NA[5)]	66	79	74	75	68	72.4	42
Cl^{-}	mg/L	1	≤400[2)]; ≤250[3)] NR[4)]	24,000	22,000	22,000	23,000	23,000	22800	20,000
SO_4^{-2}	mg/L	1	≤400[2)]; ≤500[3)] NR[4)]	2,200	2,300	1,900	2,200	2,400	2200	2,200
NO_3^{-}	mg/L	0.1	≤44[2)]; ≤50[3)]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
NO_2^{-}	mg/L	0.1	≤3.3[2),3)]	<1	<1	<1	<1	<1	<1	<1
SiO_2^{-}	mg/L	0.1	NA[5)]	0.4	3.2	2.4	2.2	2.8	2.2	13

Notes:

1) Practical Quantitation Limit (PQL) or Limit of Reporting, defined as the lowest concentration at which an analyte can be detected in a sample within a reasonable degree of accuracy and precision.
2) ANZECC and ARMCANZ (2000), Chapter 5: Guidelines for Recreational Water Quality and Aesthetic: Primary Contact.
3) Australian Government National Health and Medical Research Council Natural Resource Management Ministerial Council (2011), National Water Quality Management Strategy: Australian Drinking Water Guidelines (ADWG) 6. Guideline values are provided for Health (H) and Aesthetic (A).
4) Not relevant to apply.
5) Not available.

TABLE 4.2: LAKE EWLYAMARTUP WATER QUALITY (CONT.)

Parameter	Unit	PQL[1)]	Guideline Value	JDA Monitoring on 21 Feb 2012						
				Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Lake Avg	Inflow
C. Nutrients and Carbon										
TN	mg/L	0.1	NA[5)]	1.4	1.5	2.1	2.,0	1.5	1.625	0.5
TKN	mg/L	0.1	NA[5)]	1.4	1.5	2.1	2.,0	1.5	1.625	0.5
NO_x_N	mg/L	0.005	≤10[2)]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
NH_4_N	mg/L	0.005	≤0.008[2)]; ≤0.4[3)]	0.03	0.07	0.07	0.03	0.03	0.05	0.02
TP	mg/L	0.05	NA[5)]	0.06	0.13	0.08	0.07	0.07	0.082	<0.05
PO_4_P as FRP	mg/L	0.005	NA[5)]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Diss. Organic Carbon	mg/L	1	NA[5)]	42	61	60	61	38	52.4	NA
D. Metals										
Al	mg/L	0.02	NA[5)]	0.03	0.03	0.03	0.03	0.03	0.03	0.03
As	mg/L	0.03	≤0.05[2)]; ≤0.007[3)]	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cd	mg/L	0.002	≤0.005[2)]; ≤0.002[3)]	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cr	mg/L	0.005	≤0.05[2),3)]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fe	mg/L	0.02	≤0.3[2)]	<0.02	<0.02	0.03	0.03	<0.02	0.03	0.03
Pb	mg/L	0.02	≤0.05[2)]; ≤0.01[3)]	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mn	mg/L	0.005	≤0.1[2)]; ≤0.05[3)]	0.011	0.019	0.015	0.014	0.018	0.0154	<0.005
Hg	mg/L	$5X10^{-5}$	≤0.001[2);3)]	$<5X10^{-5}$	$<5X10^{-5}$	$<5X10^{-5}$	$<5X10^{-5}$	$<5X10^{-5}$	$<5X10^{-5}$	$<5X10^{-5}$
Se	mg/L	0.02	≤0.01[2),3)]	**0.05**	**0.04**	<0.02	**0.03**	**0.04**	**0.04**	**0.05**
Zn	mg/L	0.01	≤5[2)]; ≤3[3)]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	mg/L	0.005	≤1[2)]; ≤2[2)]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
E. Microbiology										
Algal Density	cells/mL	1	≤20,000[2)]	7,490	8,790	2,520	2,020	5,910	5,346	NA[3)]
Nuisance Cyanobacteria Density	cells/mL	1	≤15,000[3)]	0	0	0	0	0	0	NA[3)]

Notes:

1) Practical Quantitation Limit (PQL) or Limit of Reporting, defined as the lowest concentration at which an analyte can be detected in a sample within a reasonable degree of accuracy and precision.
2) ANZECC and ARMCANZ (2000), Chapter 5: Guidelines for Recreational Water Quality and Aesthetic: Primary Contact.
3) Australian Government National Health and Medical Research Council Natural Resource Management Ministerial Council (2011), National Water Quality Management Strategy: Australian Drinking Water Guidelines (ADWG) 6. Guideline values are provided for Health (H) and Aesthetic (A).
4) Not relevant to apply.
5) Not available

TABLE 4.3: LAKE EWLYAMARTUP ALGAE IDENTIFICATION AND DENSITY (21/2/12)

Species Name	Unit	Phytoplankton Density (21 Feb 2012)				
		Loc 1	Loc 2	Loc 3	Loc 4	Loc 5
Bacillariophyceae						
Chaetoceros sp.	cells/mL	1,800	1,040	1,320	1,600	760
Cylindrotheca closterium	cells/mL	2,890	0	0	60	10
Cryptophyceae						
Chroomonas sp.	cells/mL	600	0	0	0	0
Cryptomonas sp.	cells/mL	500	0	0	160	240
Prasinophyceae						
Prasinophyte sp.	cells/mL	1,700	7,750	1,200	200	4,900
Total Phytoplankton	**cells/mL**	**7,490**	**8,790**	**2,520**	**2,020**	**5,910**

TABLE 4.4: LAKE EWLYAMARTUP SEDIMENT MONITORING RESULTS

Parameter	Unit	PQL[1)]	JDA Monitoring on 21 Feb 2012	
			Loc 1	Loc 2
A. Acid Sulfate Soils				
pH_F	pH unit	NA	6.67	7.67
pH_{FOx}	pH unit	NA	7.07	7.46
Moisture	%	NA	24	52
B. Nutrients				
TN	mg/kg	1	350	67
TP	mg/kg	1	1,900	160
C. Metals				
Al	mg/kg	10	5,600	22,000
As	mg/kg	2	<2	<2
Cd	mg/kg	0.1	<0.1	<0.1
Cr	mg/kg	1	6	20
Fe	mg/kg	10	4,900	12,000
Pb	mg/kg	1	6	18
Mn	mg/kg	1	30	220
Hg	mg/kg	0.1	<0.1	<0.1
Se	mg/kg	5	<5	<5
Zn	mg/kg	5	<5	10
Cu	mg/kg	1	4	32

Notes:

1) Practical Quantitation Limit (PQL) or Limit of Reporting, defined as the lowest concentration at which an analyte can be detected in a sample within a reasonable degree of accuracy and precision.

TABLE 4.5: LAKE EWLYAMARTUP ENHANCEMENT OPTIONS COST ESTIMATES

	Clearing (sqm)	Excavation (Trench 1m) m^3			Excavation (Trench 1-2m) m^3			Dredging (m^3)	Construction	CAPITAL COST ($)	CAPITAL ADJUSTED COST ($)*1.25[3]	CAPITAL ADJUSTED COST ($) 2012[4]	ANNUAL MAINTENANCE COSTS ($) [1]
	Med Veg	Sand	Light Soil	Clay	Sand	Light soil	Clay			2009		2012	**2012**
Unit Cost ($)[2]	**0.5**	**27**	**30**	**40**	**30**	**32**	**44**	**10**					
EE1 - Diversion													
Unit													
Total Cost										**NF**	**NF**	**NF**	**NF**
EE2 - Flushing													
Unit													
Total Cost										NF	NF	NF	NF
EE3 - Dredging													
Unit								50,000					
Total Cost								**500,000**		**500,000**	**625,000**	**675,000**	**67,500**
EE4 Groundwater Replenishment													
Unit													
Total Cost										**NF**	**NF**	**NF**	**NF**
EE5 - G32: Drain Invert at 271.9 mAHD													
Clearing													
Unit	11700												
Cost	5,850												
Flushing Channel Excavation													

TABLE 4.5: LAKE EWLYAMARTUP ENHANCEMENT OPTIONS COST ESTIMATES (CONT.)

	Clearing (sqm)	Excavation (Trench 1m) m^3			Excavation (Trench 1-2m) m^3			Dredging (m^3)	Construction	CAPITAL COST ($)	CAPITAL ADJUSTED COST ($)*1.25[3]	CAPITAL ADJUSTED COST ($) 2012[4]	ANNUAL MAINTENANCE COSTS ($) [1]
	Med Veg	Sand	Light Soil	Clay	Sand	Light soil	Clay			2009		2012	**2012**
Unit Cost ($)[2]	**0.5**	**27**	**30**	**40**	**30**	**32**	**44**	**10**					
Unit			7500										
Cost			225000										
Construction of Gate													
Cost													
Bund													
Unit			830										
Cost			25,000										
Total Cost	**5,850**		**250,000**						**100,000**	**355,850**	**444,813**	**480,398**	**48,039**
Cost									100,000				
EE6 – G41: Drain Invert at 271.5 mAHD													
Clearing													
Unit	11700												
Cost	5,850												
Flushing Channel Excavation													
Unit			12000										
Cost			360,000										
Construction of Gate									100,000				

TABLE 4.5: LAKE EWLYAMARTUP ENHANCEMENT OPTIONS COST ESTIMATES (CONT.)

	Clearing (sqm)	Excavation (Trench 1m) m^3			Excavation (Trench 1-2m) m^3			Dredging (m^3)	Construction	CAPITAL COST ($)	CAPITAL ADJUSTED COST ($)*1.25[3]	CAPITAL ADJUSTED COST ($) 2012[4]	ANNUAL MAINTENANCE COSTS ($) [1]
	Med Veg	Sand	Light Soil	Clay	Sand	Light soil	Clay			2009		2012	**2012**
Unit Cost ($)[2]	**0.5**	**27**	**30**	**40**	**30**	**32**	**44**	**10**					
Unit													
Cost													
Bund													
Unit			830										
Cost			25,000										
Total Cost	**5,850**		**385,000**						**100,000**	**490,850**	**613,563**	**662,648**	**66,264**

Notes:
1. Annual Maintenance cost = 10% of Capital cost
2. Unit cost values taken from Rawlinsons 2009
3. Adjusted cost is Capital*1.25 based on Katanning Location Adjustment (Rawlinsons 2009)
4. Consumer Price Index Adjusted for 2012 (1.08)
5. NF = Not Feasible

TABLE 4.6: LAKE EWLYAMARTUP: ENHANCEMENT OPTIONS BENEFIT COST ANALYSIS

BENEFIT VARIABLES		Units	EE1	EE2	EE3	EE4	EE5	EE6
Time lag until majority of anticipated benefits occur	(L)	(0 – 100)						
Daily value of lake when >1.5m deep	(D)	(0 - 100)	30	30	30	30	30	30
Additional days when lake is >1.5m deep	(W)	(-365 - 365)	N.F.	N.F.	140	N.F.	70	-66
Social, recreational and economic value of enhancement	(V=D*W)	(-36,500 – 36,000)			4,200		2,100	-1,980
Environmental and Aboriginal heritage risk	(E)	(0 - 1)	0.9	0.9	0.5	0.9	0.9	0.9
Support for construction by landholders	(A)	(0 - 1)	0.9	0.9	0.9	0.5	0.9	0.9
Time lag until majority of anticipated benefits occur			2	2	2	2	2	2
Discount factor for benefits	(DFB)	(0 - 1)	0.9	0.9	0.9	0.9	0.9	0.9
Benefit Score	**(BS)**	**(-36,500 – 36,000)**			**1,629**		**1,466**	**-1,305**

COST VARIABLES		Units	EE1	EE2	EE3	EE4	EE5	EE6
Short-term cost of project (over 3 - 5 years)	(C)	($thousand)	N.A.	N.A.	675	N.A.	481	663
Annual maintenance cost	(M)	(Propn of C)			0.10		0.10	0.10
Annual maintenance cost	(M)	($thousand)			68		48	66
Present value of maintenance costs over 20 years	(PV(M))	($thousand)			777		553	763
Present Value of the Costs	**(PVC)**	($thousand)			**1,452**		**1,034**	**1,426**

BENEFIT COST INDEX		EE1	EE2	EE3	EE4	EE5	EE6
Index (BCI = BS/PVC)	**(BCI)**			**1.1**		**1.4**	**-0.9**

TABLE 4.7: LAKE EWLYAMARTUP - SUMMARY OF ENHANCEMENT OPTIONS, LIKELY IMPACTS AND RISK ASSESSMENT

ENHANCEMENT NO.	BRIEF DESCRIPTION	EXPECTED CHANGE IN LAKE WATER LEVEL	EXPECTED CHANGE IN LAKE WATER QUALITY	LIKELY QUALITATIVE IMPACT ON VEGETATION AND WILD LIFE	ENIVIRONMENTAL* RISK ASSESSMENT (LOW / MODERATE / HIGH)	No. EXTRA DAYS PER/YR >1.5m WATER DEPTH[4]	OUTCOMES
EE1	Diversion	NF	NF	NF	NF	NF	The Option does not meet project objectives of increasing lake hydro-period and improving water quality.
EE2	Flushing	NF	NF	NF	NF	NF	The Option does not meet project objectives of increasing lake hydro-period and improving water quality.
EE3	Dredging of Lake	Negligible change in water level (mAHD), but increase in lake depth.	Salinity: Negligible Other: Short-term increase in turbidity, and resuspension of nutrients during dredging operation.	Uncertain due to unknown impacts on benthic habitat.	High	140	This Option meets project objectives of increasing lake hydro-period (in the area dredged) but will not improve long-term water quality. Short-term there will be water quality issues associated with the dredging operation. In addition there is the risk that dredging the lake bed may remove a low permeability seal and result in leakage of lake water to the underlying groundwater. This risk needs to be further investigated should this Option be considered further.
EE4	Groundwater Replenishment	NF	NF	NF	NF	NF	Ground based geophysics conducted for this study provide target areas for any future groundwater drilling program should groundwater be further considered as a resource to meet project objectives.
EE5	LEWG Option 32	Lake level will generally be higher. Maximum lake level would be controlled to 272.85 mAHD.	Salinity: Greatly reduced. Other: Reduced nutrient concentration and algal risk.	Possible gradual change to less saline ecosystem.	Low, assuming flushing channel designed not to overflow saline water into potential Priority Ecological Community	70	This Option meets project objectives of increasing lake hydro-period and improving water quality.

TABLE 4.7: LAKE EWLYAMARTUP - SUMMARY OF ENHANCEMENT OPTIONS, LIKELY IMPACTS AND RISK ASSESSMENT (CONTD)

ENHANCEMENT NO.	BRIEF DESCRIPTION	EXPECTED CHANGE IN LAKE WATER LEVEL	EXPECTED CHANG IN LAKE WATER QUALITY	LIKELY QUALITATIVE IMPACT ON VEGETATION AND WILD LIFE	ENIVIRONMENTAL* RISK ASSESSMENT (LOW / MODERATE / HIGH)	No. EXTRA DAYS PER/YR >1.5m WATER DEPTH[4]	OUTCOMES
EE6	LEWG Option 41	Lake level will generally be lower. Maximum lake level would be controlled to 272.85 mAHD.	Salinity: Reduced. Other: Reduced nutrient concentration and algal risk.	Negligible.	Low, assuming flushing channel designed not to overflow saline water into potential Priority Ecological Community	-66	This Option does not meet project objectives of increasing lake hydro-period, but does reduce lake salinity, nutrient concentration and algal risk.

Notes: *) Environmental includes consideration of aboriginal/cultural heritage issues.
1. Refer to Environmental Report (Attachment 1) for further details of Environmental Risk Assessment.
2. NI – Not investigated
3. NF – Not Feasible
4. See Figures 4.15c, 4.18c and 4.20c.

10.1.2

LAKE YEALERING

TABLE 5.1: LAKE YEALERING BATHYMETRY

Level (mAHD)	Surface Area (m^2)	Volume (Mm^3)
269.00	153,000	0
269.25	897,000	0.132
269.50	1,298,000	0.406
269.75	1,466,000	0.751
270.00	1,554,000	1.129
270.25	1,623,000	1.526
270.50	2,012,000	1.940
270.75	2,720,000	2.412

Note: Surface area and volume are rounded-up to nearest $1000m^2$ and $1000m^3$, respectively

TABLE 5.2: LAKE YEALERING WATER QUALITY MONITORING RESULTS (22/2/12)

Parameter	Unit	PQL[1]	Guideline Value[2]	JDA Monitoring on 22 Feb 2012			
				Loc 1	Loc 2	Loc 3	Lake Avg
A. Physic-chemical							
Temperature	°C	0.01	15 to 35[2]	29.85	30.8	30.05	30.2
pH	pH unit		5 to 9[2]; 6.5 to 8.5[3]	7.7	7.7	7.6	7.7
EC	mS/cm	1	NA[5]	310	325.	309.	315.
TDS	mg/L	1	≤1,000; NR[4]	170,000	180,000	170,000	173,333
TSS	mg/L	1	NA[5]	200	330	140	223
Turbidity	NTU	1	NA[5]	62	64	56	60
Total Hardness	mg/L	1	≤500[2,3]; NR[4]	30,000	31,000	31,000	30,667
B. Ions							
Ca^{+2}	mg/L	0.1	NA[5]	2,000	2,000	2,000	2,000
Mg^{+2}	mg/L	0.1	NA[5]	6,100	6,200	6,200	6,167
Na^{+}	mg/L	0.5	≤300[2]; ≤180[3];NR[4]	48,000	49,000	48,000	48,333
K^{+}	mg/L	0.1	NA[5]	720	740	730	730
NH_3^{+}	mg/L	0.01	≤0.01[2]; ≤0.5[3]	**0.85**	**0.92**	**0.91**	**1**
PO_4^{-2}	mg/L	0.01	NA[5]	<0.01	<0.01	<0.01	<0.01
CO_3^{-2}	mg/L	5	NA[5]	<5	<5	<5	<5
HCO_3^{-}	mg/L	5	NA[5]	180	190	180	183
Cl^{-}	mg/L	1	≤400[2]; ≤250[3] NR[4]	110,000	110,000	110,000	110,000
SO_4^{-2}	mg/L	1	≤400[2]; ≤500[3] NR[4]	9,700	9,400	9,200	9,433
NO_3^{-}	mg/L	0.1	≤44[2]; ≤50[3]	<4	<4	<4	<4
NO_2^{-}	mg/L	0.1	≤3.3[2,3]	**<4**	**<4**	**<4**	**<4**
SiO_2^{-}	mg/L	0.1	NA[5]	15	16	16	15.67

Notes:

1) Practical Quantitation Limit (PQL) or Limit of Reporting, defined as the lowest concentration at which an analyte can be detected in a sample within a reasonable degree of accuracy and precision.
2) ANZECC and ARMCANZ (2000), Chapter 5: Guidelines for Recreational Water Quality and Aesthetic: Primary Contact.
3) Australian Government National Health and Medical Research Council Natural Resource Management Ministerial Council (2011), National Water Quality Management Strategy: Australian Drinking Water Guidelines (ADWG) 6. Guideline values are provided for Health (H) and Aesthetic (A)
4) Not relevant to apply.
5) Not available.

TABLE 5.2: LAKE YEALERING WATER QUALITY (CONT.)

Parameter	Unit	PQL[1]	Guideline Value[2]	JDA Monitoring on 22 Feb 2012			
				Loc 1	Loc 2	Loc 3	Lake Avg
C. Nutrients							
TN	mg/L	0.1	NA[5]	13	13	12	13
TKN	mg/L	0.1	NA[5]	13	13	12	13
NO_x_N	mg/L	0.005	≤10[2]	<0.005	<0.005	<0.005	<0.005
NH_4_N	mg/L	0.005	≤0.008[2]; ≤0.4[3]	**0.7**	**0.76**	**0.75**	**0.74**
TP	mg/L	0.05	NA[5]	0.21	0.16	0.18	0.18
PO_4_P as FRP	mg/L	0.005	NA[5]	<0.005	<0.005	<0.005	<0.005
Diss. Organic Carbon	mg/L	1	NA[5]	200	210	NA	205
D. Metals							
Al	mg/L	0.02	NA[5]	0.03	0.03	0.04	0.03
As	mg/L	0.03	≤0.05[2]; ≤0.007[3]	0.03	<0.03	<0.03	<0.03
Cd	mg/L	0.002	≤0.005[2]; ≤0.002[3]	<0.002	<0.002	<0.002	<0.002
Cr	mg/L	0.005	≤0.05[2),3]	<0.005	<0.005	<0.005	<0.005
Fe	mg/L	0.02	≤0.3[2]	0.04	0.03	0.03	0.03
Pb	mg/L	0.02	≤0.05[2]; ≤0.01[3]	<0.02	<0.02	<0.02	<0.02
Mn	mg/L	0.005	≤0.1[2]; ≤0.05[3]	**0.3**	**0.45**	**0.26**	**0.34**
Hg	mg/L	$5X10^{-5}$	≤0.001[2);3]	$<5X10^{-5}$	$<5X10^{-5}$	$<5X10^{-5}$	$<5X10^{-5}$
Se	mg/L	0.02	≤0.01[2),3]	**0.06**	**0.07**	**0.06**	**0.06**
Zn	mg/L	0.01	≤5[2]; ≤3[3]	0.02	0.03	0.03	0.03
Cu	mg/L	0.005	≤1[2]; ≤2[2]	0.007	0.009	0.01	0.01
E. Microbiology							
Algal Density	cells/mL	1	≤20,000[2]	**1,848,250**	**944,000**	**1,079,300**	**1,290,517**
Nuisance Cyanobacteria Density	cells/mL	1	≤15,000[3]	250	0	0	83
Chlorophyll-*a*	µg/L	1	NA[5]	42	44	32	39

Notes:

1) Practical Quantitation Limit (PQL) or Limit of Reporting, defined as the lowest concentration at which an analyte can be detected in a sample within a reasonable degree of accuracy and precision.
2) ANZECC and ARMCANZ (2000), Chapter 5: Guidelines for Recreational Water Quality and Aesthetic: Primary Contact.
3) Australian Government National Health and Medical Research Council Natural Resource Management Ministerial Council (2011), National Water Quality Management Strategy: Australian Drinking Water Guidelines (ADWG) 6. Guideline values are provided for Health (H) and Aesthetic (A)
4) Not relevant to apply.
5) Not available

TABLE 5.3: LAKE YEALERING ALGAE IDENTIFICATION AND DENSITY (22/2/12)

Species Name	Unit	Phytoplankton Density (22 Feb 2012)		
		Loc 1	Loc 2	Loc 3
Cyanobacteria				
Synechococcus spp.	cells/mL	1,432,000	561,000	892,800
Dinophyceae				
Prorocentrum sp.	cells/mL	250	0	0
Prasinophyceae				
Prasinophyte sp.	cells/mL	416,000	383,000	186,500
Total Phytoplankton Density	cells/mL	**1,848,250**	**944,000**	**1,079,300**

TABLE 5.4: LAKE YEALERING SEDIMENT MONITORING RESULTS

Parameter	Unit	PQL[1)]	JDA Monitoring on 22 Feb 2012		
			Loc 1	Loc 2	Loc 3
A. Acid Sulfate Soils					
pH_F	pH unit	NA	6.94	6.92	7,42
pH_{FOx}	pH unit	NA	6.97	7.4	7.73
Moisture	%	NA	65	71	22
B. Nutrients					
TN	mg/kg	1	2500	3400	230
TP	mg/kg	1	180	220	21
C. Metals					
Al	mg/kg	10	21,000	13,000	15,000
As	mg/kg	2	3	<2	<2
Cd	mg/kg	0.1	<0.1	<0.1	<0.1
Cr	mg/kg	1	18	11	16
Fe	mg/kg	10	14,000	8,400	9,400
Pb	mg/kg	1	21	13	27
Mn	mg/kg	1	710	460	71
Hg	mg/kg	0.1	<0.1	<0.1	<0.1
Se	mg/kg	5	<5	<5	<5
Zn	mg/kg	5	11	7	6
Cu	mg/kg	1	12	9	9

Notes:

1) Practical Quantitation Limit (PQL) or Limit of Reporting, defined as the lowest concentration at which an analyte can be detected in a sample within a reasonable degree of accuracy and precision.

TABLE 5.5: LAKE YEALERING ENHANCEMENT OPTIONS COST ESTIMATES												
	Excavation (Trench 1m) m^3			Excavation (Trench 1-2m) m^3			Dredging (m^3)	Construction	CAPITAL COST ($)	CAPITAL ADJUSTED COST ($)*1.25[3]	CAPITAL ADJUSTED COST ($) 2012[4]	ANNUAL MAINTENANCE COSTS ($)[1]
	sand	light soil	clay	sand	light soil	clay			2009		2012	2012
Unit Cost ($)[2]	27	30	40	30	32	44	10					
Yealering												
EY1 Bund within Outlet Swamp												
Unit		12924										
Total Cost	0	387,720	0	0	0	0			388720	485,900	524,772	52,477
EY2 Improvement of Outlet												
Bund												
Unit		1879										
Cost		56370										
Gate								100,000				
Cost												
Total Cost	0	56,370	0	0	0	0		100,000	156,370	195,463	211,100	21,110
EY3 Dredging of Lake												
Unit							50,000					
Total Cost							500,000		500,000	625,000	675,000	67,500

TABLE 5.5: LAKE YEALERING ENHANCEMENT OPTIONS COST ESTIMATES (CONT.)												
	Excavation (Trench 1m) m^3			Excavation (Trench 1-2m) m^3			Dredging (m^3)	Construction	CAPITAL COST ($)	CAPITAL ADJUSTED COST ($)*1.25[3]	CAPITAL ADJUSTED COST ($) 2012[4]	ANNUAL MAINTENANCE COSTS ($)[1]
	sand	light soil	clay	sand	light soil	clay			2009		2012	2012
Unit Cost ($)[2]	27	30	40	30	32	44	10					
EY4 Groundwater Replenishment												
Unit												
Total Cost									NF	NF	NF	NF
EY5 Gated System on Outlet Drain												
Total Cost									NF	NF	NF	NF

Notes:
1. Annual Maintenance cost = 10% of Capital cost
2. Unit cost values taken from Rawlinsons 2009
3. Adjusted cost is Capital*1.25 based on Yealering Location Adjustment (Rawlinsons 2009)
4. Consumer Price Index Adjusted for 2012 (1.08)
5. NF = Not Feasible

TABLE 5.6: LAKE YEALERING: ENHANCEMENT OPTIONS BENEFIT COST ANALYSIS

BENEFIT VARIABLES		Units	EY1	EY2	EY3	EY4	EY5
Daily value of lake when >1.5m deep	(D)	(0 - 100)	100	100	100	100	100
Additional days when lake is >1.5m deep	(W)	(-365 - 365)	87	4	140	N.F.	
Social, recreational and economic value of enhancement	(V=D*W)	(-36,500 - 36,000)	8,700	400	14,000		
Environmental and Aboriginal heritage risk	(E)	(0 - 1)	0.7	0.9	0.1	0.9	0.7
Support for construction by landholders	(A)	(0 - 1)	0.5	0.9	0.9	0.5	0.9
Time lag until majority of anticipated benefits occur	(L)	(0 - 100 years)	2	2	2	2	2
Discount factor for benefits	(DFB)	(0 - 1)	0.9	0.9	0.9	0.9	0.9
Benefit Score	**(BS)**	**(-36,500 - 36,000)**	**2,624**	**279**	**1,086**		

COST VARIABLES		Units	EY1	EY2	EY3	EY4	EY5
Short-term cost of project construction	(C)	($thousand)	5258	211	675	N.A.	
Annual maintenance cost	(M)	(Propn of C)	0.1	0.1	0.1		
Annual maintenance cost	(M)	($thousand)	52	21	68		
Present value of maintenance costs over 20 years	(PV(M))	($)	604	243	777		
Present Value of the Costs	**(PVC)**	($thousand)	**1,129**	**454**	**1,452**		

BENEFIT COST INDEX		EY1	EY2	EY3	EY4	EY5
Index (BCI = BS/PVC)	**(BCI)**	**2.3**	**0.6**	**0.7**		

TABLE 5.7: LAKE YEALERING DECREASE IN LAKE AREA – EY 3

WATER LEVELS (mAHD)	EXISTING LAKE AREA (ha)	DECREASE IN LAKE AREA (ha)
269	15.2	0
269.5	129.7	1.9
270	155.3	1.7
270.5	714	1.6
271	714	1.5

TABLE 5.8: LAKE YEALERING - SUMMARY OF ENHANCEMENT OPTIONS, LIKELY IMPACTS AND RISK ASSESSMENT

ENHANCEMENT NO.	BRIEF DESCRIPTION	EXPECTED CHANGE IN LAKE WATER LEVEL	EXPECTED CHANGE IN LAKE WATER QUALITY	LIKELY QUALITATIVE IMPACT ON VEGETATION AND WILD LIFE	ENIVIRONMENTAL* RISK ASSESSMENT (LOW / MODERATE / HIGH)	No. EXTRA DAYS PER/YR >1.5m WATER DEPTH[5]	OUTCOMES
EY1	Bund within Outlet Swamp	Increase.	Salinity: Decrease. Other: Decrease in nutrient concentration and algal risk.	Improved in lake, subject to maximum water level not exceeding 271.0 mAHD above which fringing vegetation adversely affected. Changed water regime in Outlet Swamps probably acceptable given lack of swamp vegetation and recognised lower ecological value.	Low/Moderate due to uncertainty described in other headings	88	This Option meets the project objectives of increasing lake hydro-period and improving water quality. Options EY1 and EY2 should be considered jointly. (see Note 3)
EY2	Improvement of Outlet	Increase to control modelled level 271.6 mAHD.	Salinity: Decrease. Other: Decrease in nutrient concentration and algal risk. Salinity: Negligible	Significant adverse impact on fringing vegetation due to higher water level.[3] (Note 3)	Moderate/High depending on height and duration of extended high water level affecting fringing vegetation. [3] (Note 3)	4	This Option meets the project objectives of increasing lake hydro-period and improving water quality. Options EY1 and EY2 should be considered jointly. (see Note 3)
EY3	Dredging of Lake	Negligible change in water level (mAHD), but increase in lake depth.	Other: short-term increase in turbity in short-term suspension of nutrients during dredging operation.	Uncertain due to unknown impacts on benthic habitat.	High	140	This Option meets the project objectives of increasing lake hydro-period and improving water quality. Options EY1 and EY2 should be considered jointly. (see Note 3)

TABLE 5.8: LAKE YEALERING - SUMMARY OF ENHANCEMENT OPTIONS, LIKELY IMPACTS AND RISK ASSESSMENT (CONTD)

ENHANCEMENT NO.	BRIEF DESCRIPTION	EXPECTED CHANGE IN LAKE WATER LEVEL	EXPECTED CHANG IN LAKE WATER QUALITY	LIKELY QUALITATIVE IMPACT ON VEGETATION AND WILD LIFE	ENIVIRONMENTAL* RISK ASSESSMENT (LOW / MODERATE / HIGH)	No. EXTRA DAYS PER/YR >1.5m WATER DEPTH[5]	OUTCOMES
EY4	Groundwater Replenishment	NF	NF	NF	NF	NF	Ground based geophysics inducted for this study provide target areas for any future groundwater drilling program should groundwater be further considered as a resource to meet project objectives.
EY5	Gated System on Outlet Drain	NF	NF	NF	NF	See Note 4	

Notes: *) Environmental includes consideration of aboriginal/cultural heritage issues.
1. Refer to Environmental Report (Attachment 1) for further details of Environmental Risk Assessment.
2. NF – Not Feasible
3 Implementation of EY1 and EY2 is recommended on a staged basis, with EY2 occurring before EY1.
4. Option could be considered in the future subject to the improvement in lake following implementation of EY1 and EY2.
5. See Figures 5.13c, 5.15c and 5.17c.

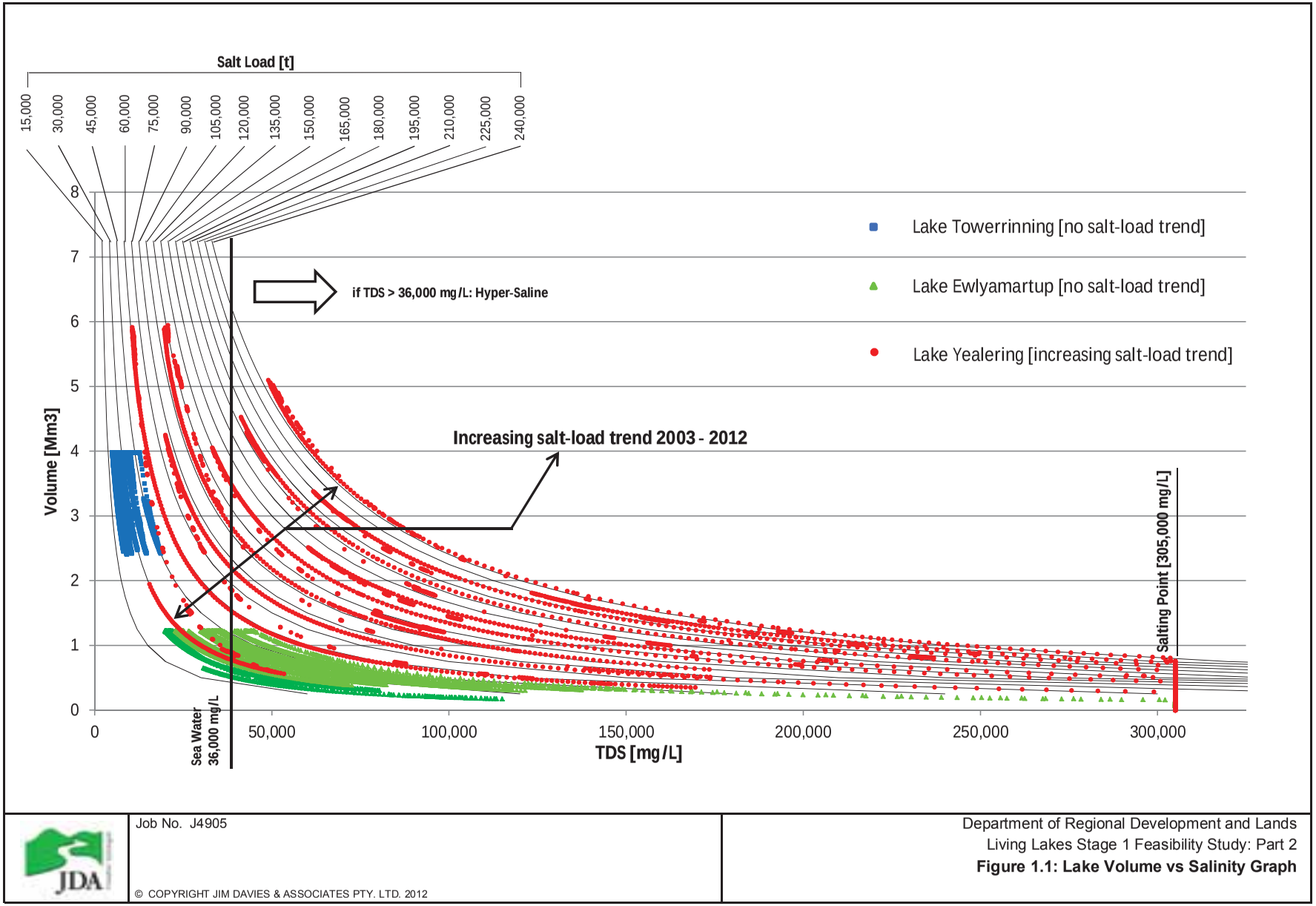
TABLE 6.1: BETWEEN LAKE COMPARISON – SORTED BY BCI RANK

Rank	Lake	Option	Description	BCI	Construction Cost ($)
1	Towerrinning	ET5	Rehabilitate rediversion drain	5.4	137,700
2	Towerrinning	ET2	Capercup reserve drain to lake	2.6	24,300
3	Yealering	EY1	Bund within backswamps	2.4	524,772
4	Towerrinning	ET1	Increase rediversion capacity	1.7	13,500
5	Ewlyamartup	EE5	Option G32	1.4	480,870
6	Ewlyamartup	EE3	Dredging	1.1	675,000
7	Yealering	EY3	Dredging	0.7	675,000
8	Yealering	EY2	Improvement of Outlet Drain	0.6	211,100
9	Towerrinning	ET3	Dredging	0.0	3,240,000
10	Ewlyamartup	EE6	Option G41	-0.9	663,120

Note: Construction costs, rather than the present value of all costs (PVC), are presented here to give the client an idea of the initial outlay needed for each project. The PVC is proportional to the construction costs.

10.1.2

FIGURES



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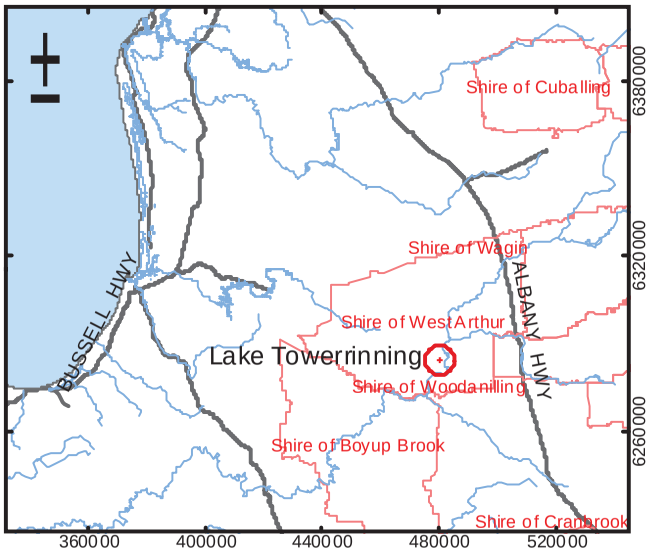
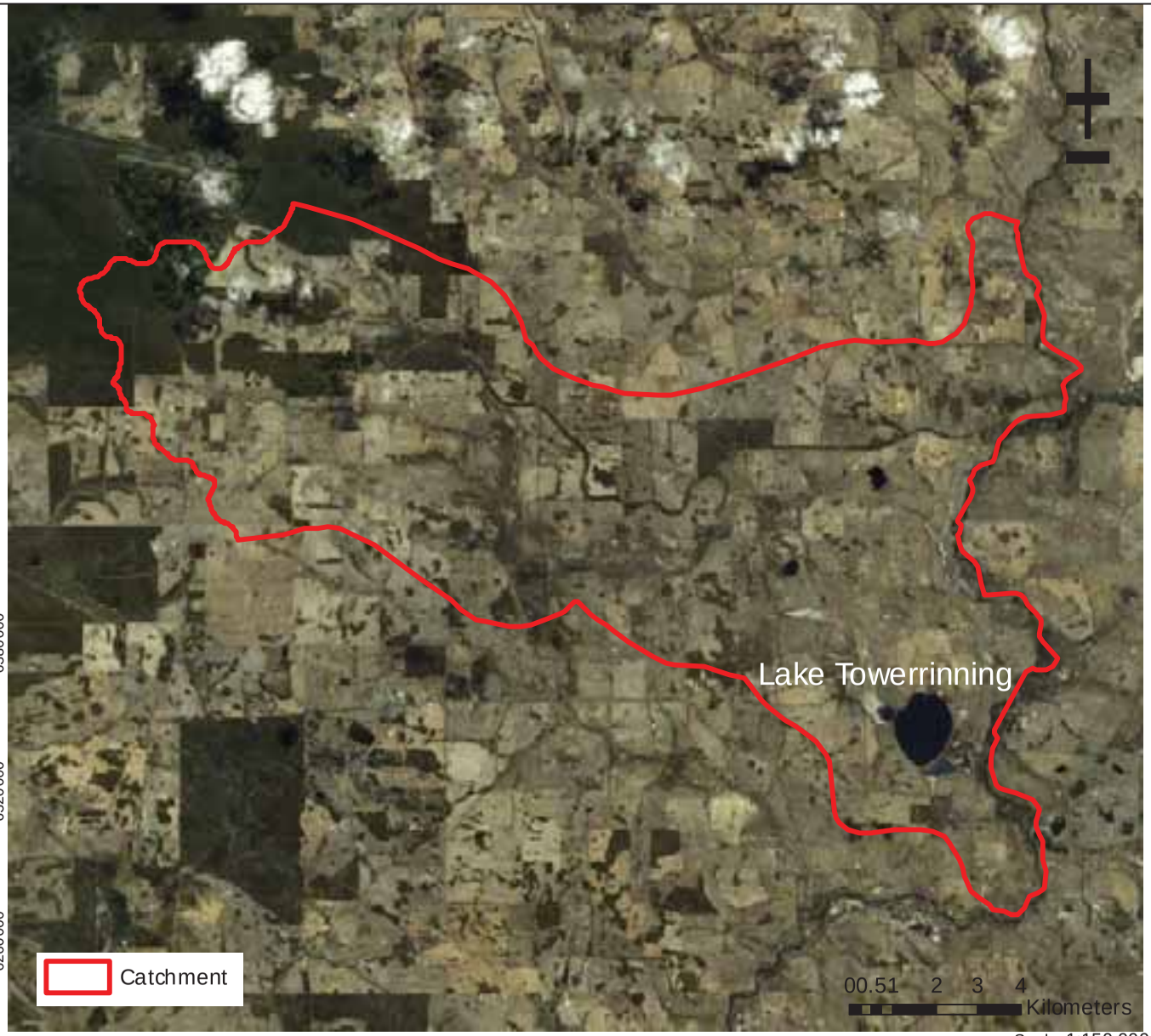
Living Lakes Stage 1 Feasibility Study: Part 2
Figure 1.1: Lake Volume vs Salinity Graph

10.1.2





Scale: 1:150,000

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Figure 3.1: Lake Towerrinning Location Map and Catchments

10.1.2

Job No. J4905
Scale:1:60,000
0 0.5 1 2 3 4 Kilometers

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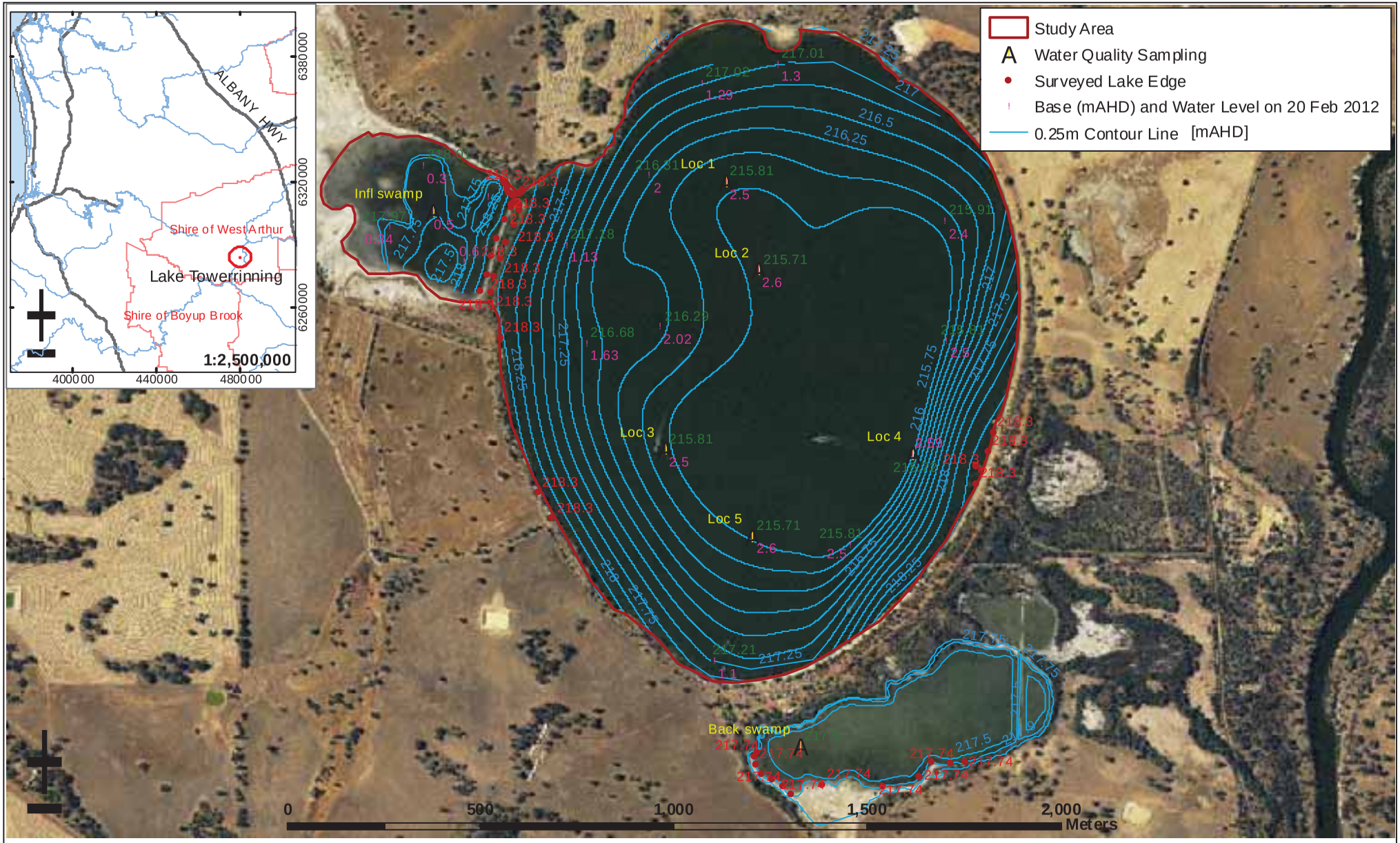
Living Lakes Feasibility Study Stage 1: Part 2:

Figure 3.2: Lake Towerrinning Land Ownership



Data Source: JDA Survey on 20 Feb 2012, JBA Surveys (2012).

Job No. J4905
Scale: 1:13,500

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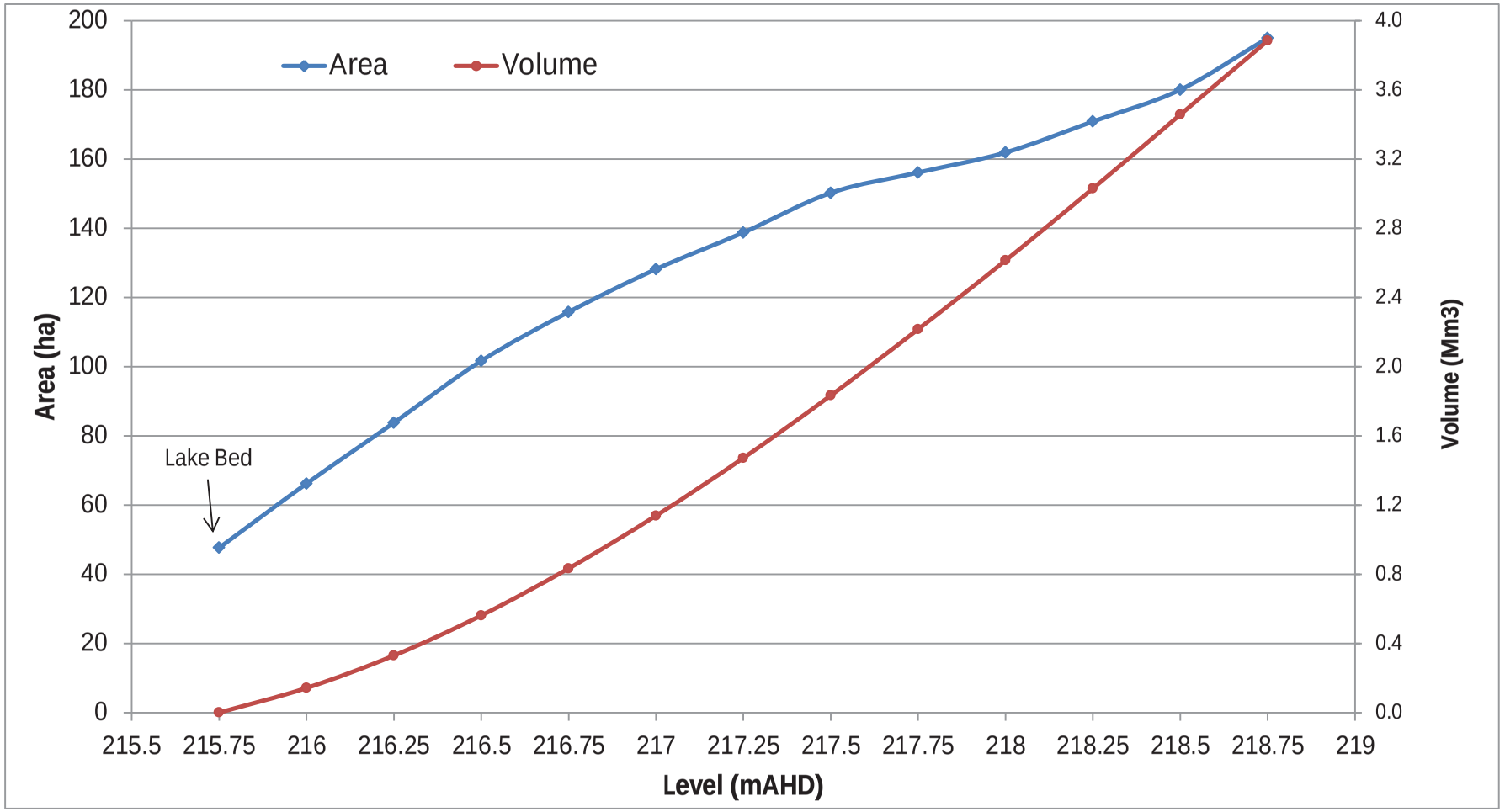
Living Lakes Stage 1 Feasibility Study - Wheatbelt and Adjoining Regions Part 2

Figure 3.3: Lake Towerrinning: Lake & Bed Sampling Locations & Contours

10.1.2



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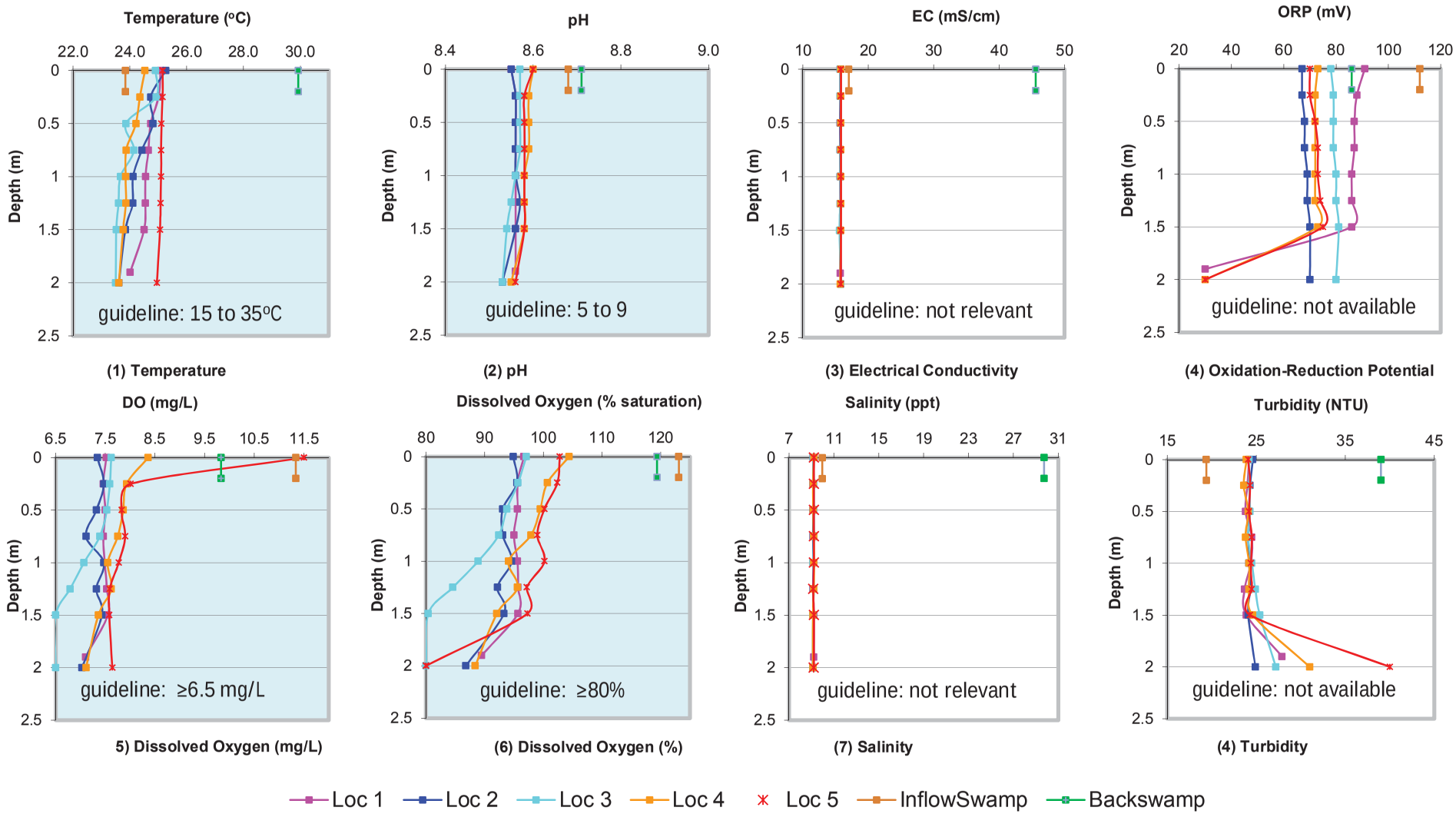
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 3.4 Lake Towerrinning: Lake Bathymetry (Existing)



Notes:

1. Refer to Figure 3.3 for sampling locations

2. Guidelines refer to ANZECC & ARMCANZ (2000) Guidelines for recreational water quality & aesthetic

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Living Lakes Stage 1 Feasibility Study - Wheatbelt and Adjoining Regions Part 2

Figure 3.5: Lake Towerrinning Water Quality Profiling

10.1.2

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0 0.4 0.8 1.6 2.4 3.2 Kilometres

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Figure 3.6: Lake Towerrinning Land Survey Locations

10.1.2

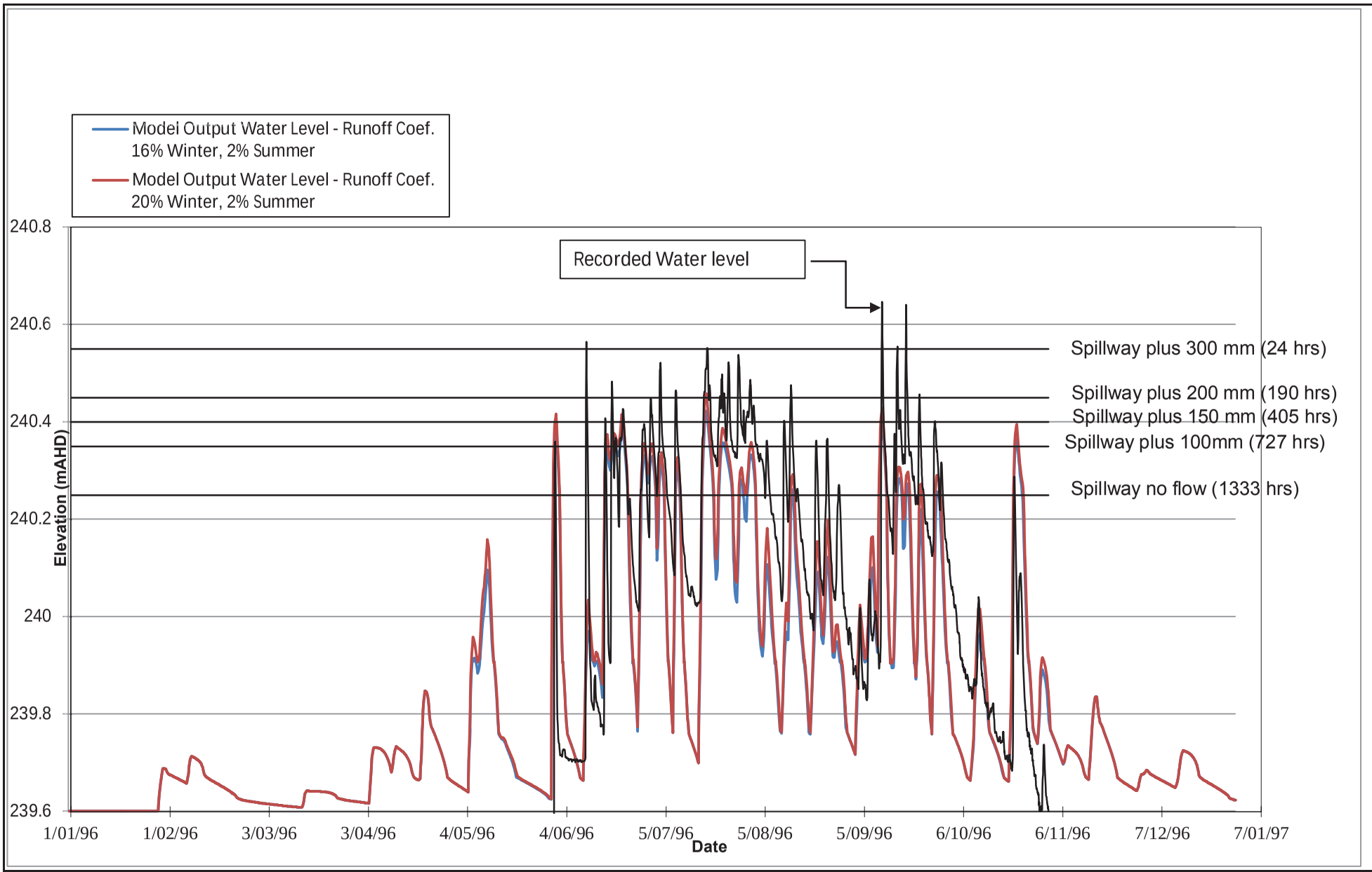

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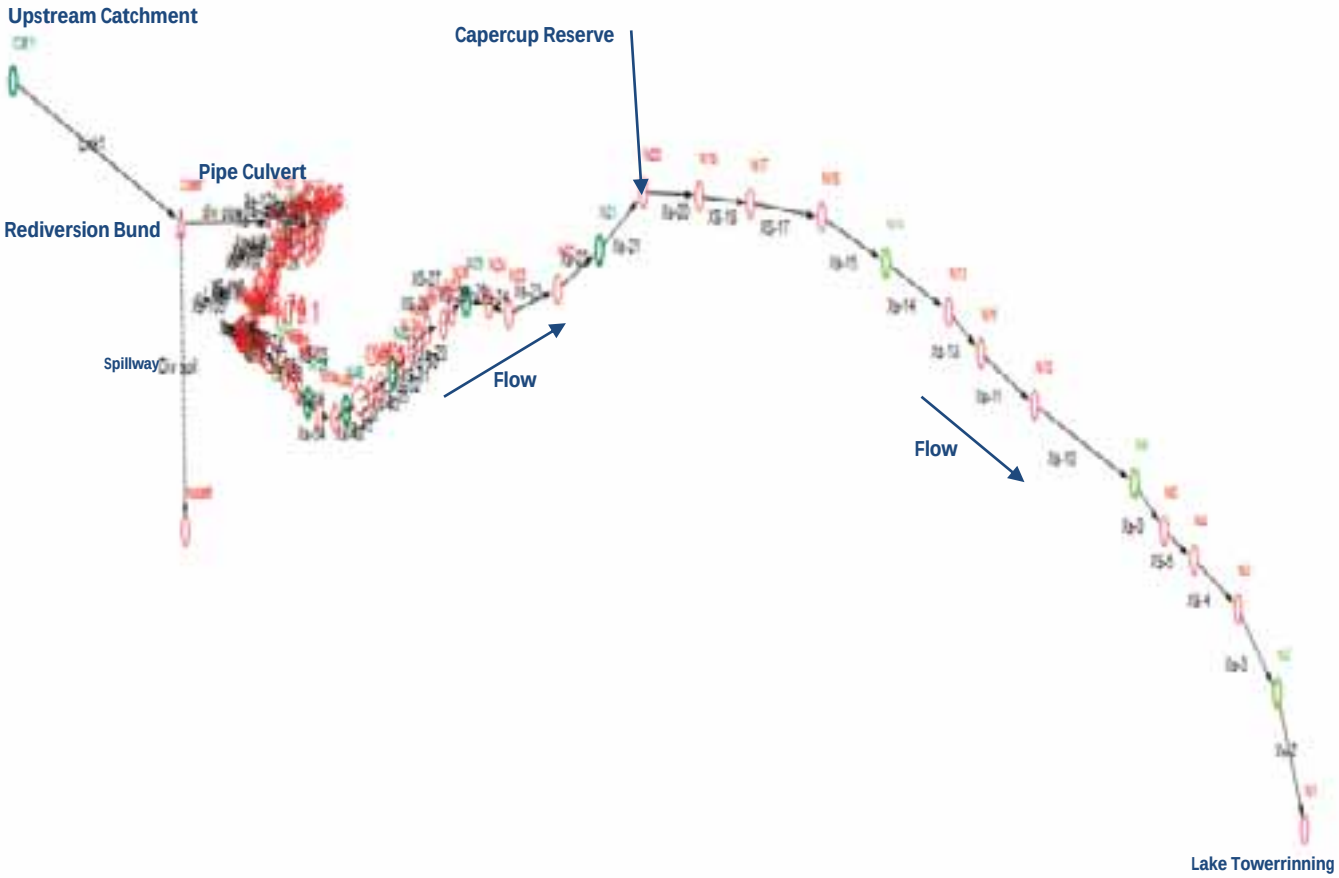
Figure 3.7 Rediversion Structure Water Level Data 1996: XP Model Calibration



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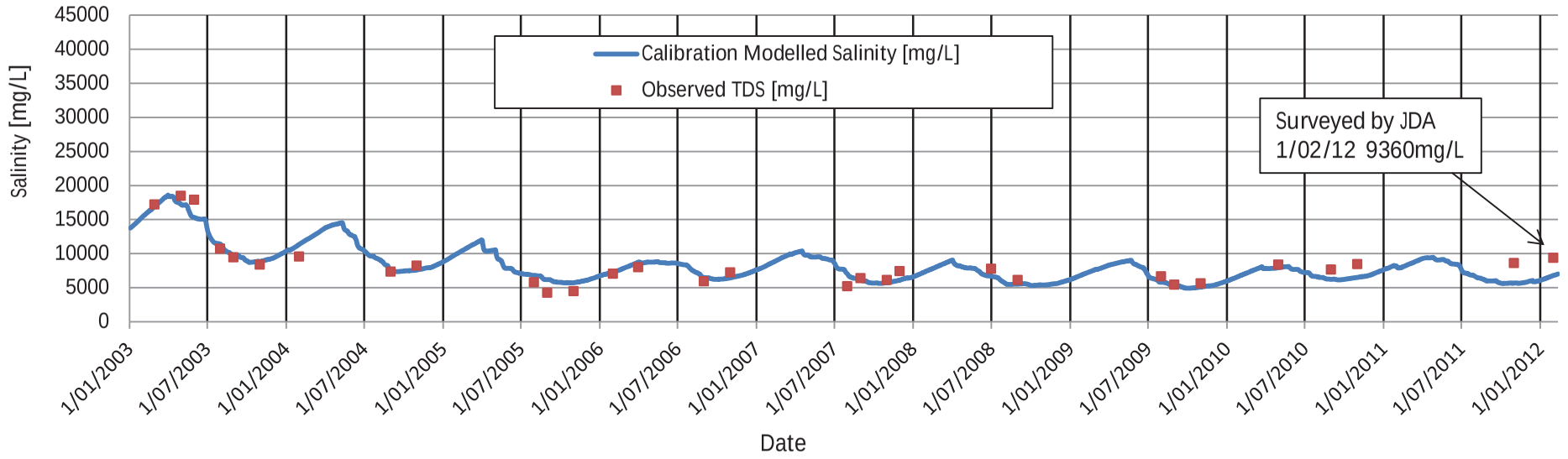
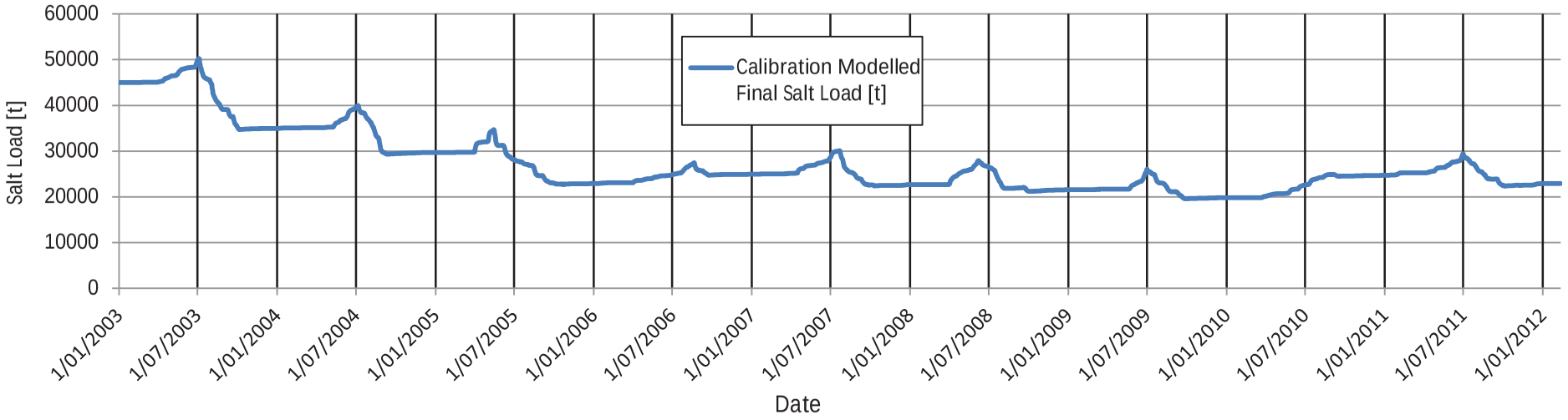
Living Lakes Feasibility Study Stage 1: Part 2

Figure 3.8: Lake Towerrinning : Long-section Between Rediversion structure and Lake Towerrinning





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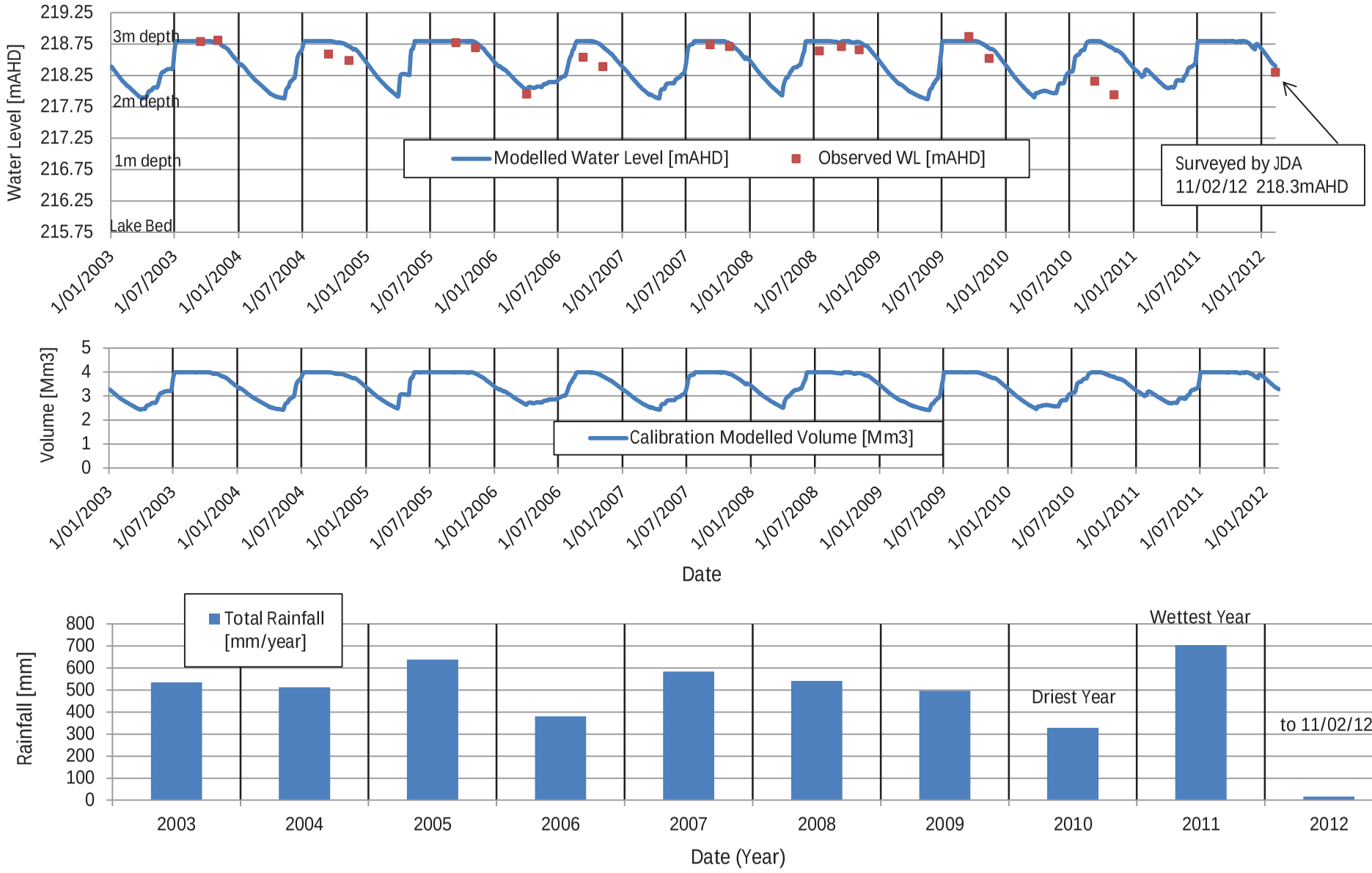
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 3.9a Lake Towerrinning: Daily Salt Balance - Calibration

10.1.2



Job No: J4905

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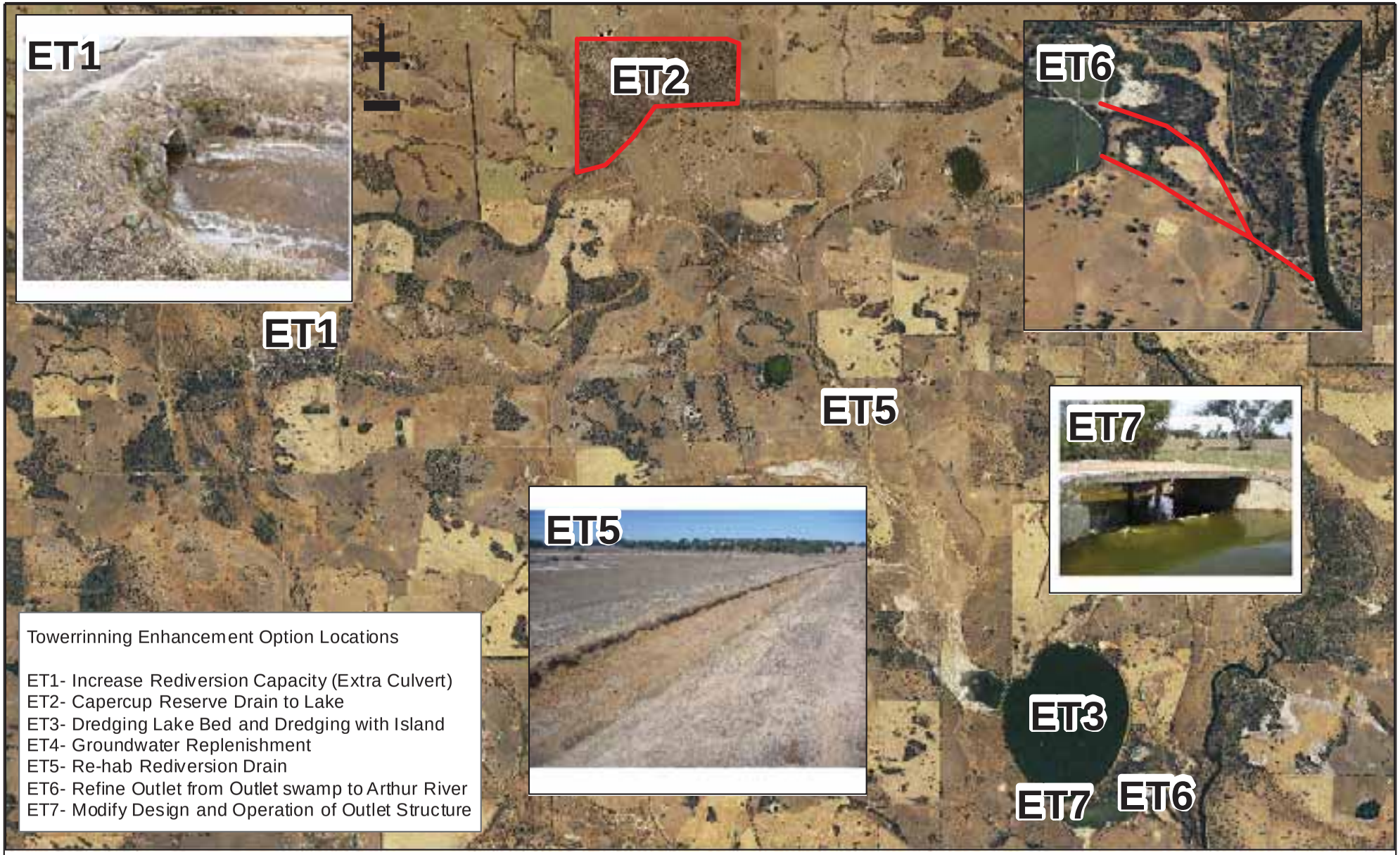
Living Lakes Feasibility Study Stage 1: Part 2 Report

Figure 3.9b Lake Towerrinning: Daily Water Balance - Calibration



Data Source:

Job No. J4905

0 500 1,000 1,500 2,000 Meters

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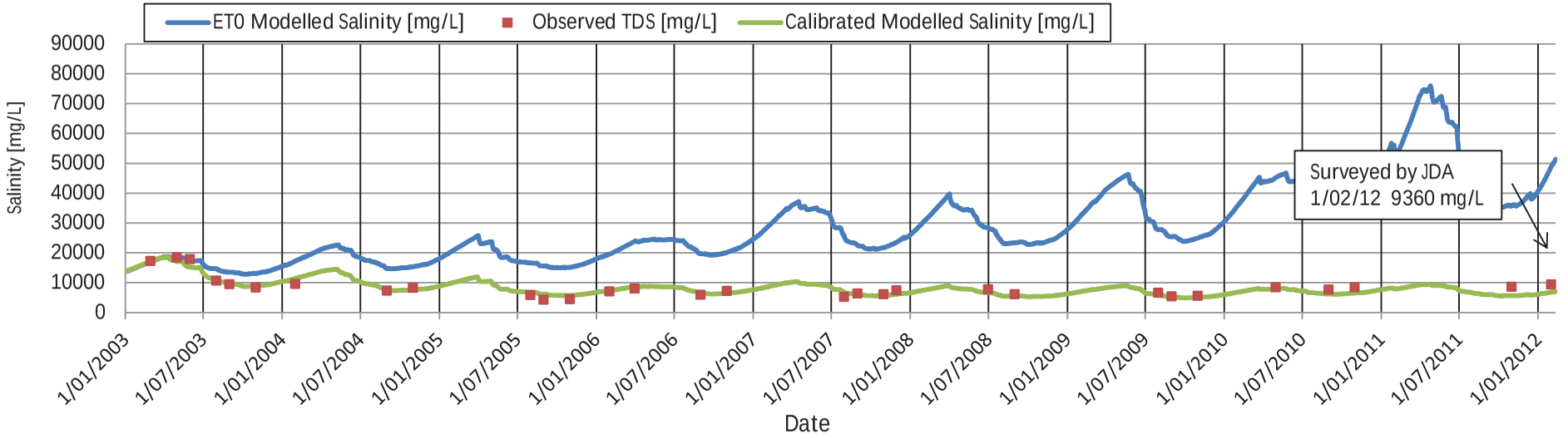
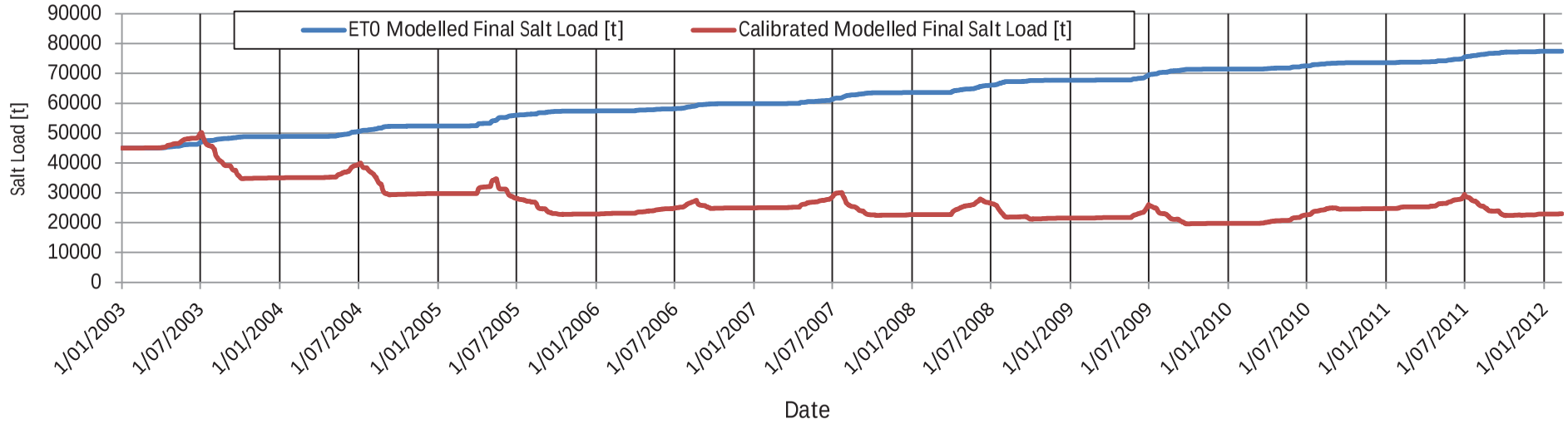
Living Lakes Feasibility Study Stage 1: Part 2

Figure 3.10: Lake Towerrinning Enhancement Option Locations

10.1.2





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Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 3.11a: Lake Towerrinning: Daily Salt Balance - ET0

10.1.2

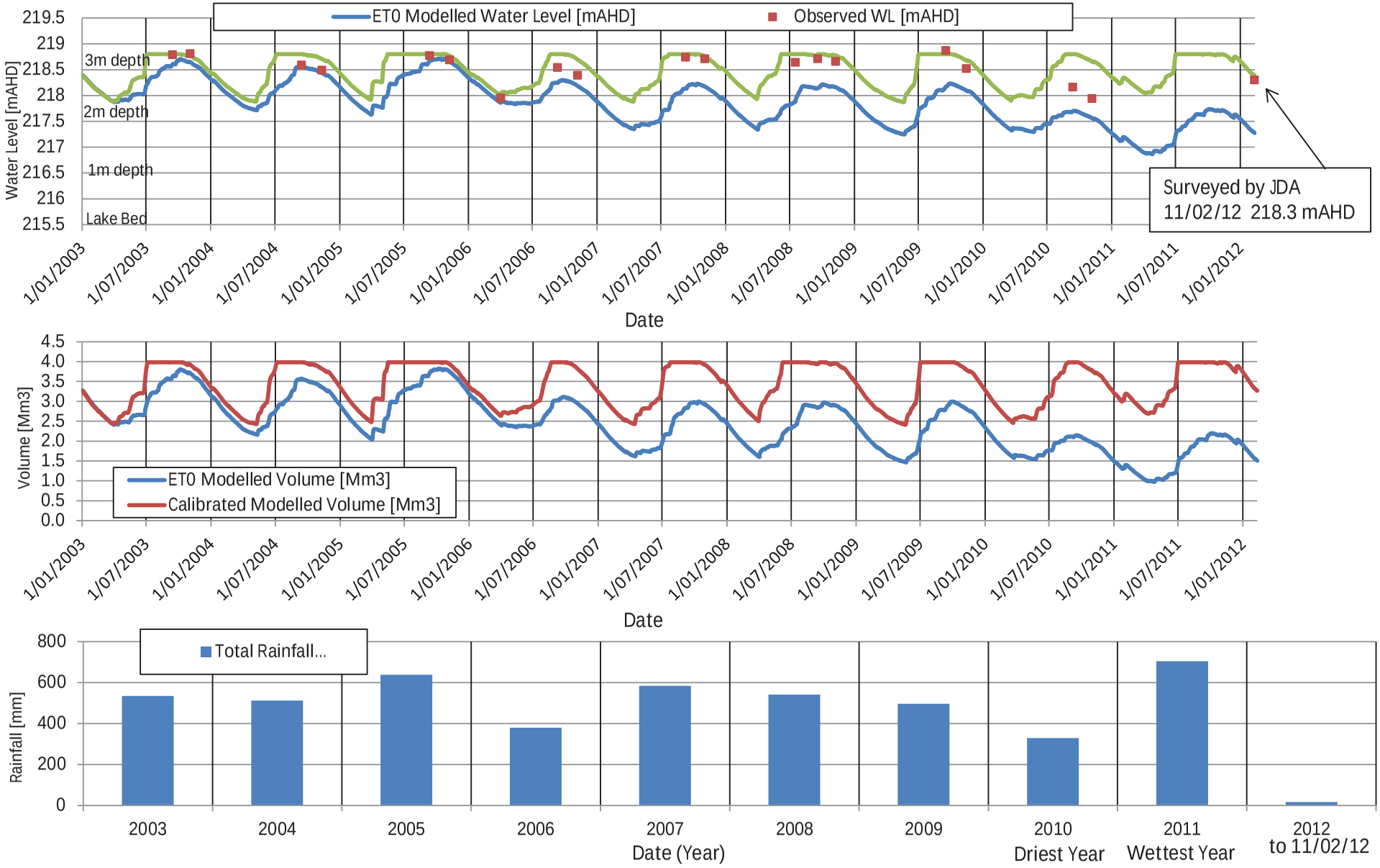

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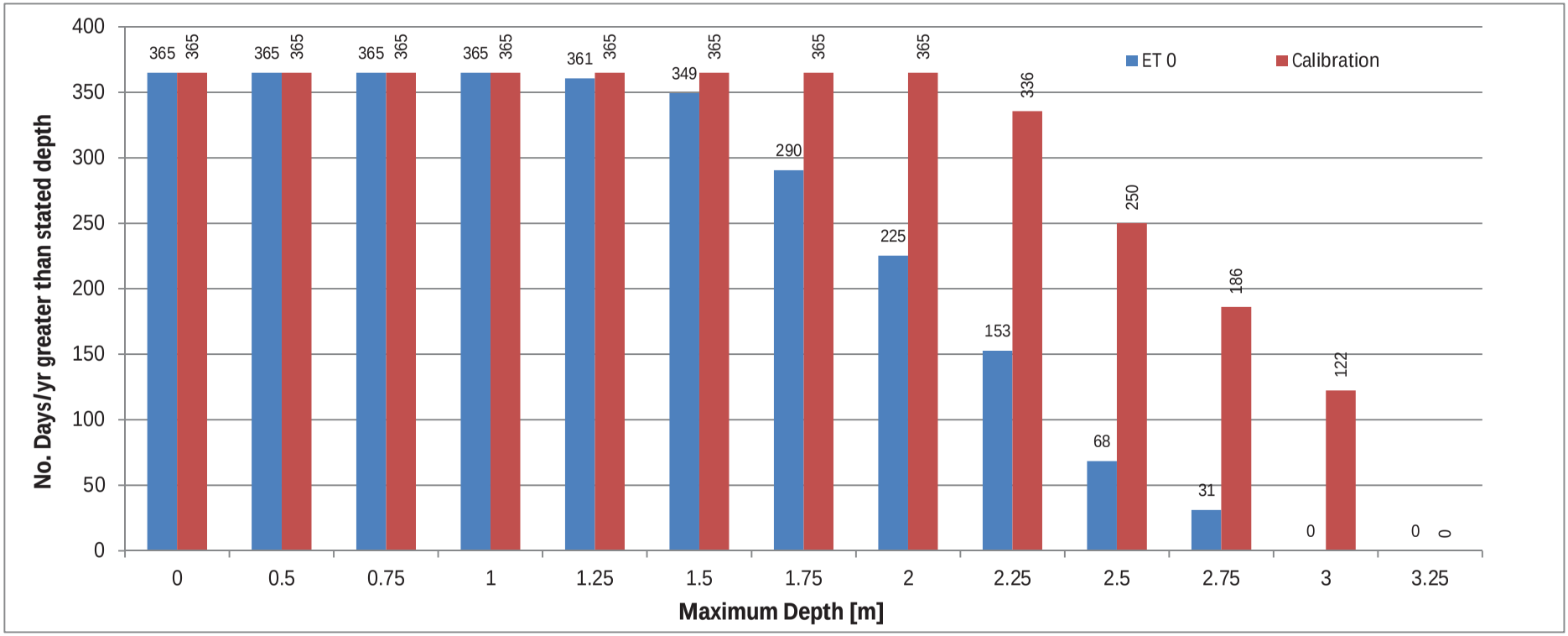
Figure 3.11b: Lake Towerrinning: Daily Water Balance - ET0



e.g. No of days/yr > 2.5 m depth = 68 days as per ET 0

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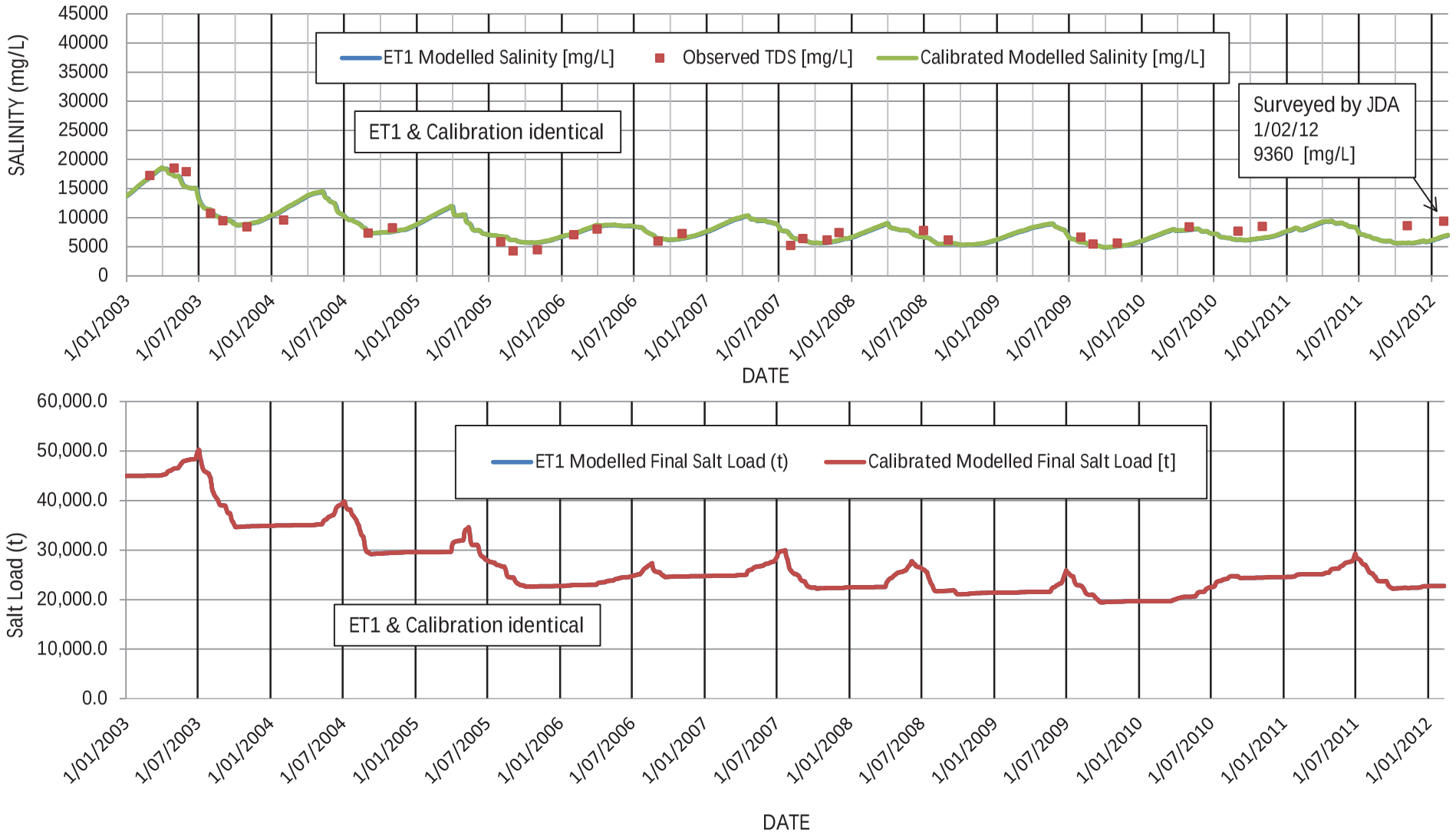
Living Lakes Feasibility Study Stage 1: Part 2
Figure 3.11c Effect on lake depth ET0

10.1.2



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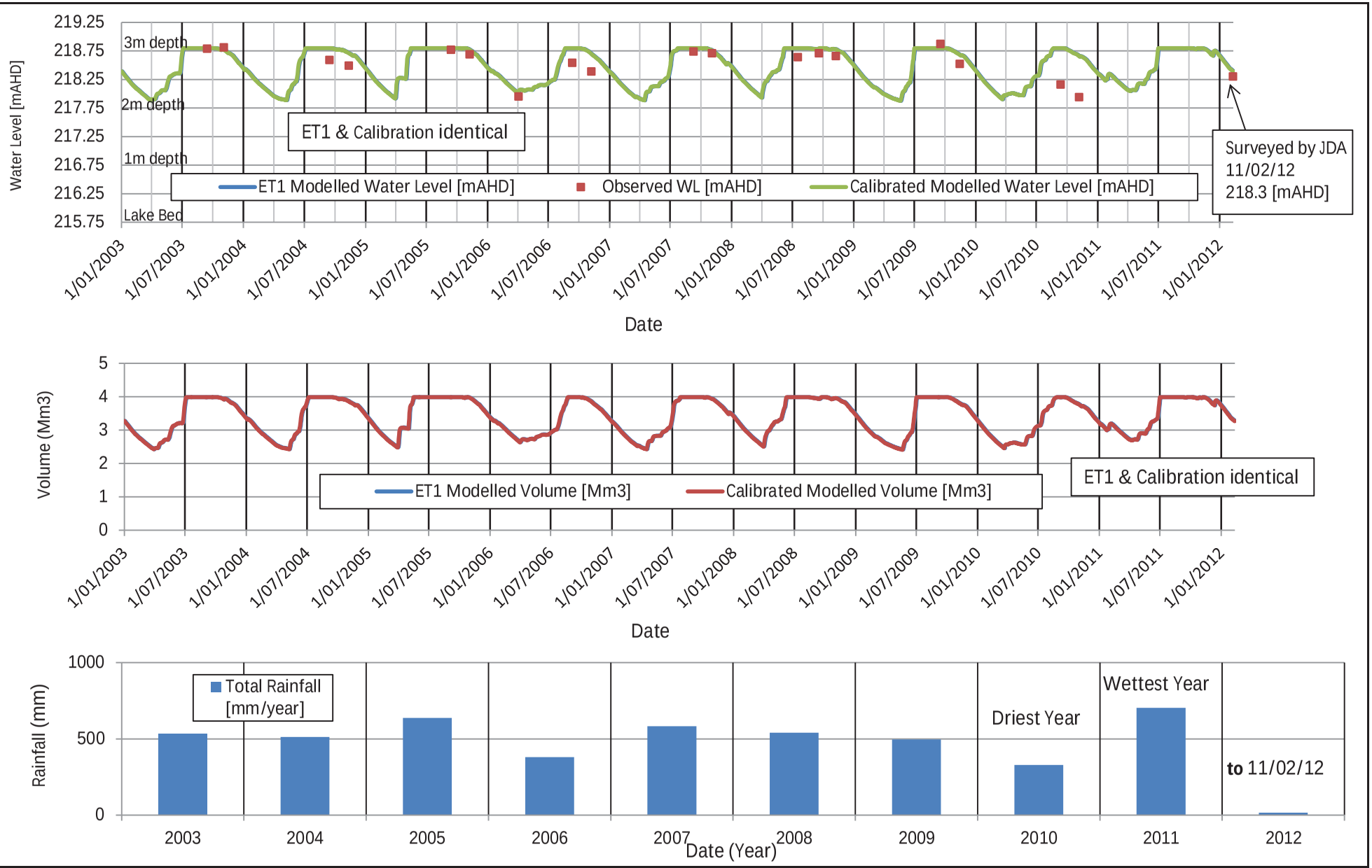
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 3.12a: Lake Towerrinning Daily Salt Balance - ET1



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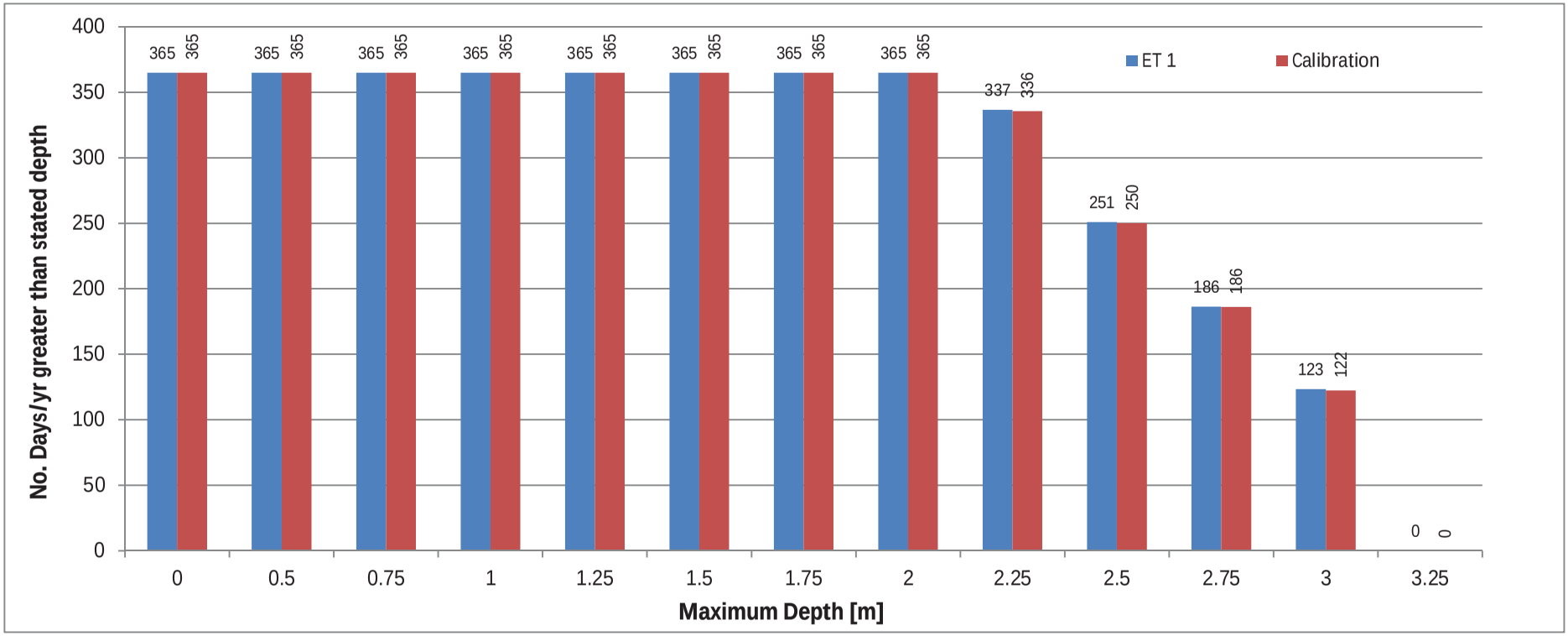
Living Lakes Feasibility Study Stage 1: Part 2 Report

Figure 3.12b: Lake Towerrinning Daily Water Balance - ET1

10.1.2



e.g. No of days/yr > 2.5 m depth = 251 days as per ET 1

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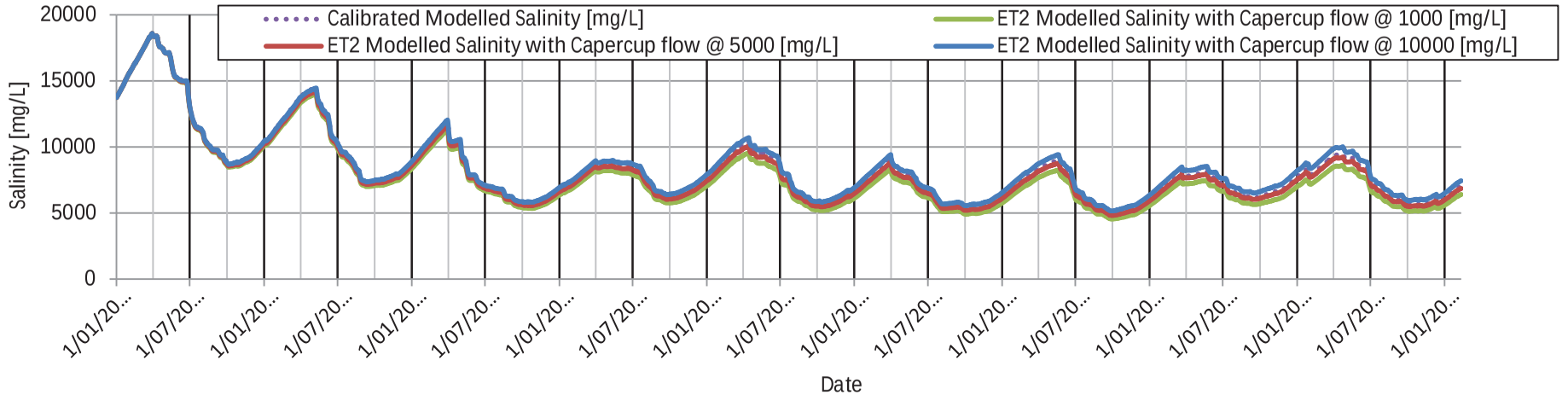
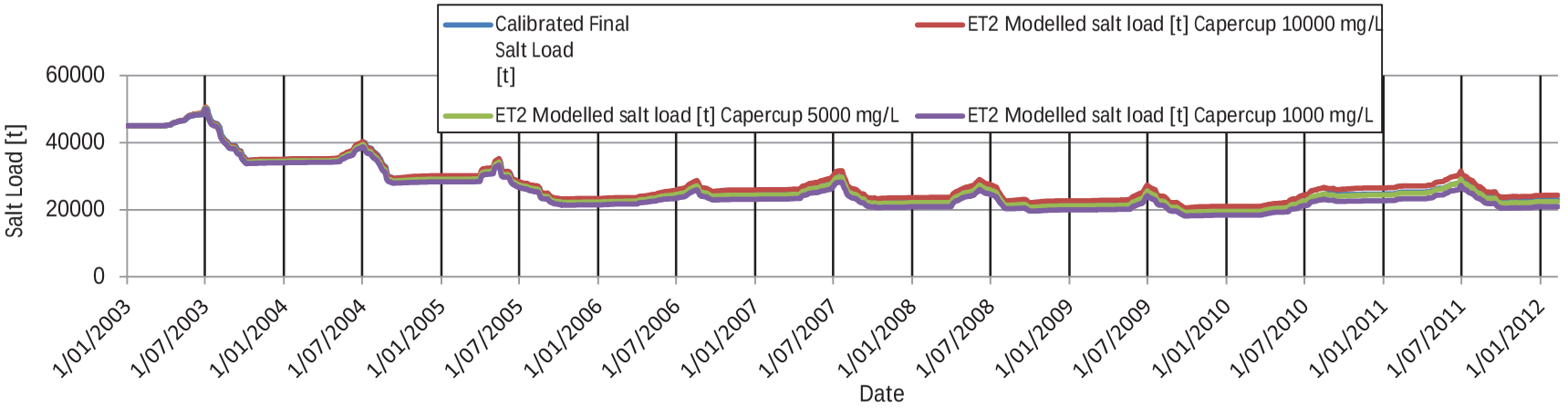
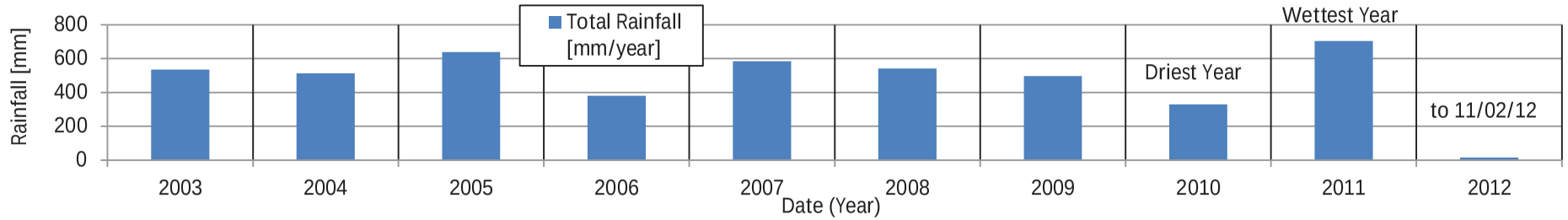
Living Lakes Feasibility Study Stage 1: Part 2
Figure 3.12c: Effect on lake depth - ET1

10.1.2







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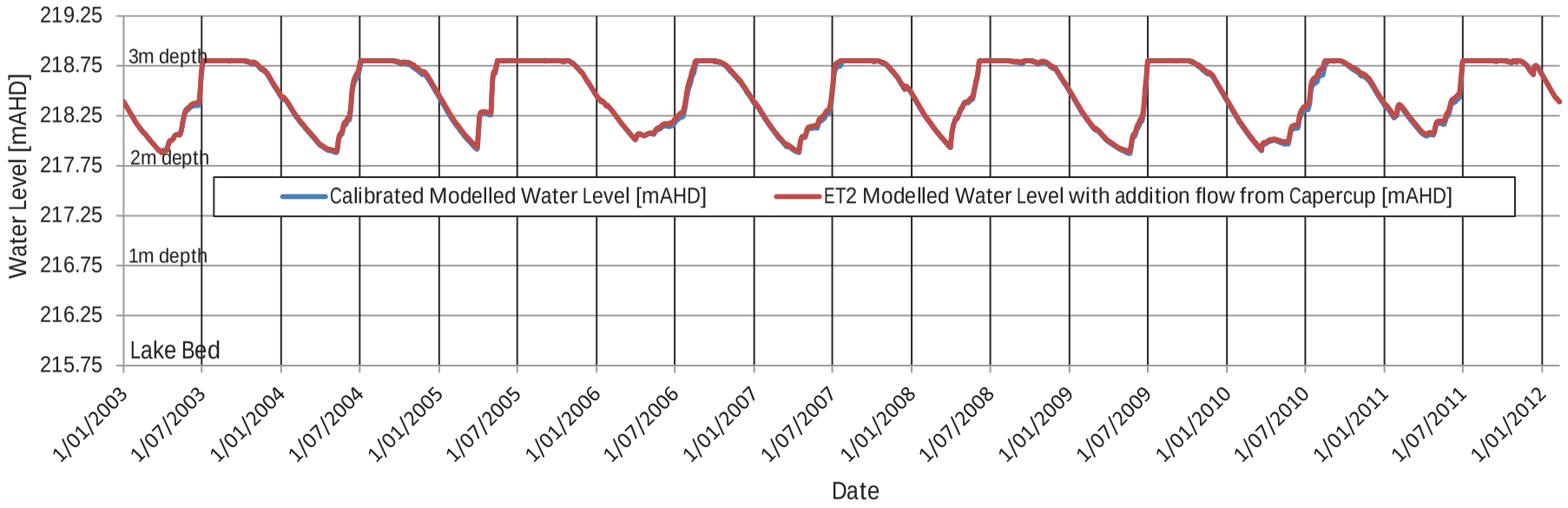
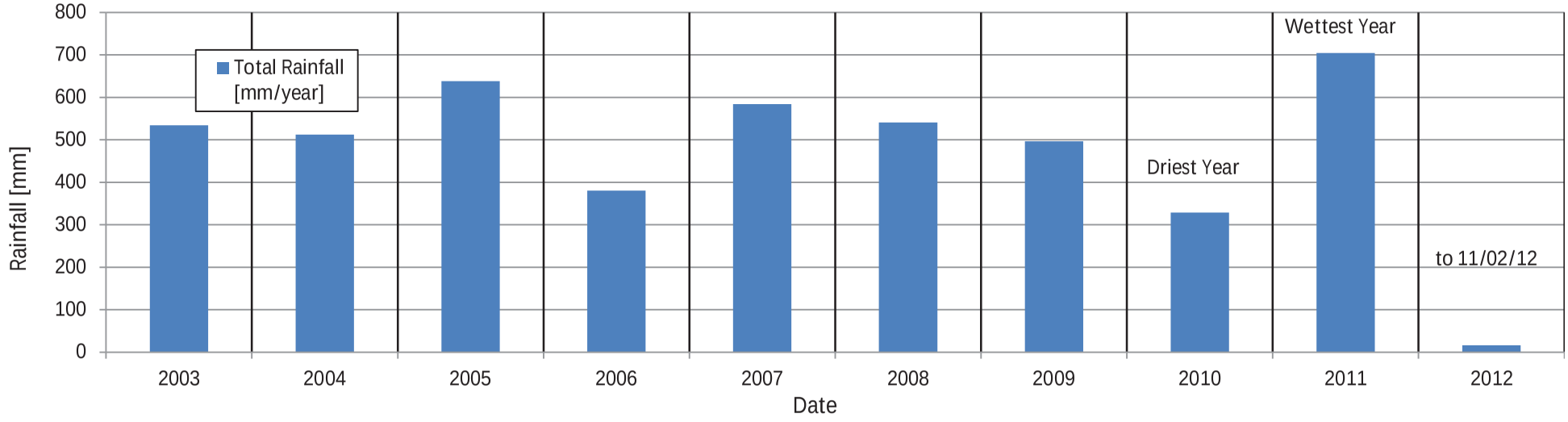
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 3.13a Lake Towerrinning: Daily Salt Balance - ET2

10.1.2





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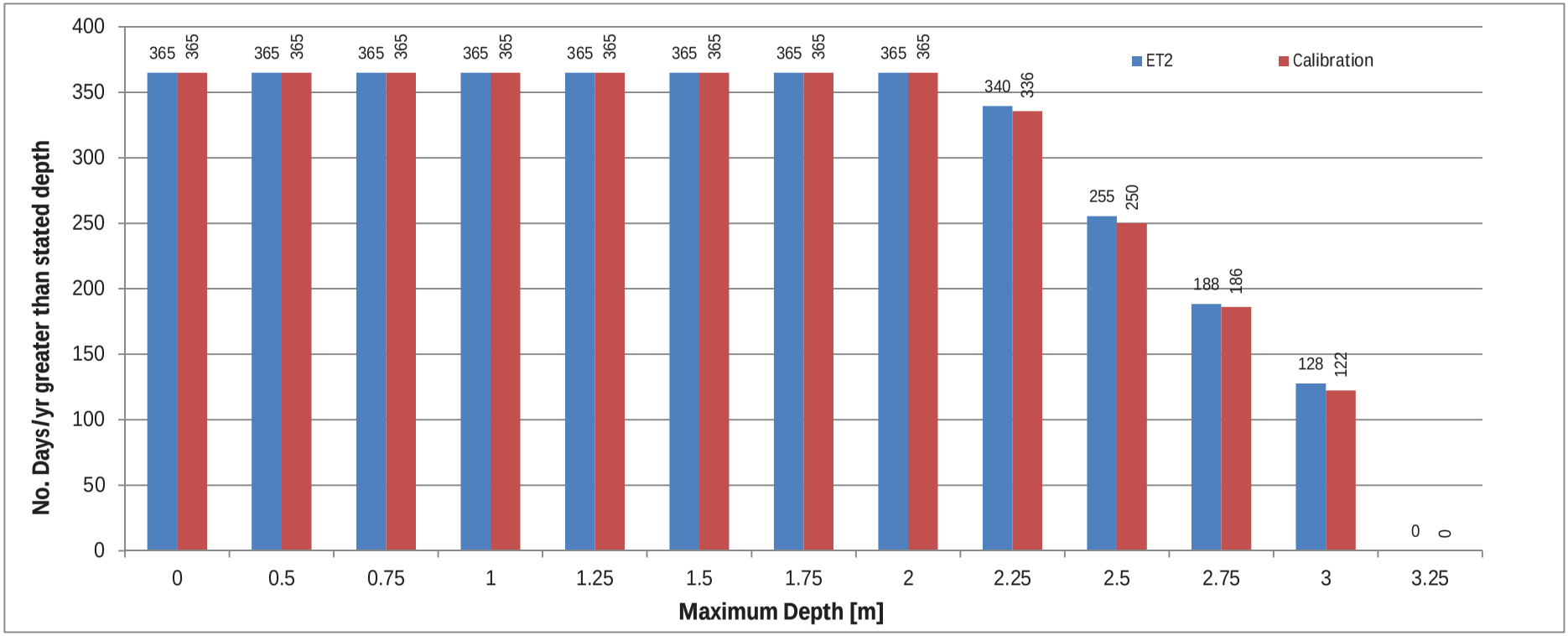
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 3.13b Lake Towerrinning Daily Water Balance - ET2

10.1.2



e.g. No of days/yr > 2.5 m depth = 255 days as per ET2

Job No: 4905

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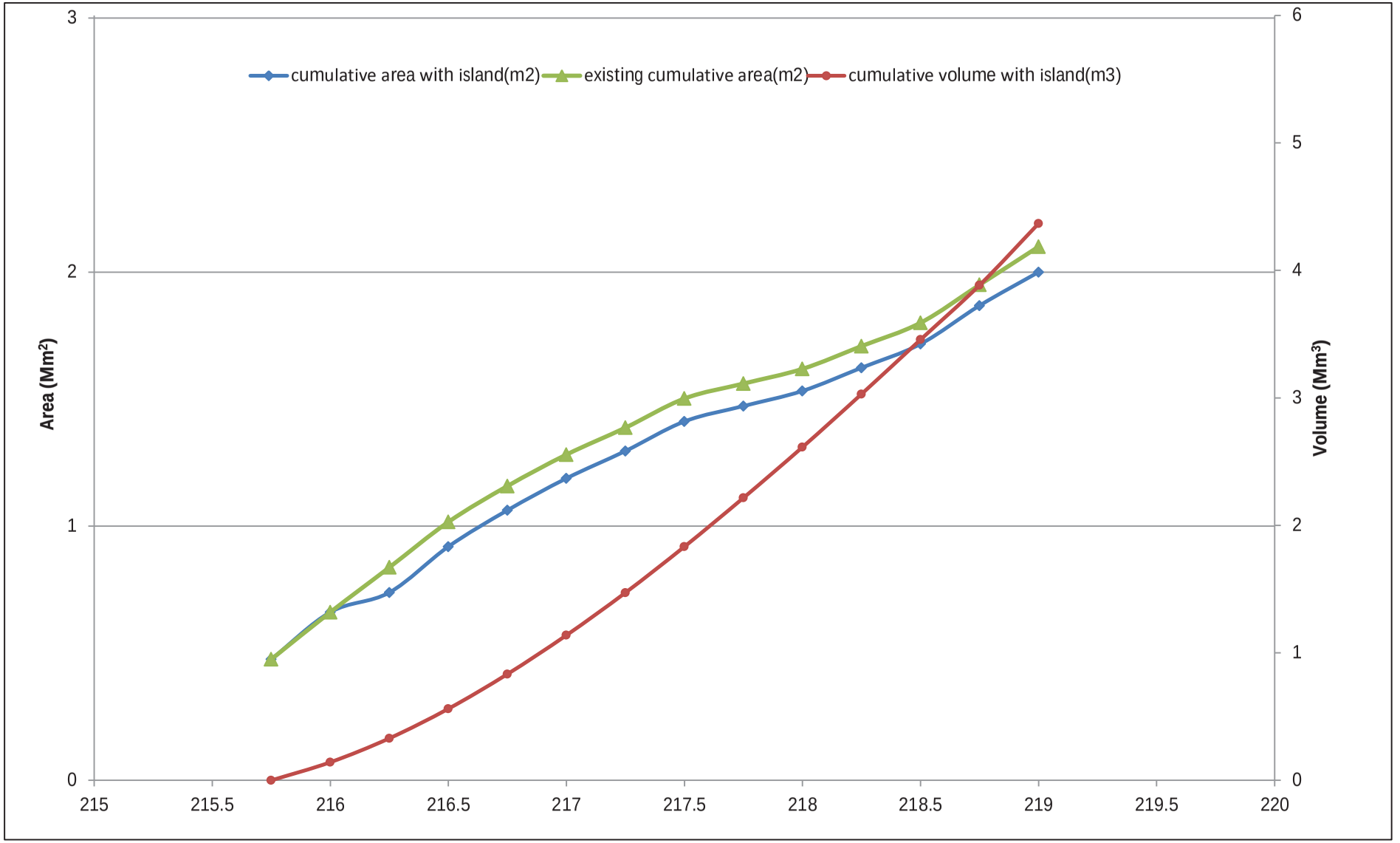
Living Lakes Feasibility Study Stage 1: Part 2
Figure 3.13c: Effect on lake depth - ET2



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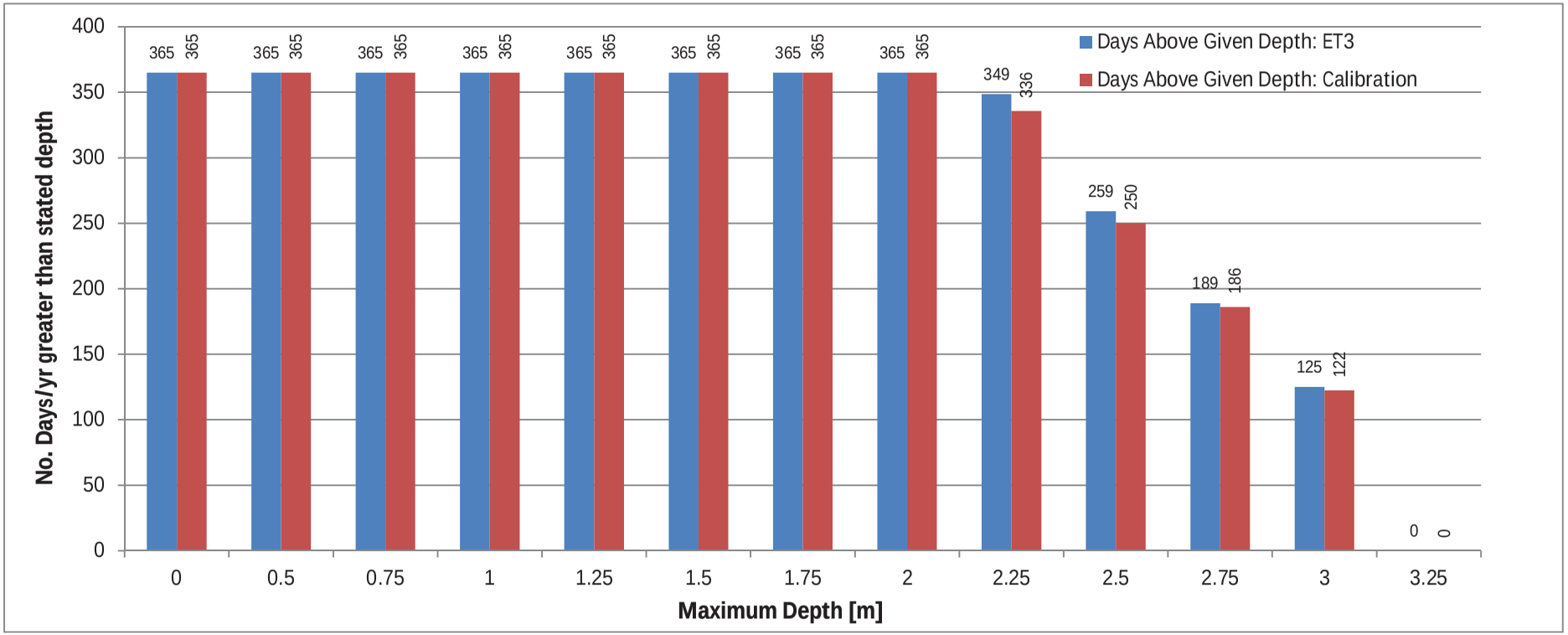
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 3.14 Lake Towerrinning: Lake Bathymetry - ET3

10.1.2

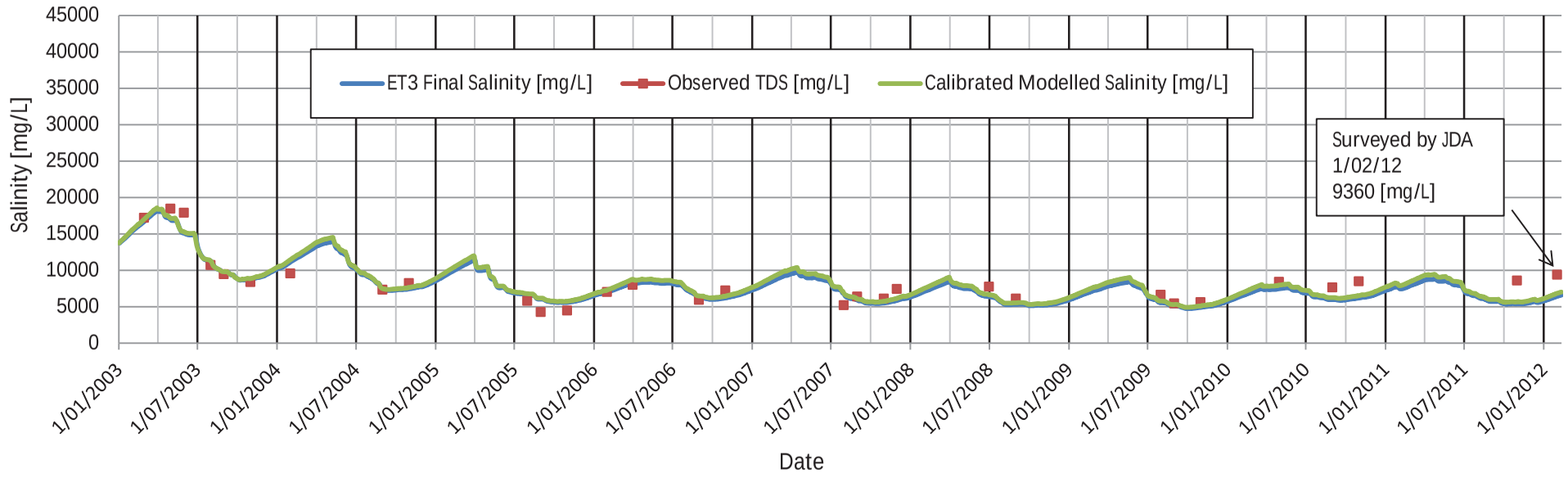


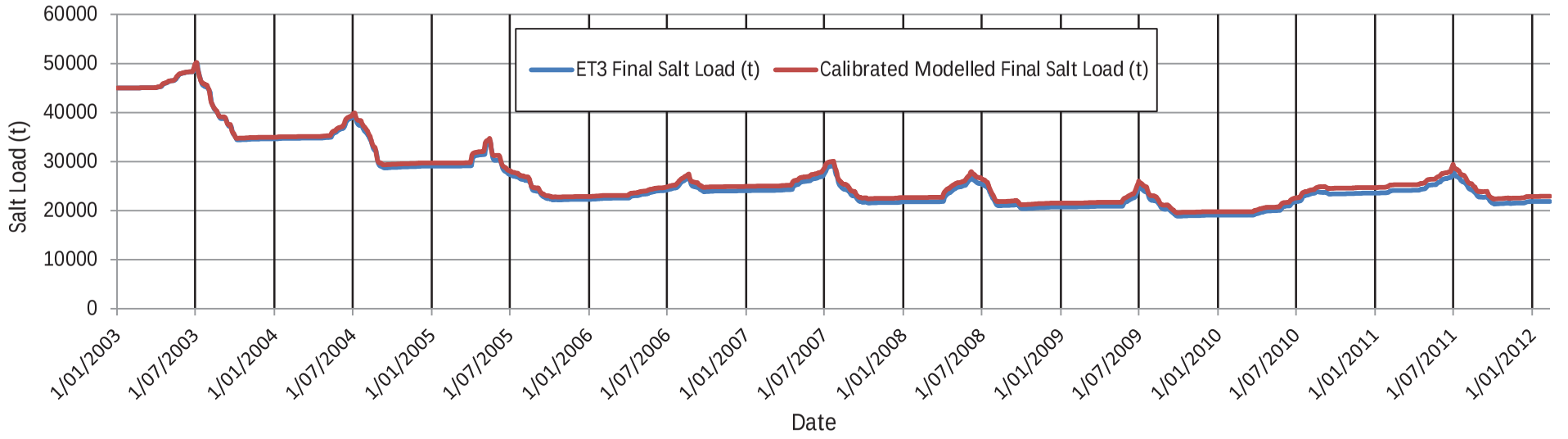
e.g. No of days/yr > 2.5 m depth = 259 days as per ET3

Job No: J4905

Department of Regional Development and Lands
Living Lakes Feasibility Study Stage 1: Part 2
Figure 3.15: Effect on lake depth - ET3

10.1.2





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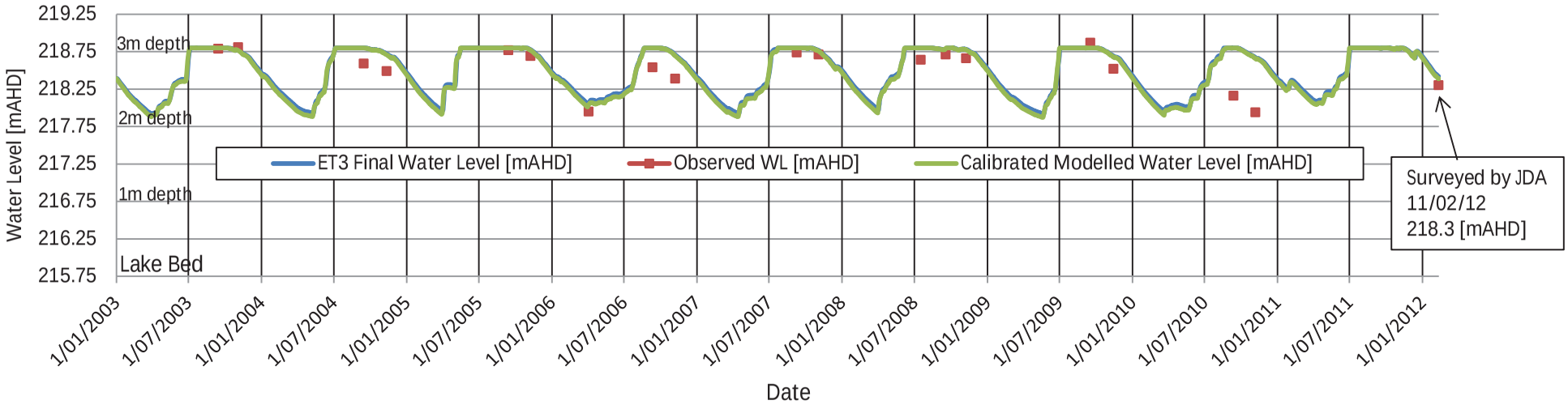
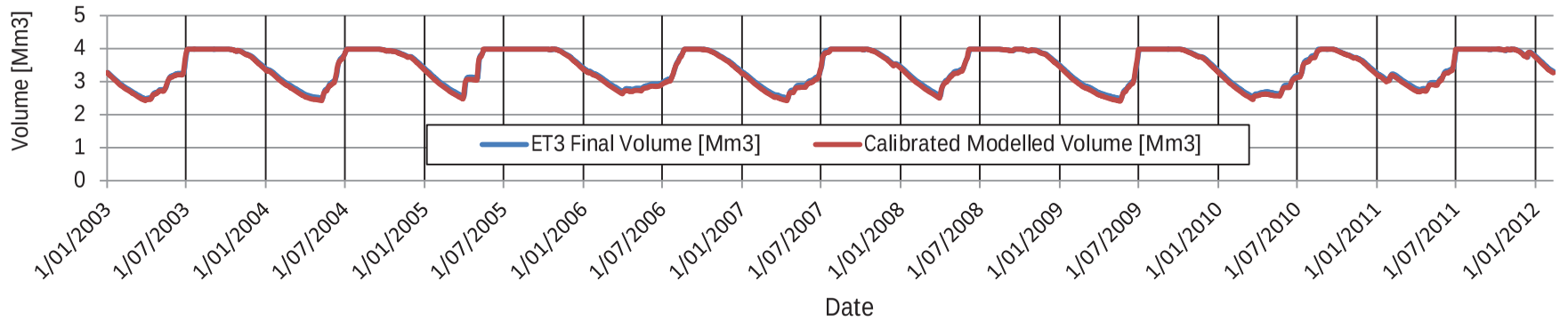
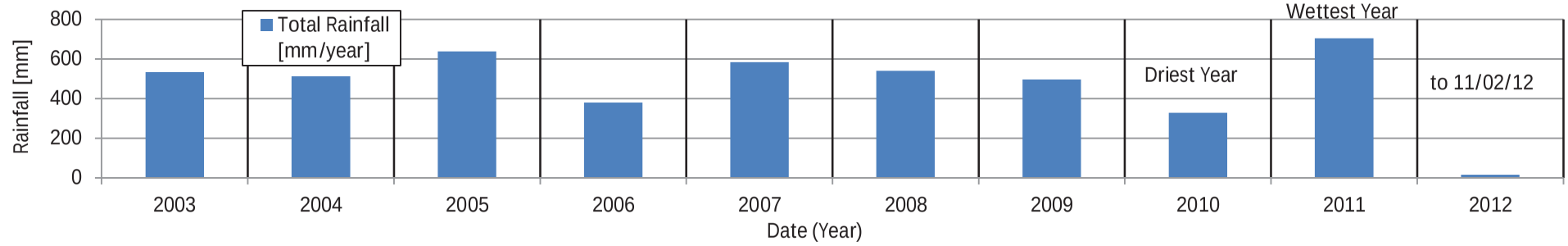
Job No: J4905

Dept of Regional Development and Lands
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 3.16a Lake Towerrinning: Daily Salt Balance - ET3

10.1.2







Job No: J4905

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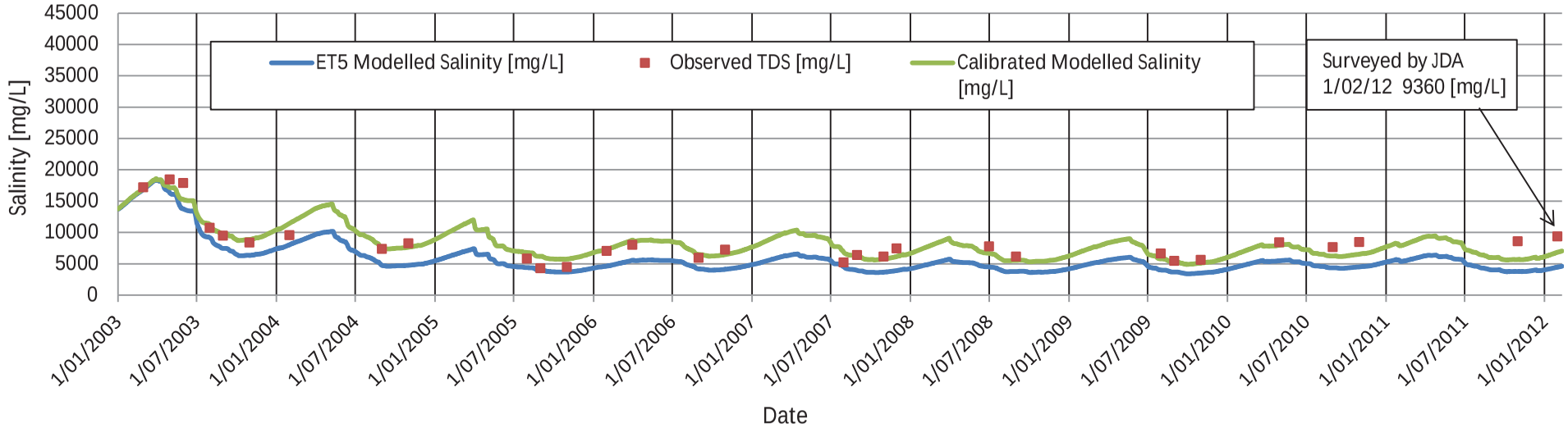
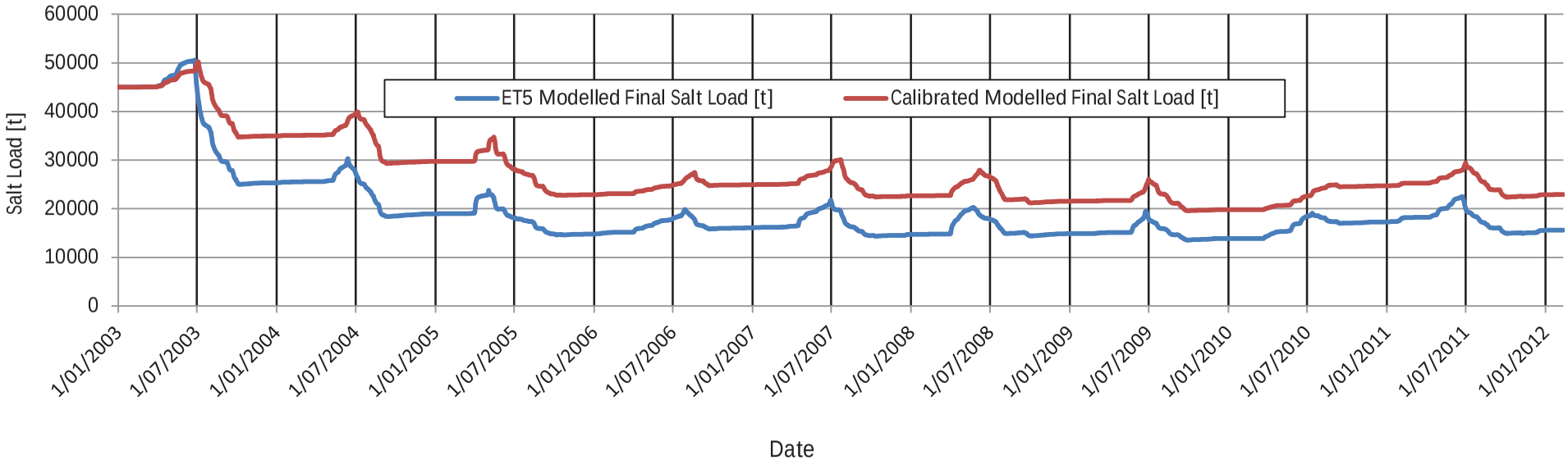
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 3.16b Lake Towerrinning: Daily Water Balance - ET3

10.1.2





Job No: J4905

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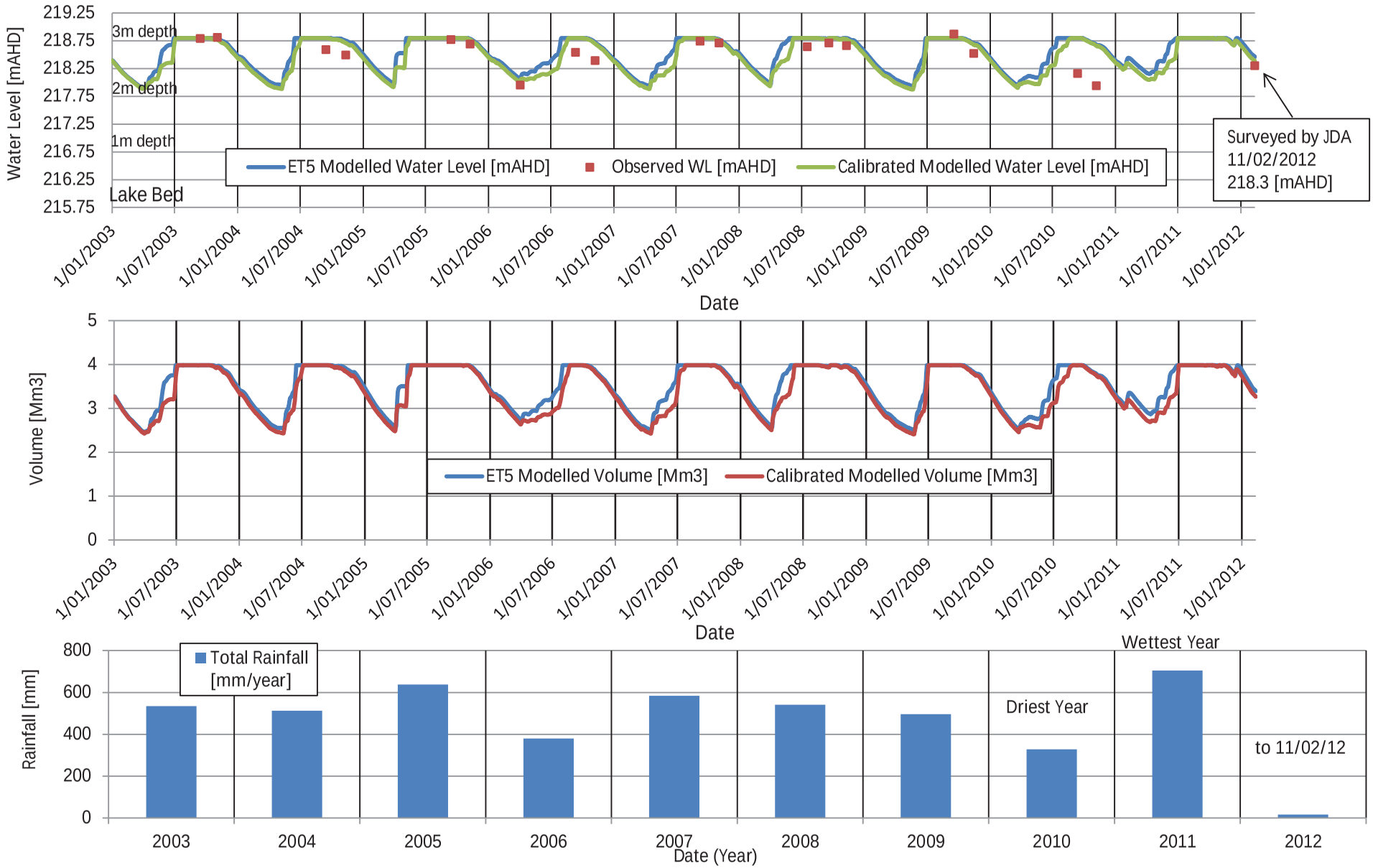
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 3.17a Lake Towerrinning: Daily Salt Balance - ET5

10.1.2



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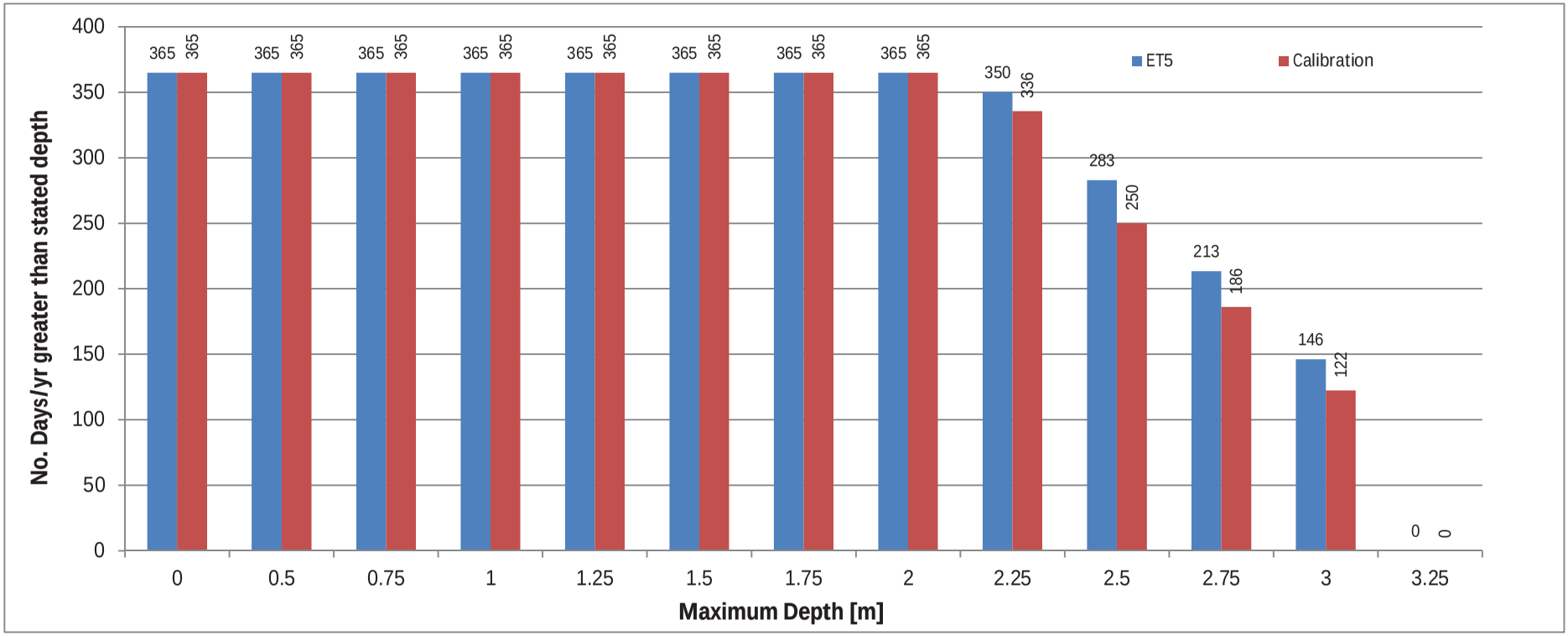
Living Lakes Feasibility Study Stage 1: Part 2 Report

Figure 3.17b Lake Towerrinning: Daily Water Balance - ET5

10.1.2



e.g. No of days/yr > 2.5 m depth = 283 days as per ET5

Job No: 4905

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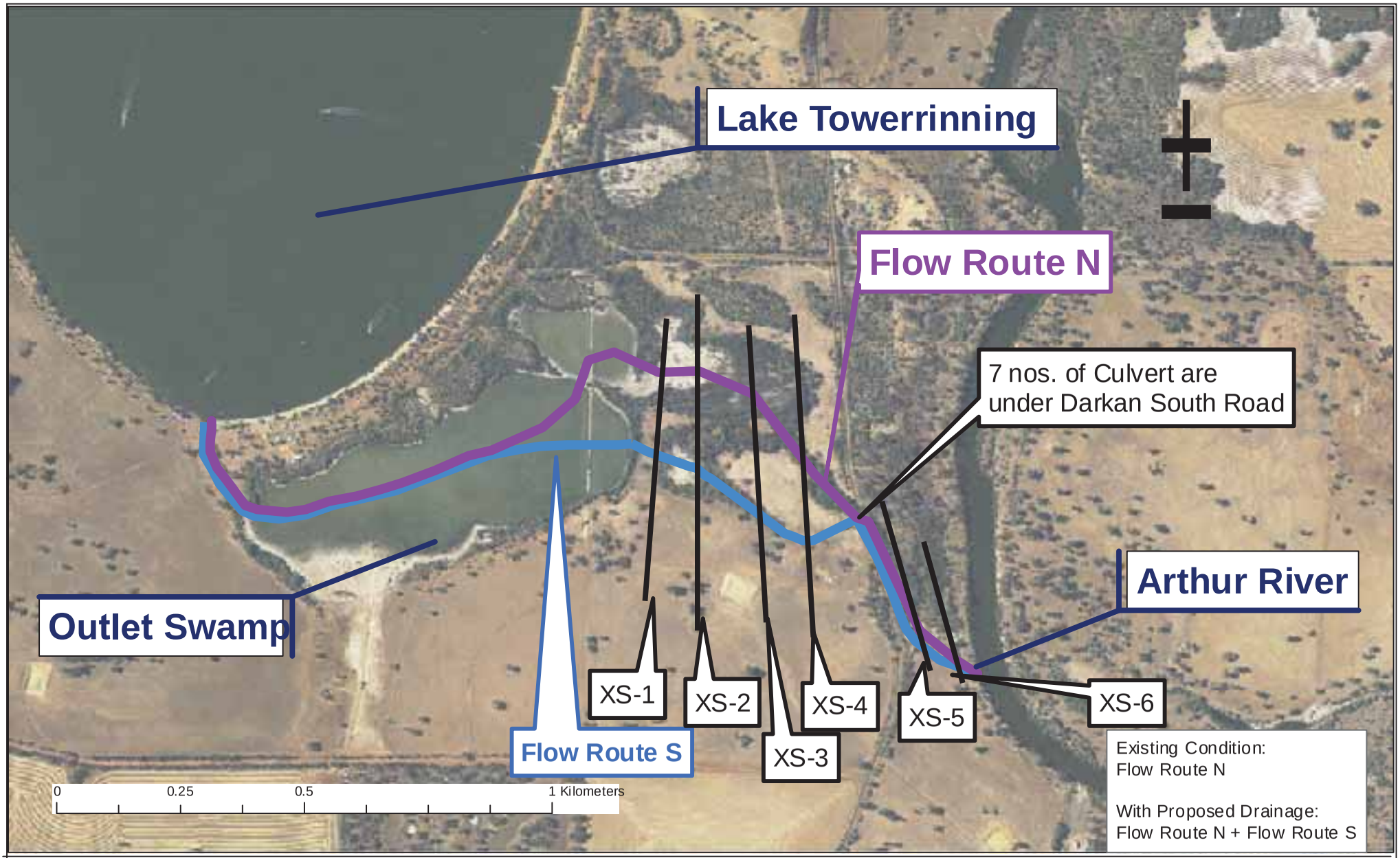
Living Lakes Feasibility Study Stage 1: Part 2
Figure 3.17c: Effect on lake depth - ET5

10.1.2



Job No. J4905

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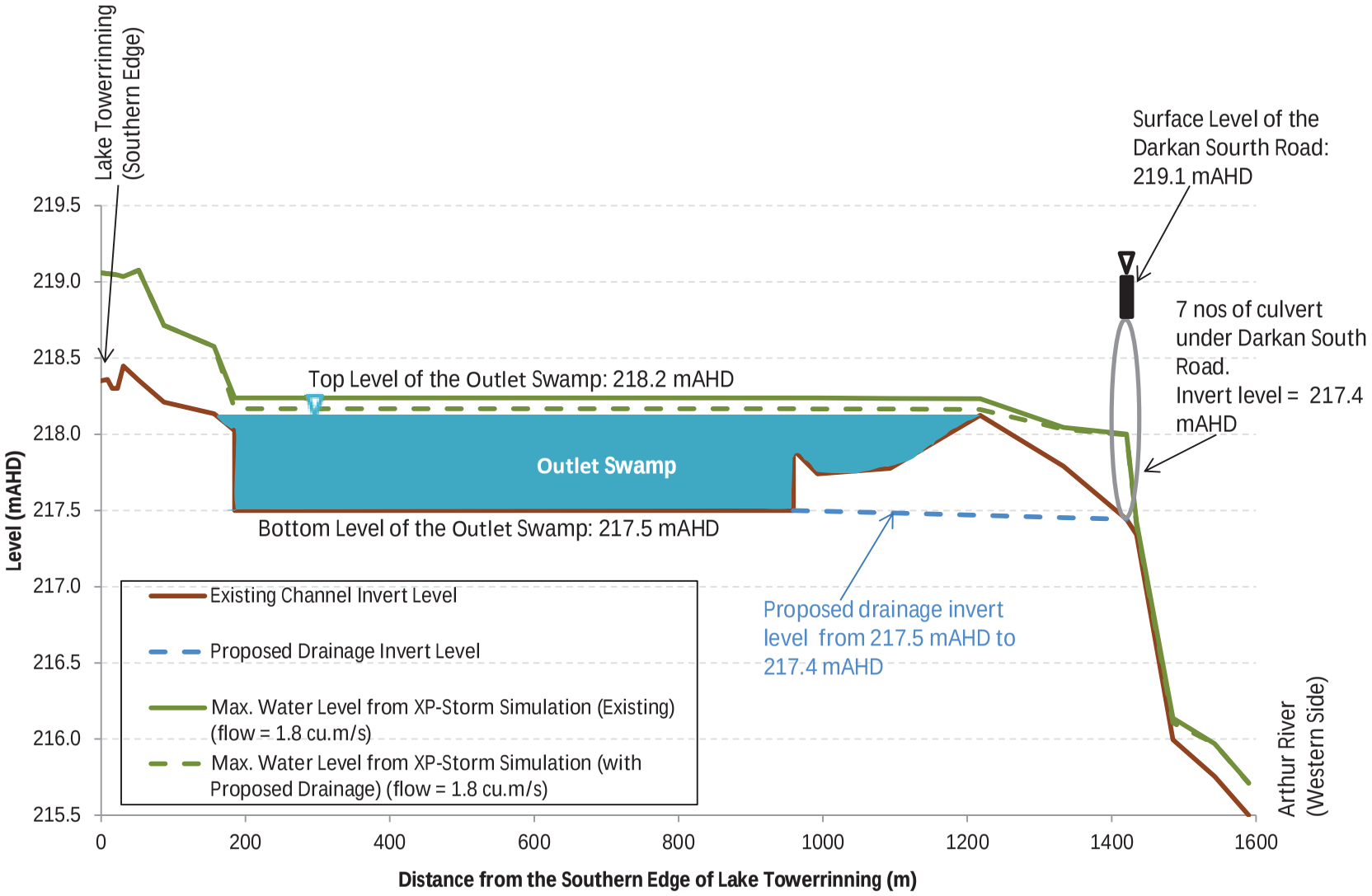
Living Lakes Feasibility Study Stage 1: Part 2: Report

Figure 3.18: Lake Towerrinning:Plan of refined outlet from Outlet Swamp- Arthur River

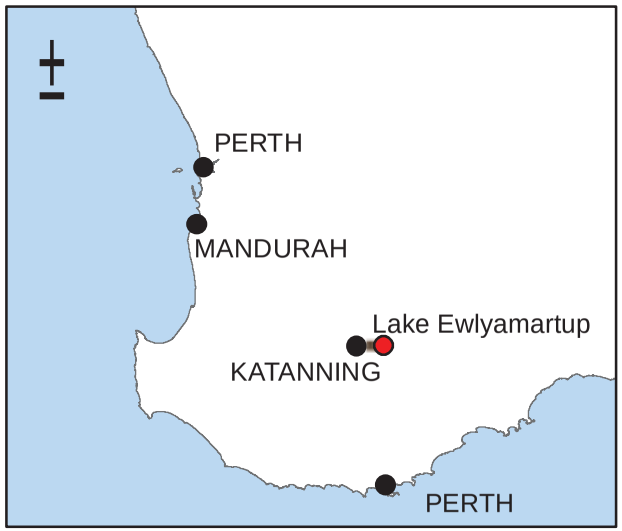
10.1.2

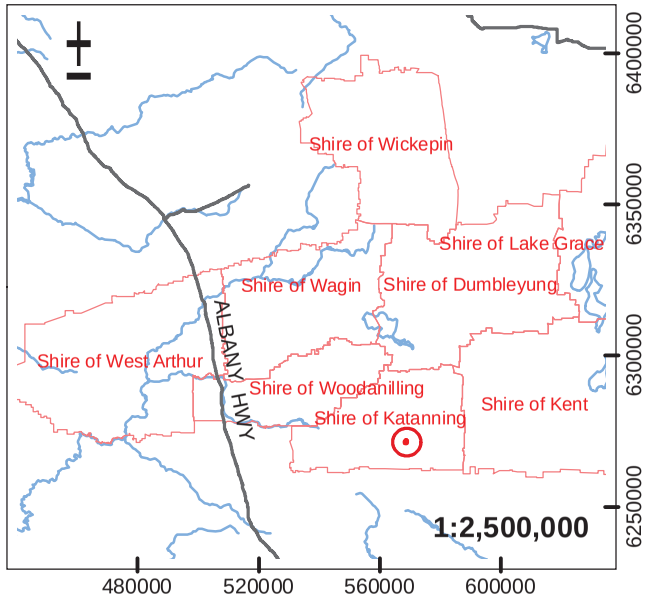


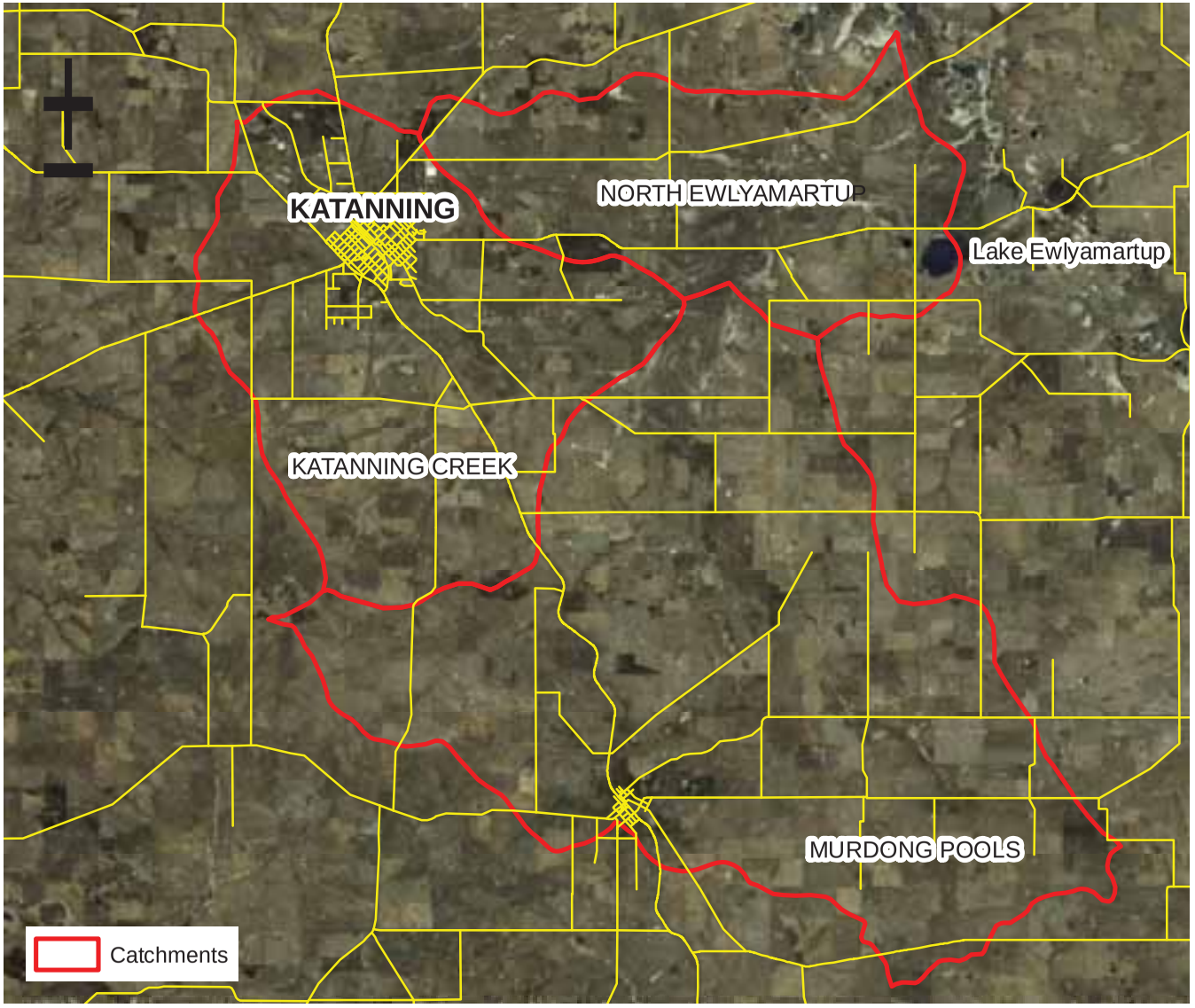
Job No: J4905

Department of Regional Development and Lands
Living Lakes Feasibility Study Stage 1: Part 2 Report

Figure 3.19: Lake Towerrinning: Long Section of Refined Outlet from Outlet Swamp at Back Swamp to Arthur River







0 1 2 4 6 8
Scale: 1:245,374 Kilometers

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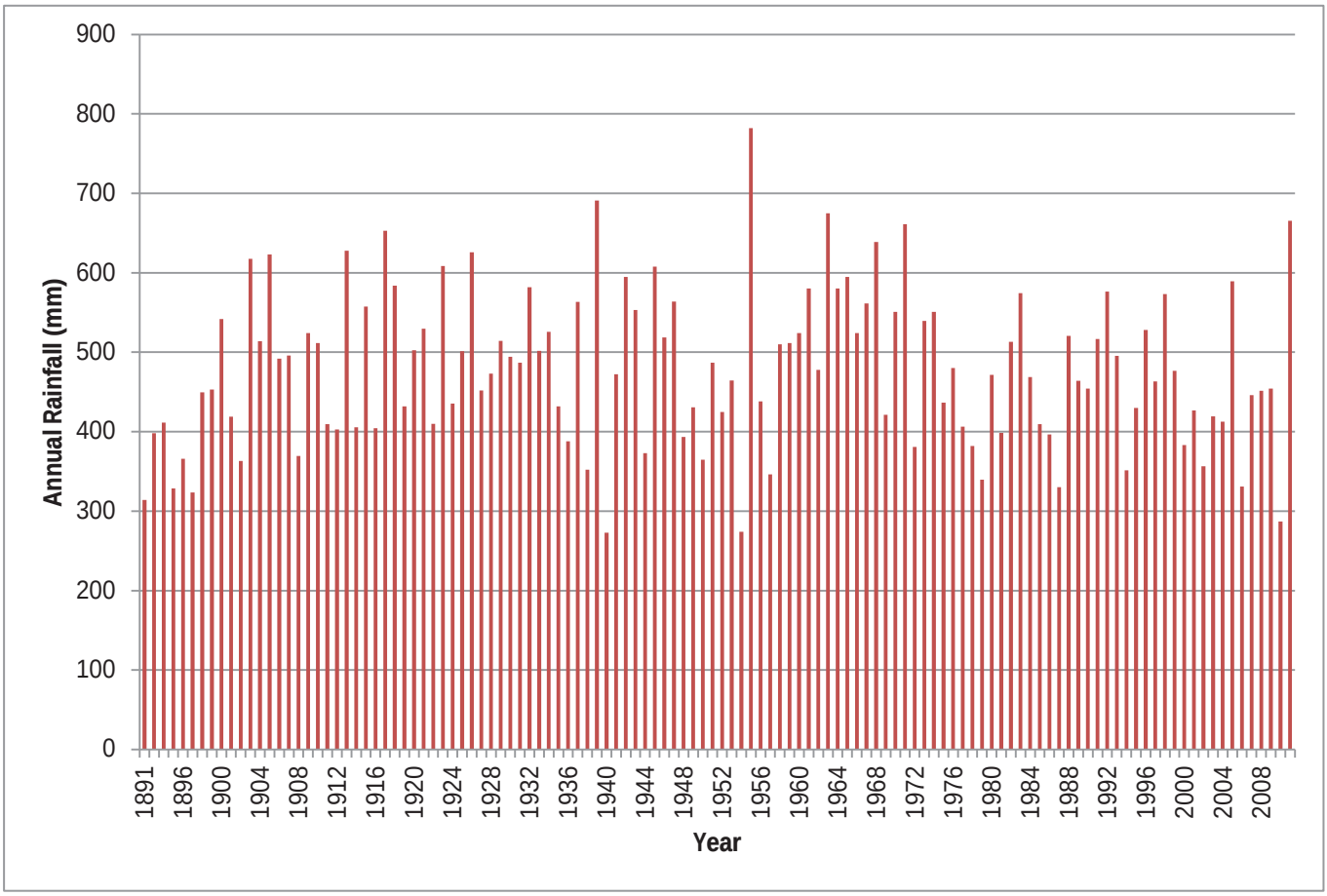
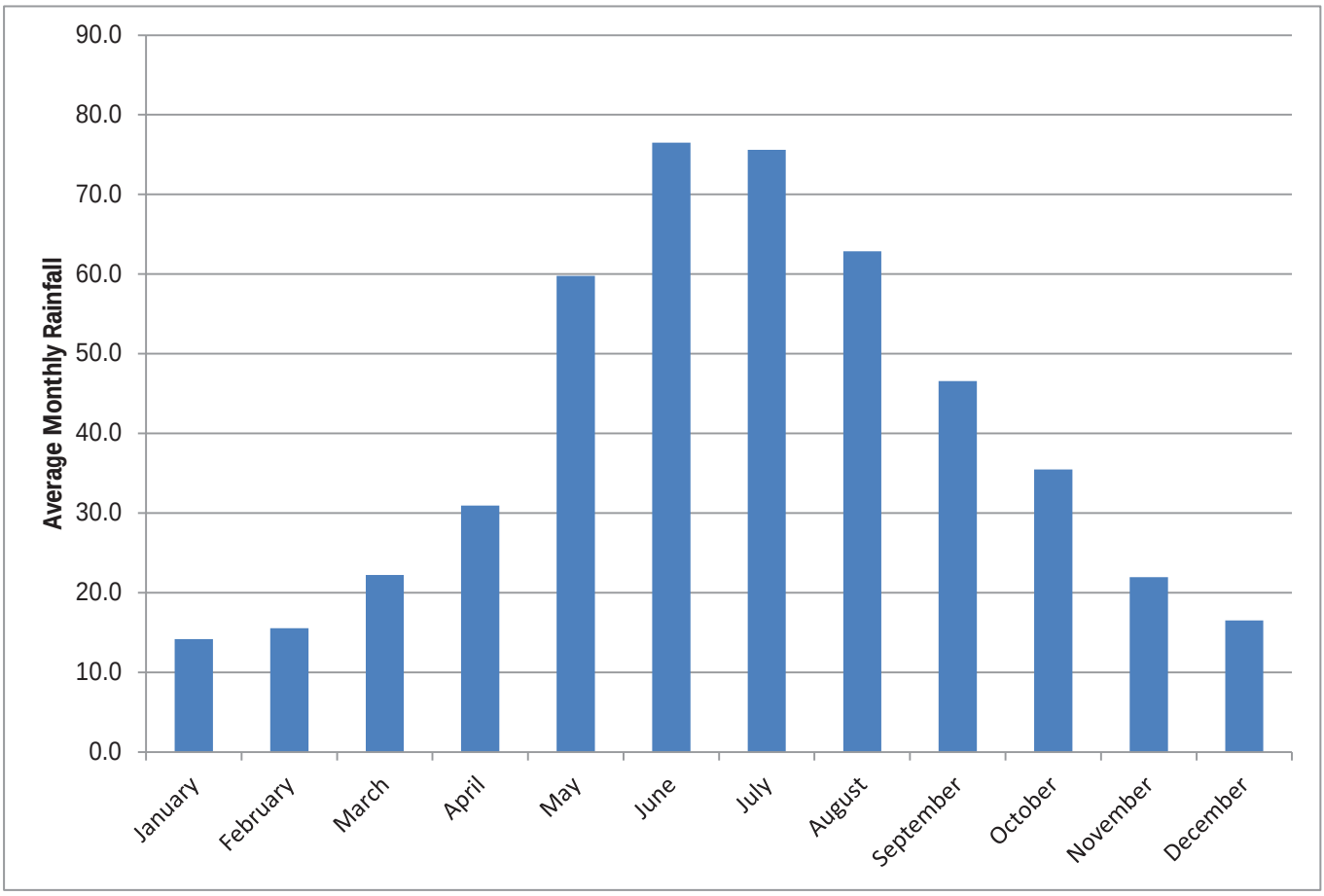
Living Lakes Feasibility Study Stage 1: Part 2: Report
Figure 4.1: Lake Ewlyamartup Location Map and Catchment Boundaries

10.1.2





Data Source: Bureau of Meteorology

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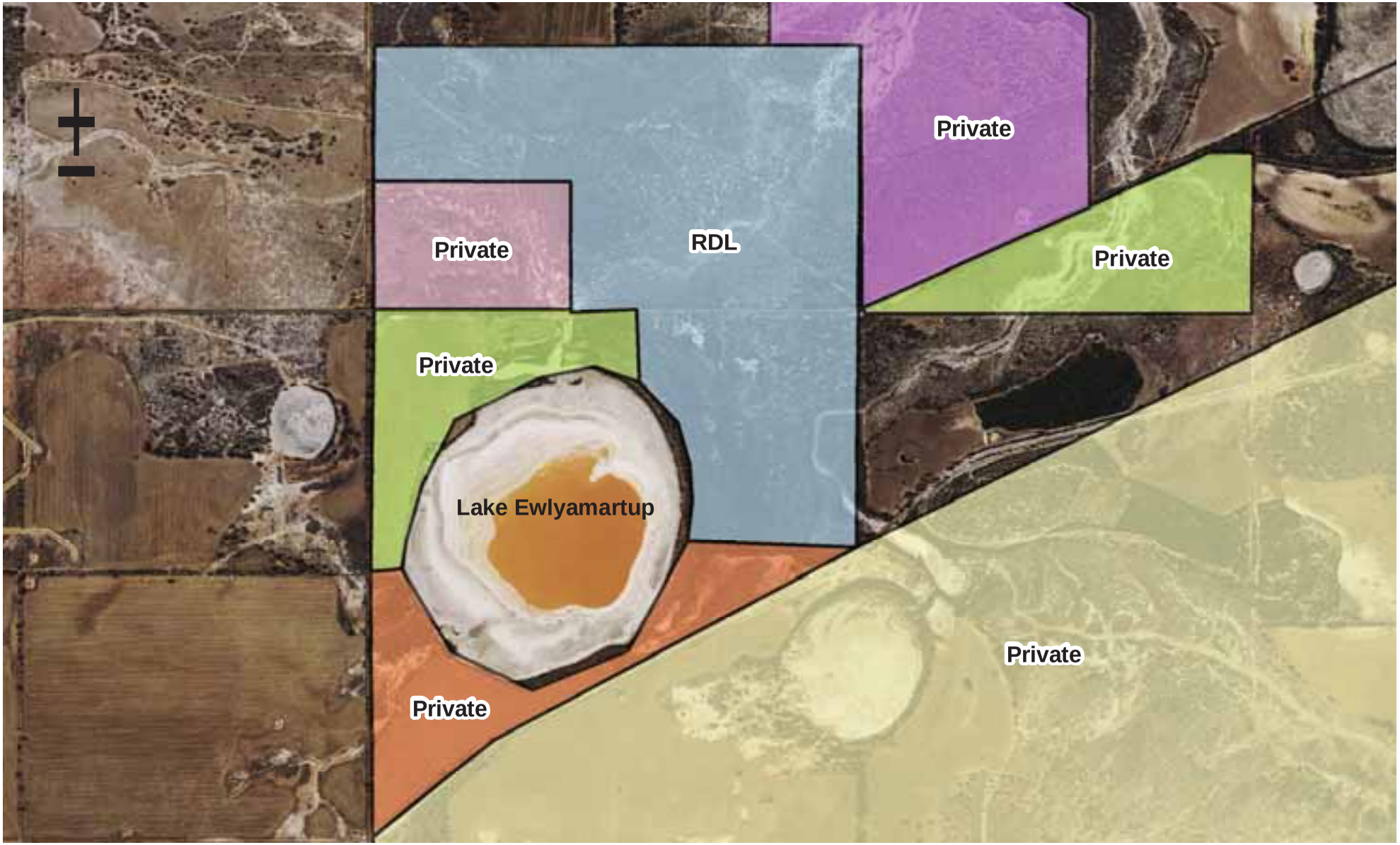
Figure 4.2: Lake Ewlyamartup Annual Rainfall (BoM Station # 010579 - Katanning)



Data Source:

Job No. J4905
Scale:1:26,223

0 500 1,000 1,500 2,000 Meters

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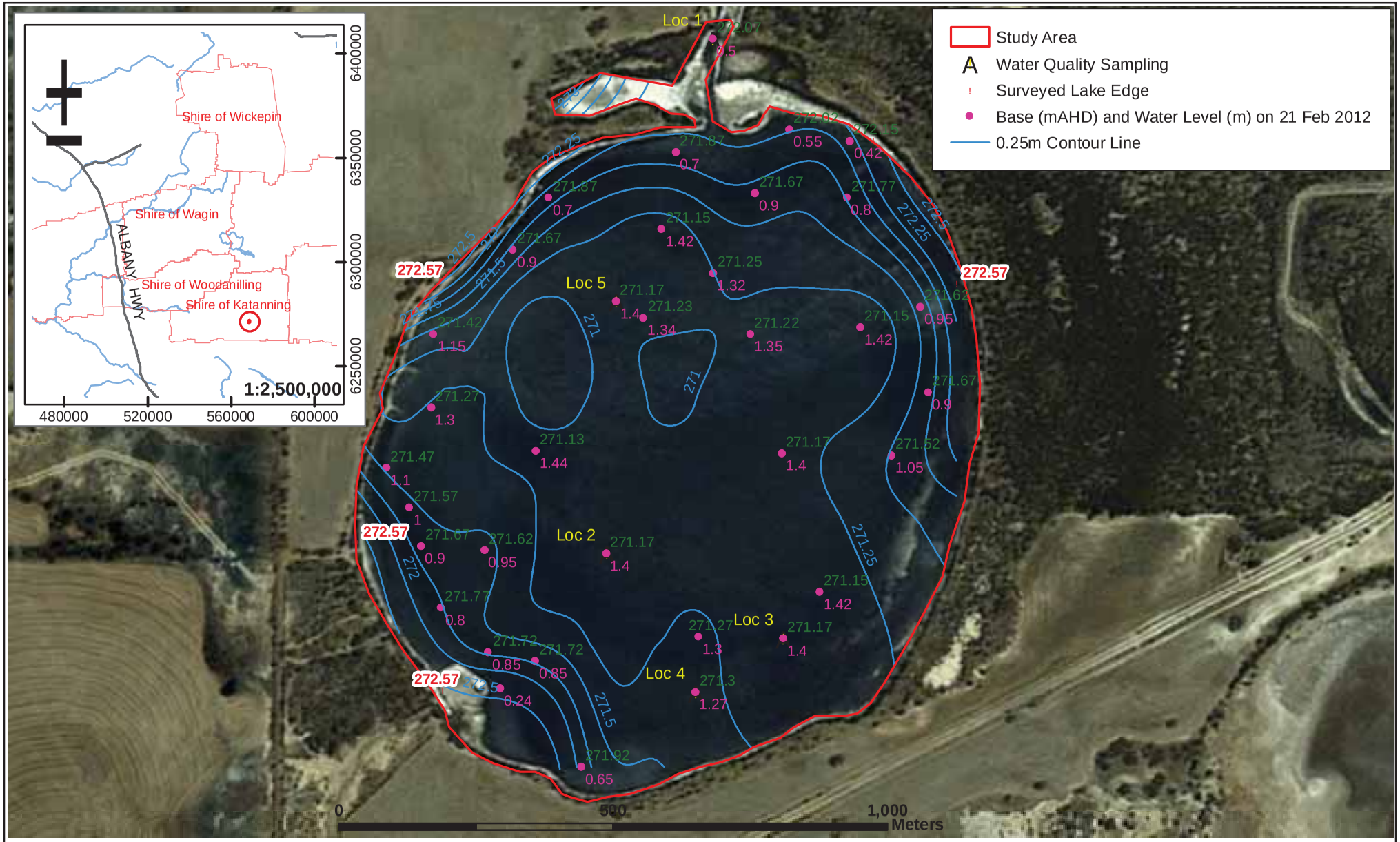
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 4.3: Lake Ewlyamartup Land Ownership



Data Source: JDA Survey on 20 Feb 2012, JBA Surveys (2012), Google Earth aerial photograph taken in 2008.

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Scale:1:9,500

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Figure 4.4: Ewlyamartup Lake: Lake and Bed Sampling Locations and Lake Bed Contours

10.1.2

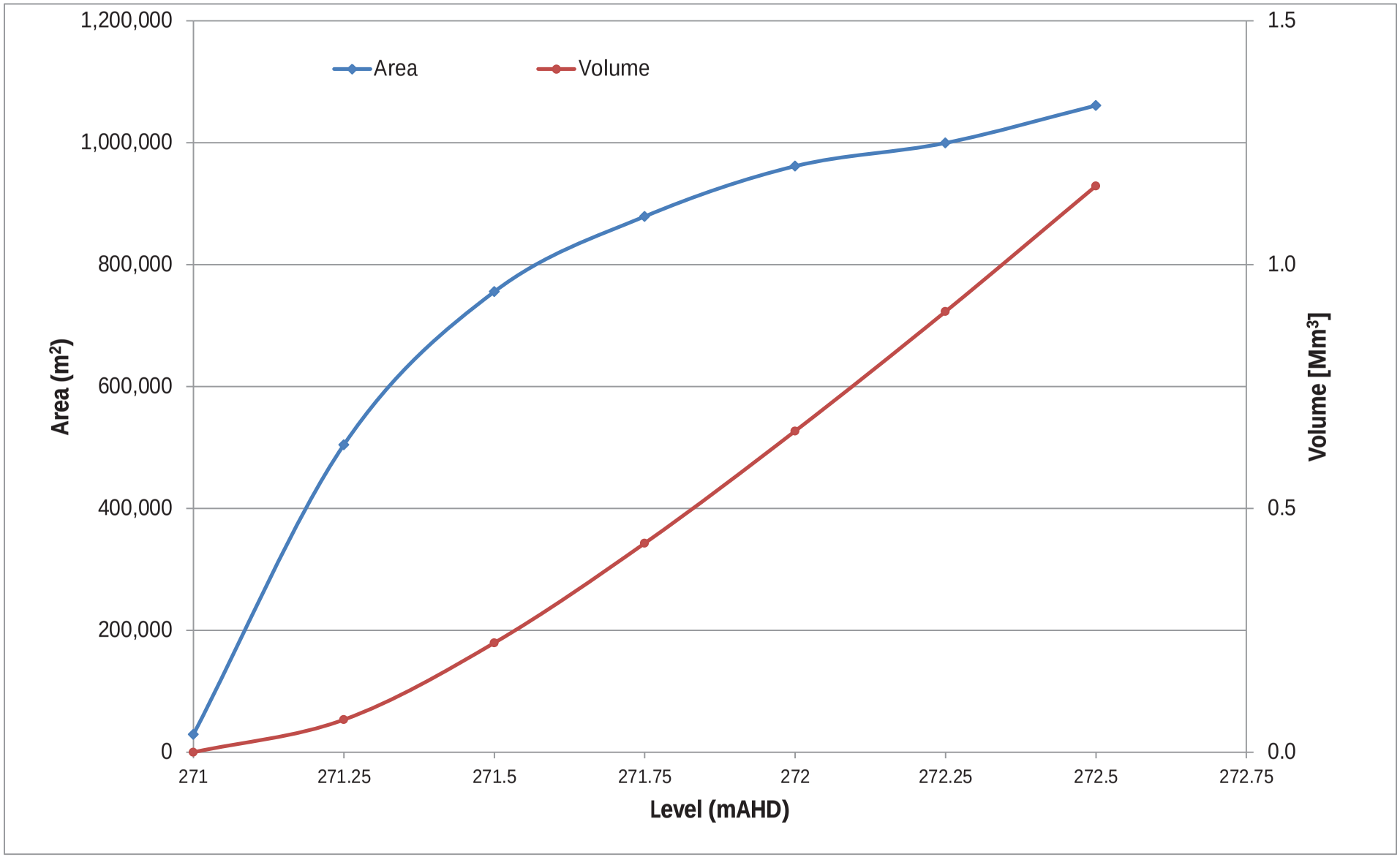

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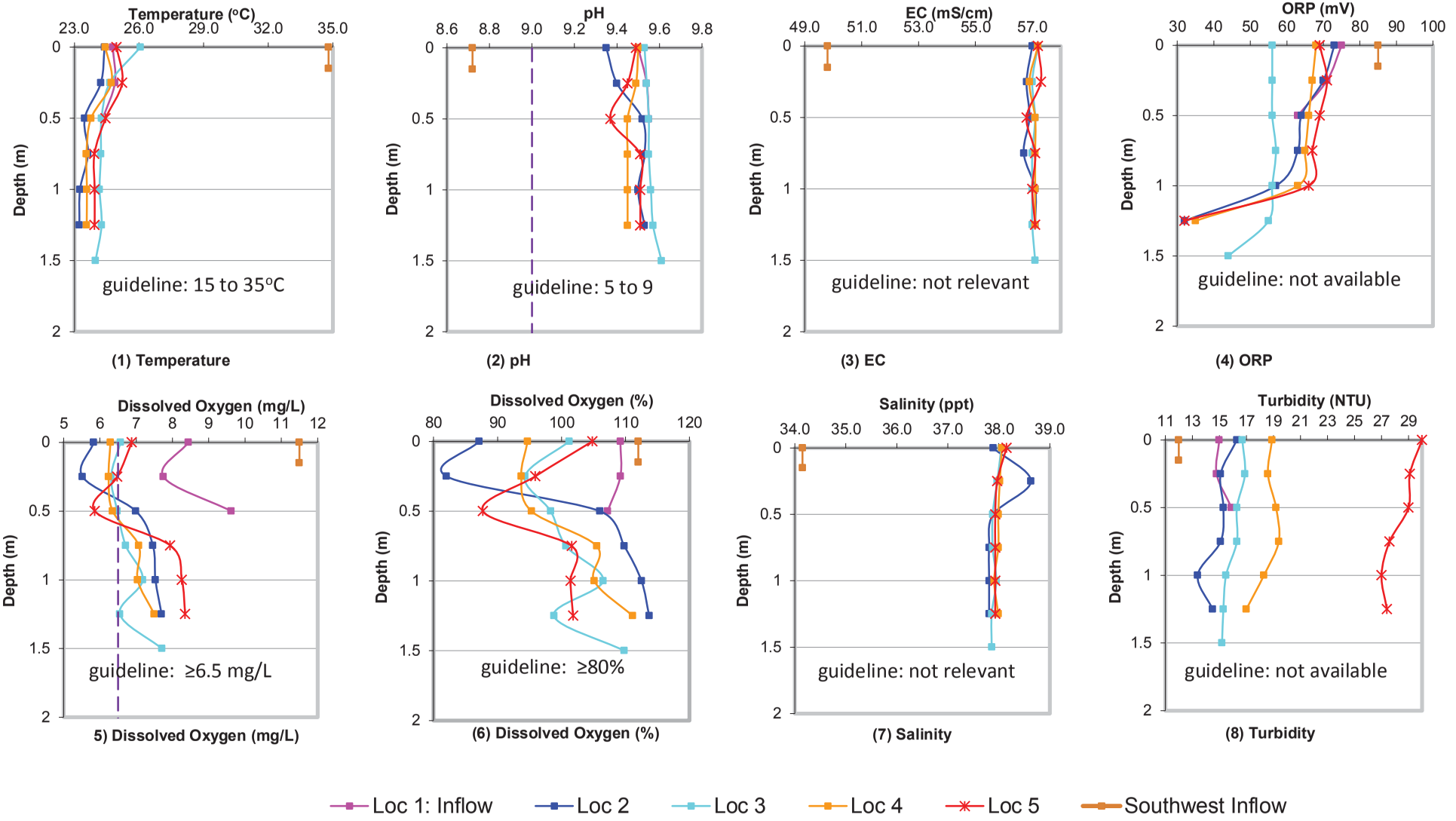
Figure 4.5: Lake Ewlyamartup: Lake Bathymetry (Existing)



Notes:

1. Refer to Figure 4.3 for sampling locations

2. Guideline refer to ANZECC and ARMCANZ (2000) Guideline for recreational water quality and aesthetic

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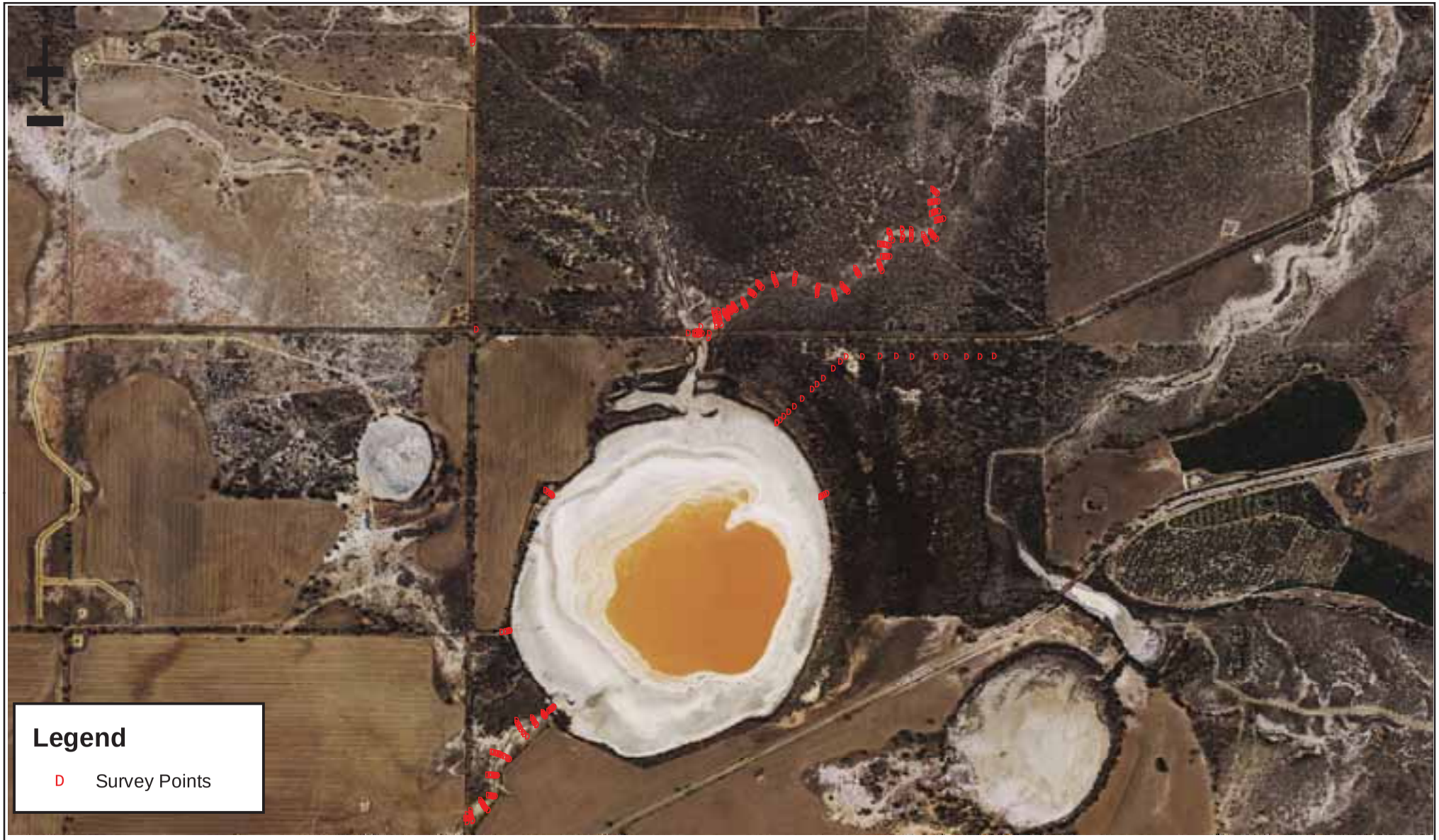
Living Lakes Stage 1 Feasibility Study - Wheatbelt and Adjoining Regions Part 2

Figure 4.6: Lake Ewlyamartup Water Quality Profiling

10.1.2



Job No. J4905
Scale:1:18,912

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Living Lakes Feasability Study Part 2

Figure 4.7: Lake Ewlyamartup Survey (JBA)

Data Source:

Job No. J4905
Scale:1:24,000

0 500 1,000 1,500 2,000 Meters

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Figure 4.8a: Lake Ewlyamartup Geophysics Survey Lines (Fugro)

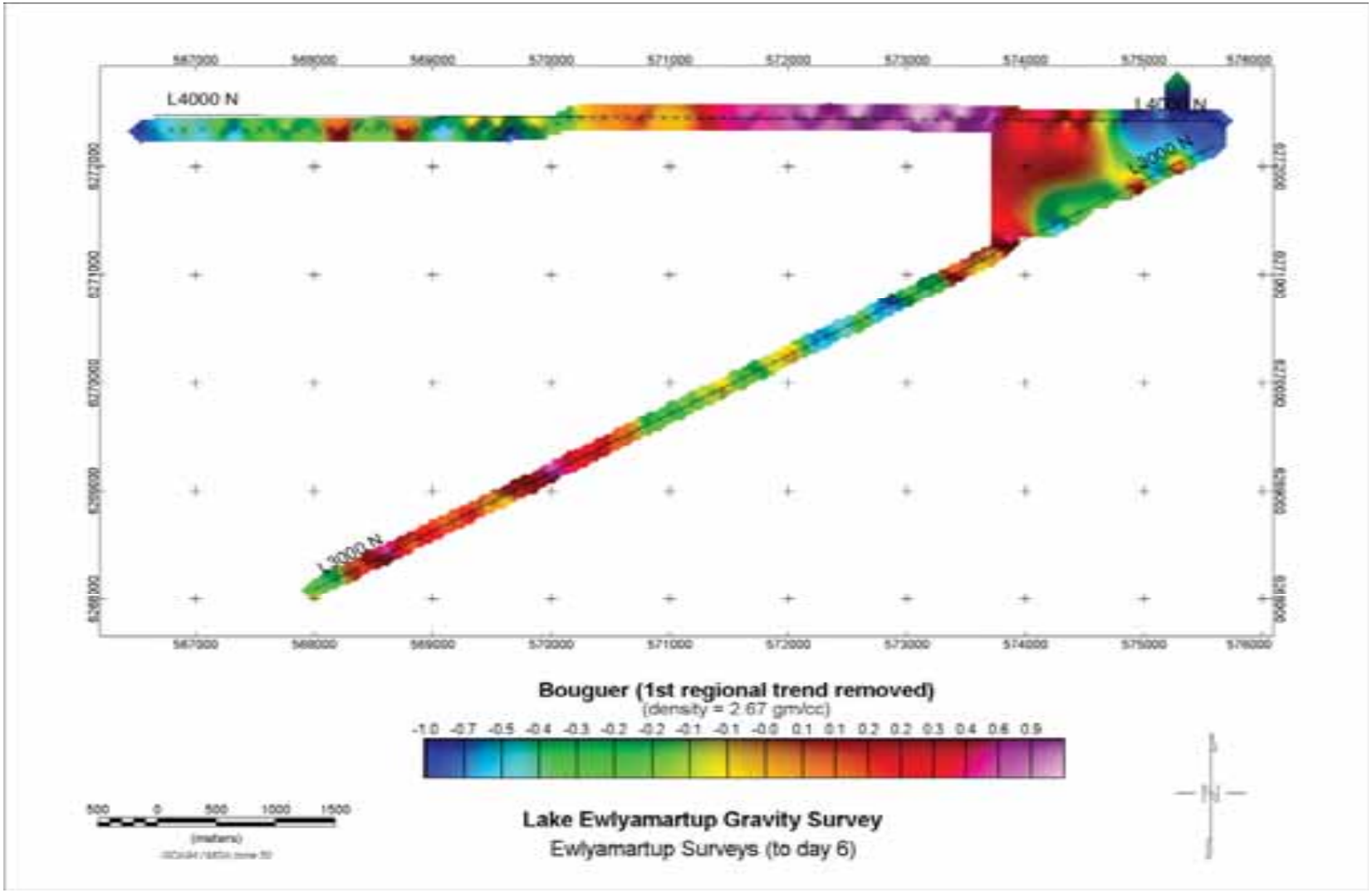

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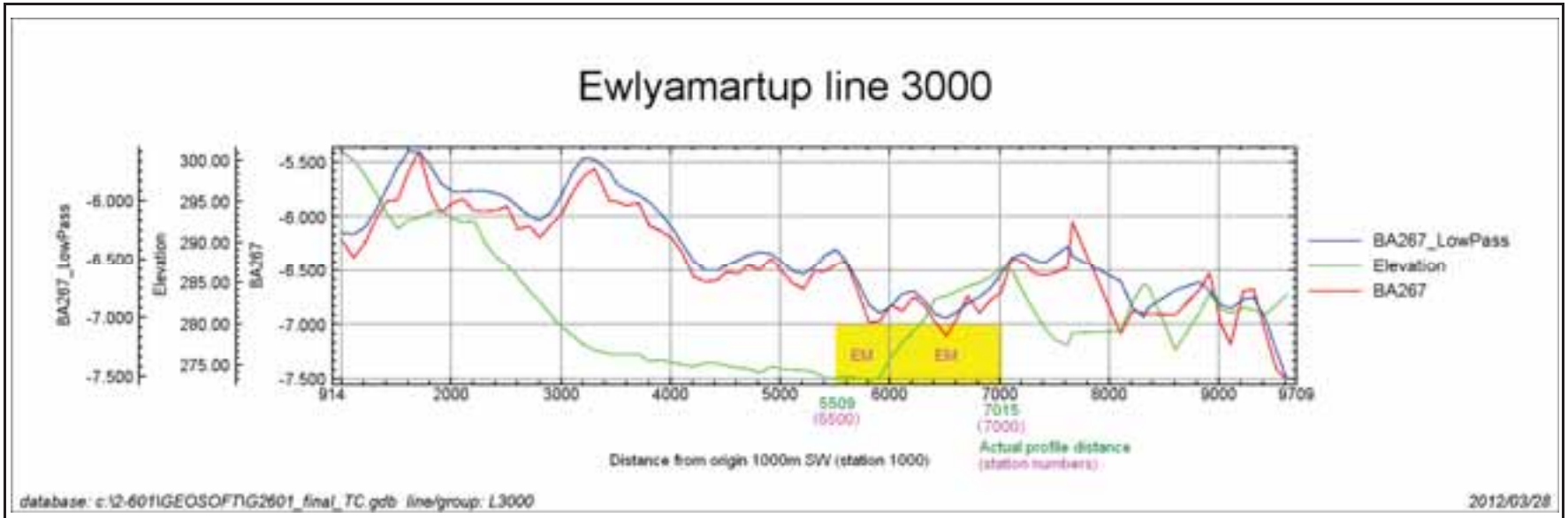
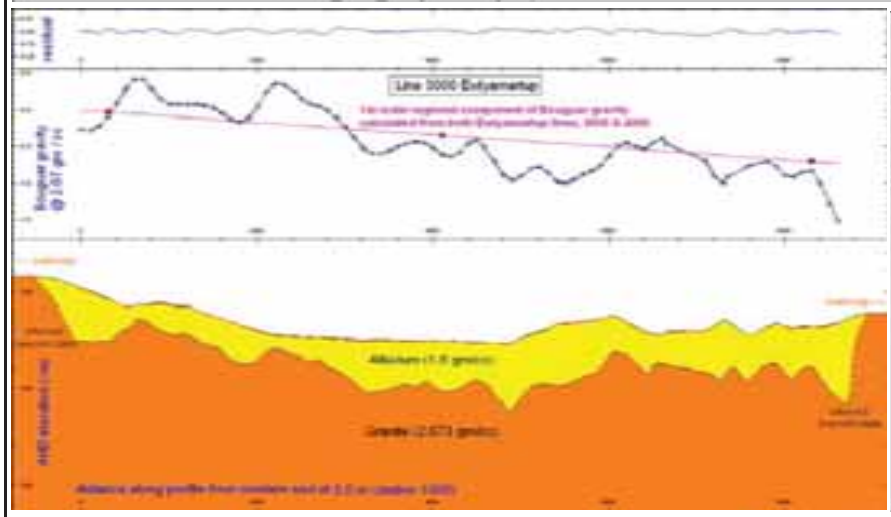
Figure4.8b: Lake Ewlyamartup Gravity Transect Results





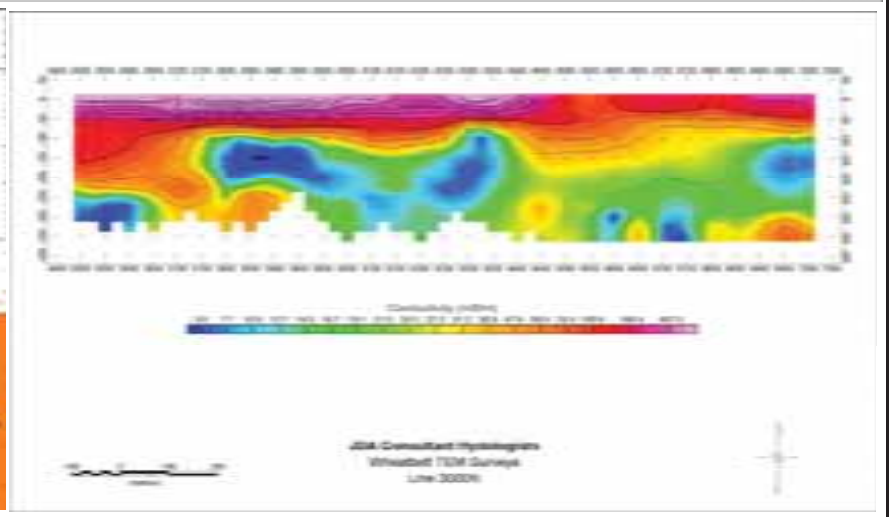


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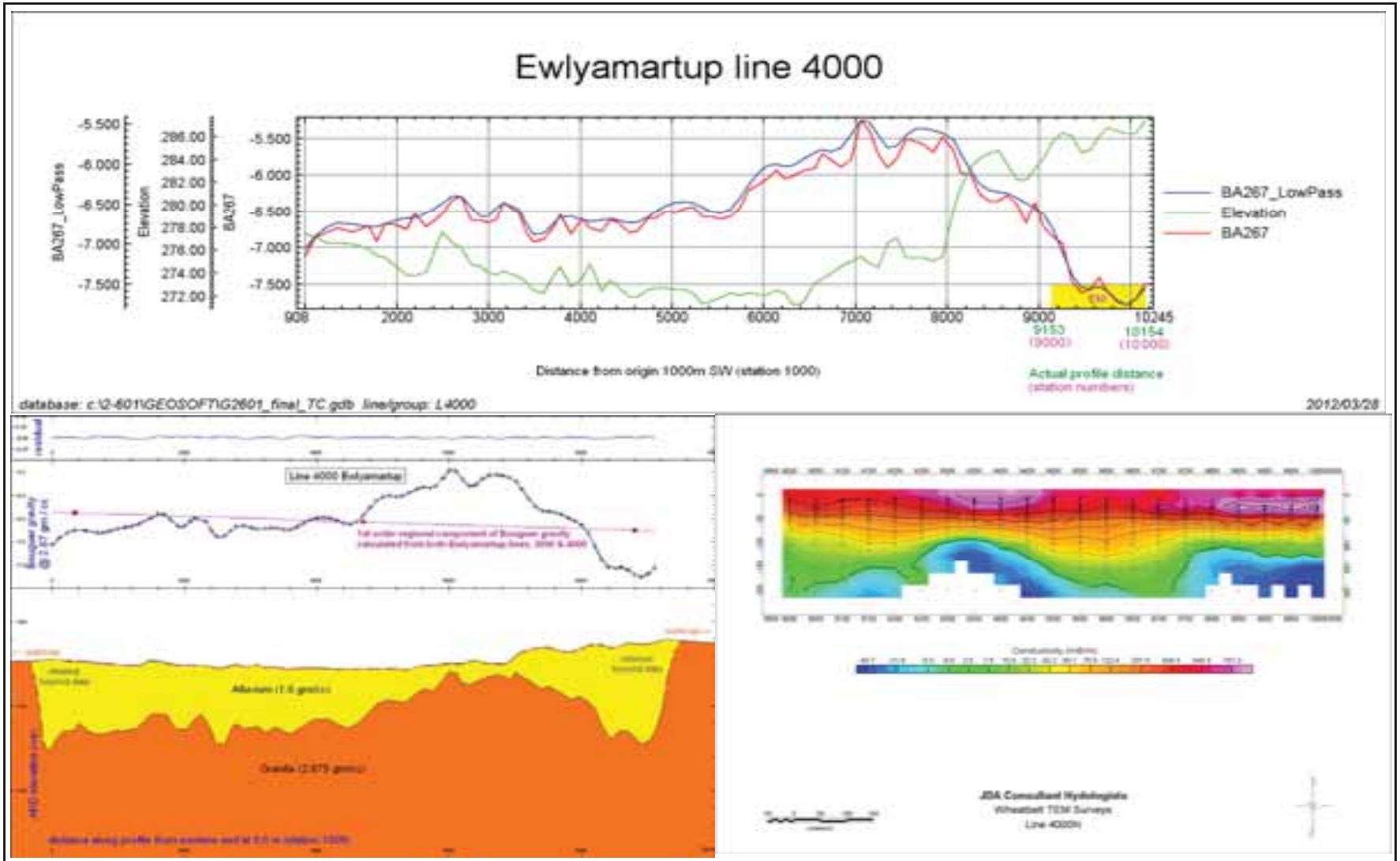
Figure 4.8c: Lake Ewlyamartup Geophysical Survey Results

10.12



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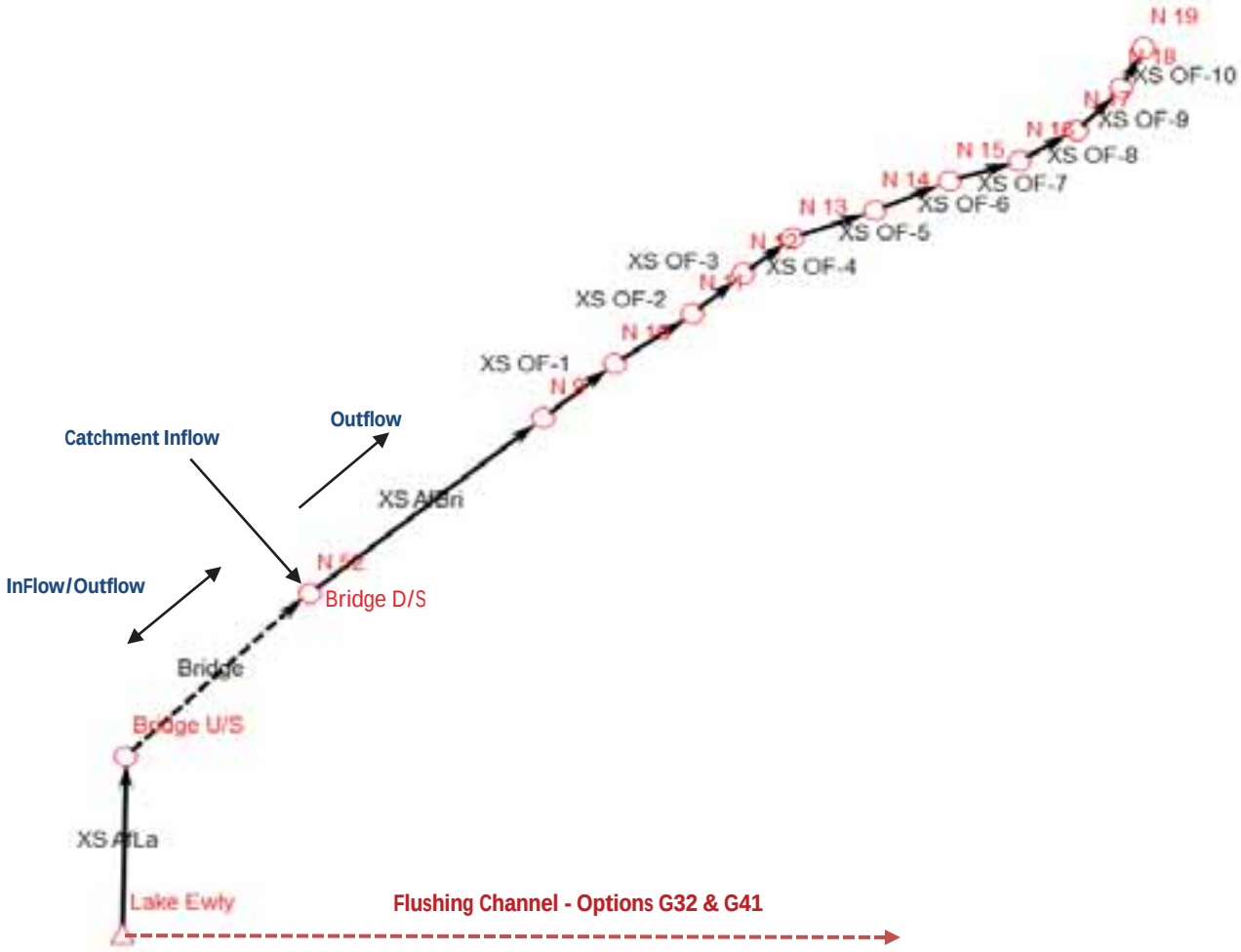
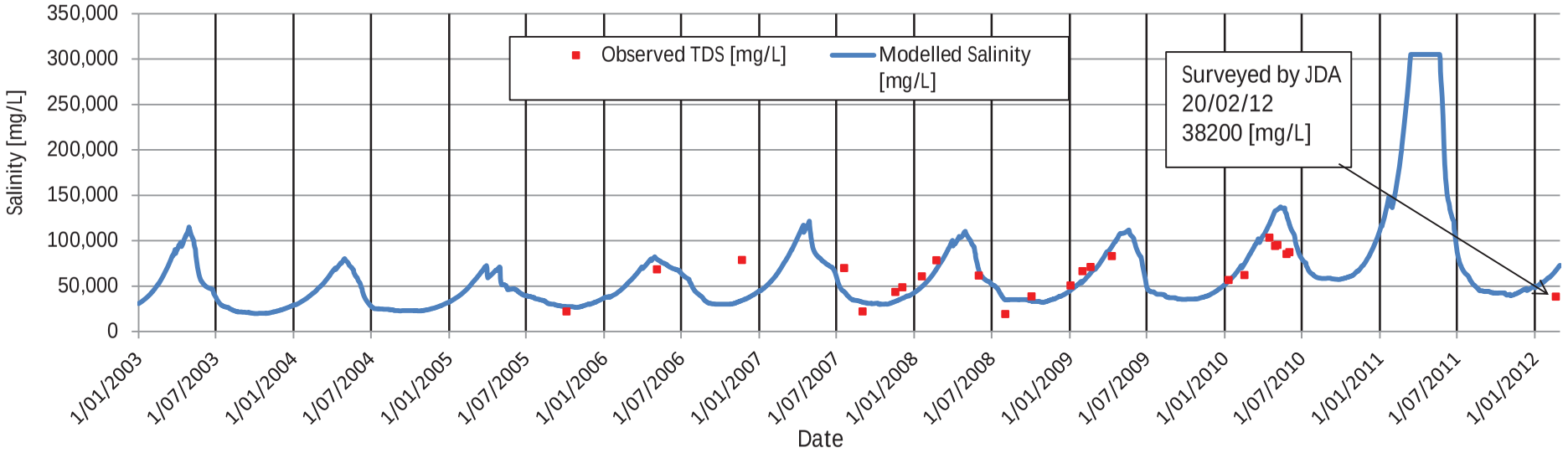
Living Lakes Feasibility Study Stage 1: Part 2

Figure 4.8d: Lake Ewlyamartup Geophysical Survey Results

10.12



JDA	Job No. J4905	Department of Regional Development and Lands Living lakes Feasibility Study Stage 1: Part 2 Report **Figure 4.9: Lake Ewlyamartup XP-Storm Model Schematic**



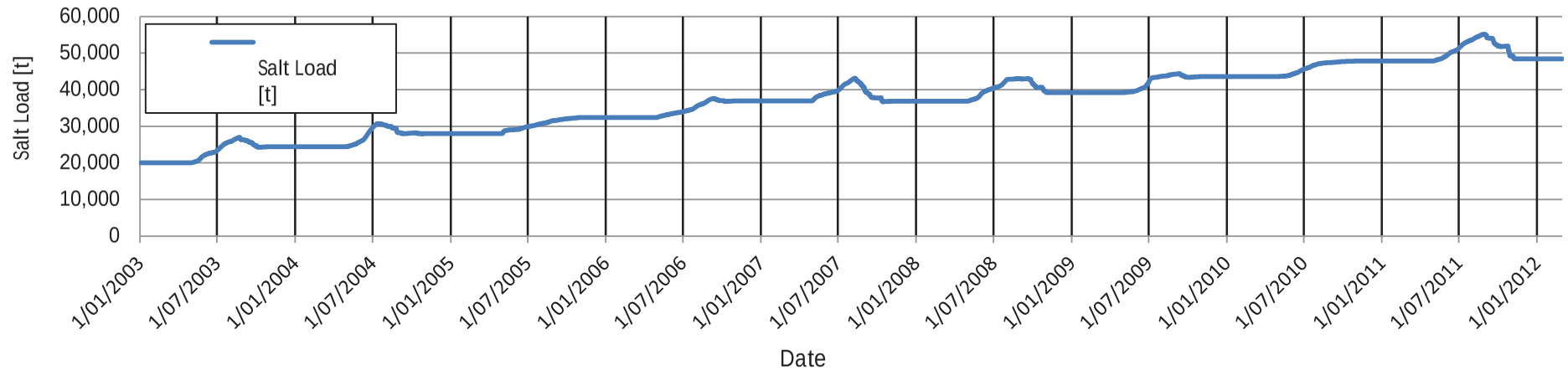


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Figure 4.10a: Lake Ewlyamartup: Daily Salt Balance - Calibration

10.1.2

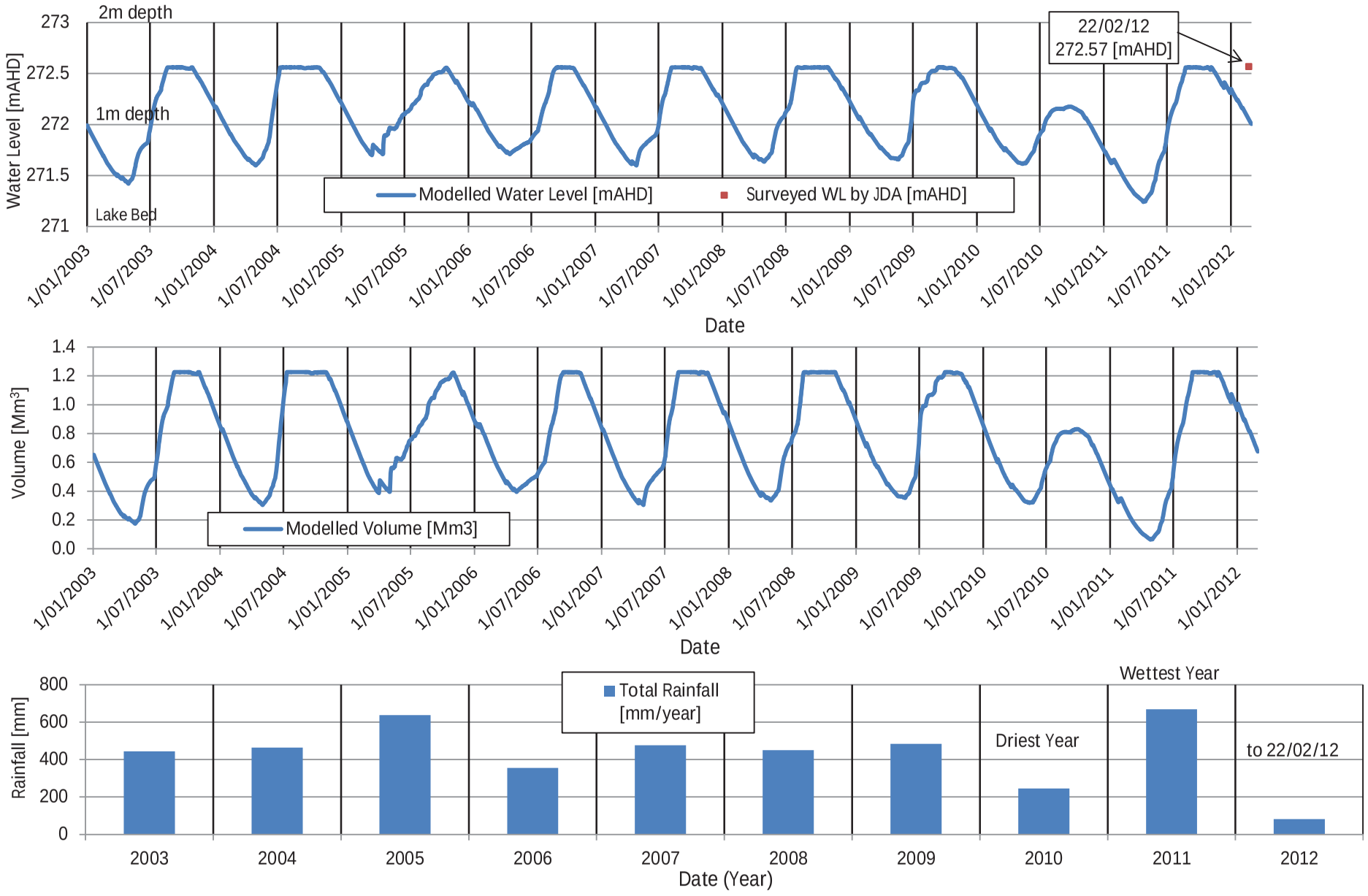

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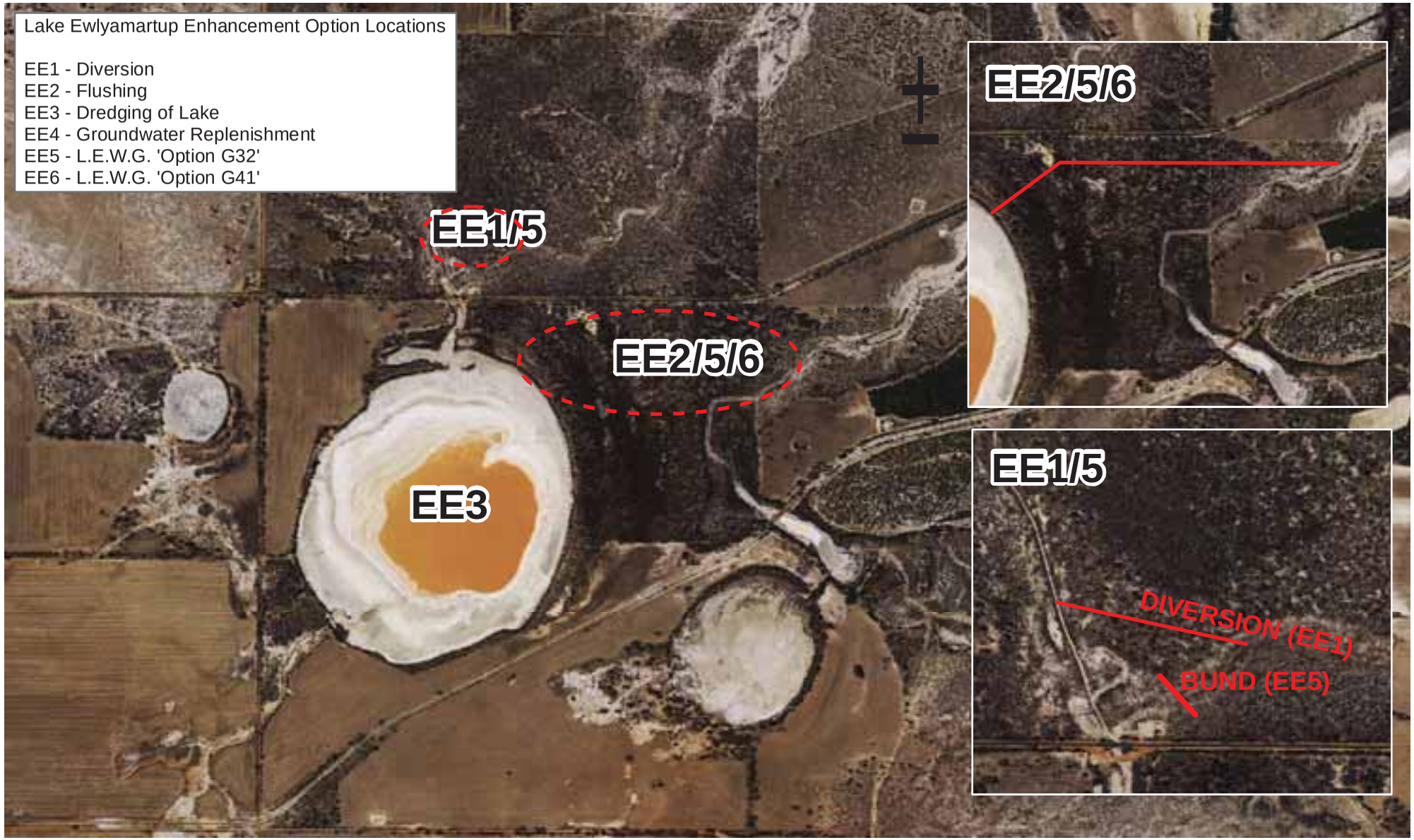
Figure 4.10b: Lake Ewlyamartup: Daily Water Balance - Calibration



Data Source:

Job No. J4905

0 500 1,000 1,500 2,000 Metres

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Figure 4.11: Lake Ewlyamartup Enhancement Option Locations

10.1.2

Data Source: Maesepp (2010)

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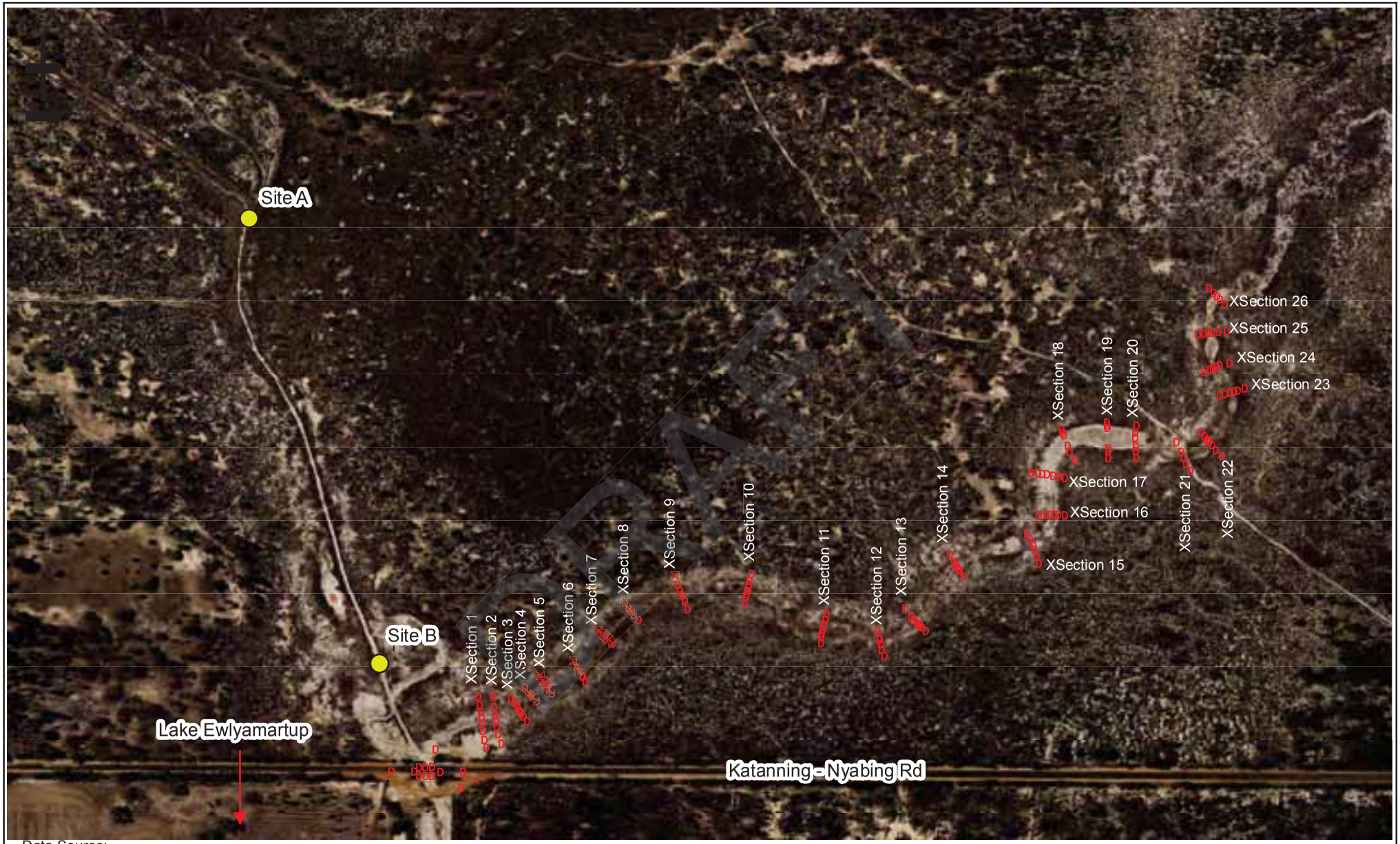
Figure 4.12: Lake Ewlyamartup Potential Diversion Structure Locations



Data Source:

Job No. J4905
Scale: 1:5,500
0 200 400 Meters

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Figure 4.13: Lake Ewlyamartup Downstream Channel Cross Sections

10.1.2

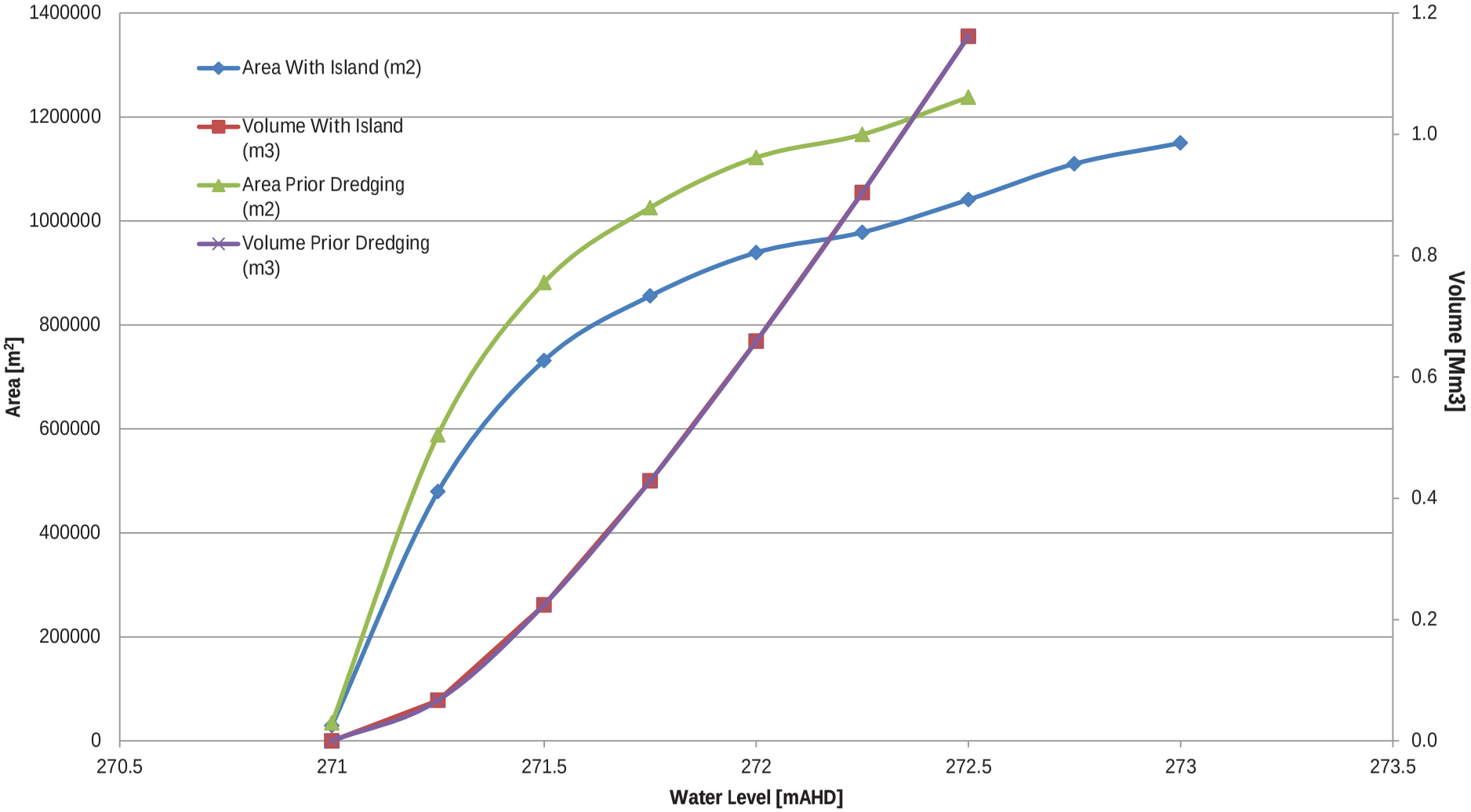

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Figure 4.14 Lake Ewlyamartup: Lake Bathymetry - EE3

10.1.2

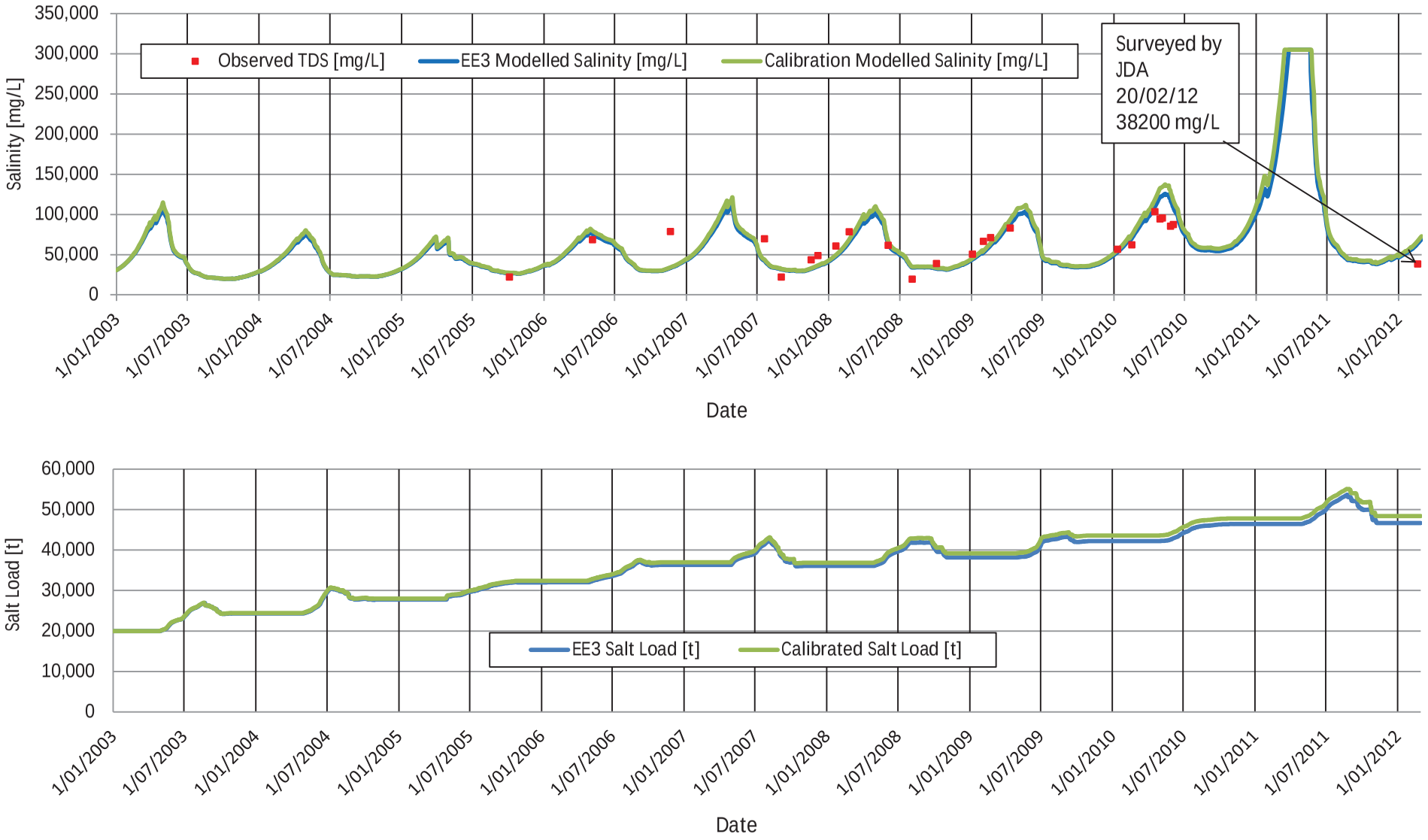

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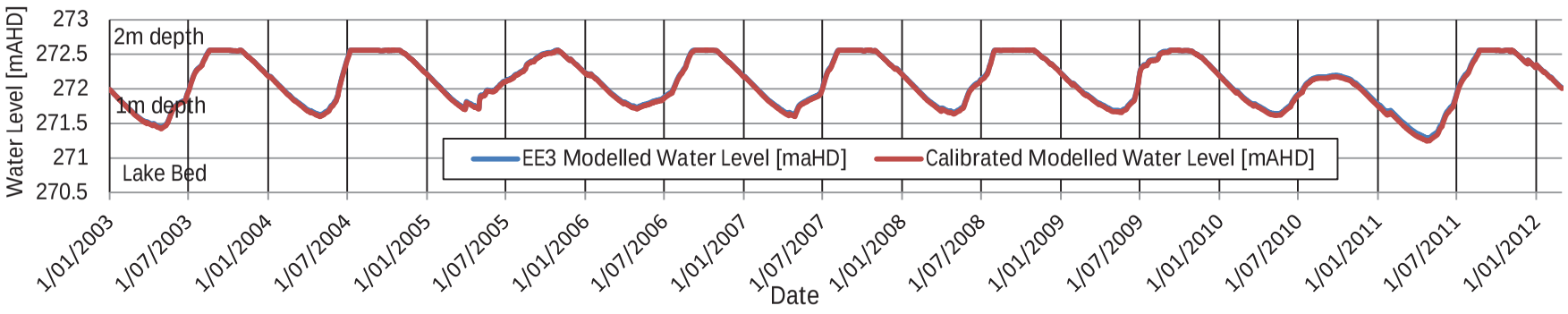
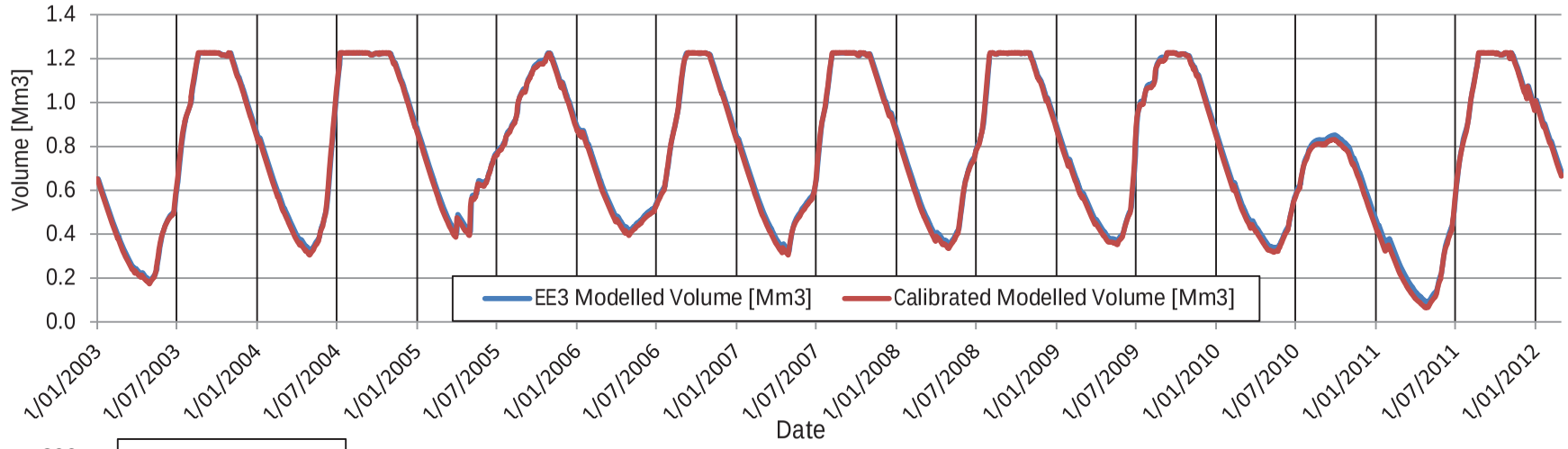
Figure 4.15a: Lake Ewlyamartup: Daily Salt Balance - EE3





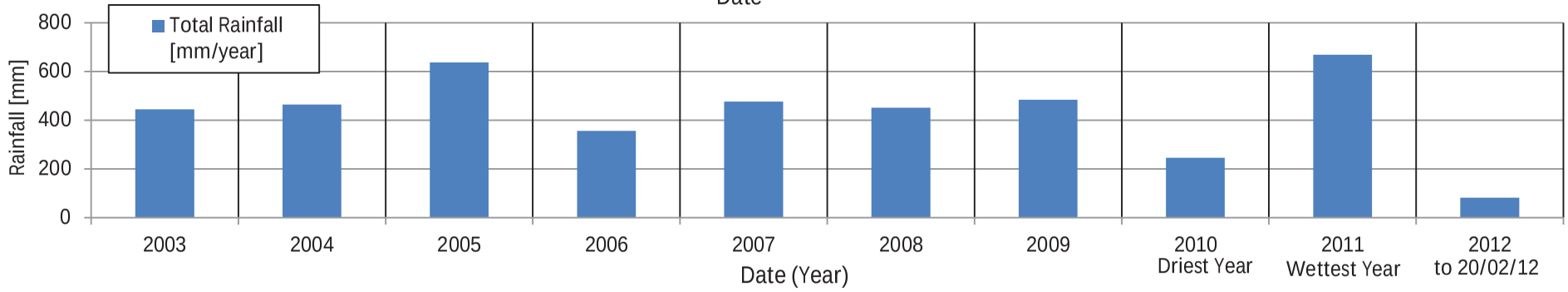


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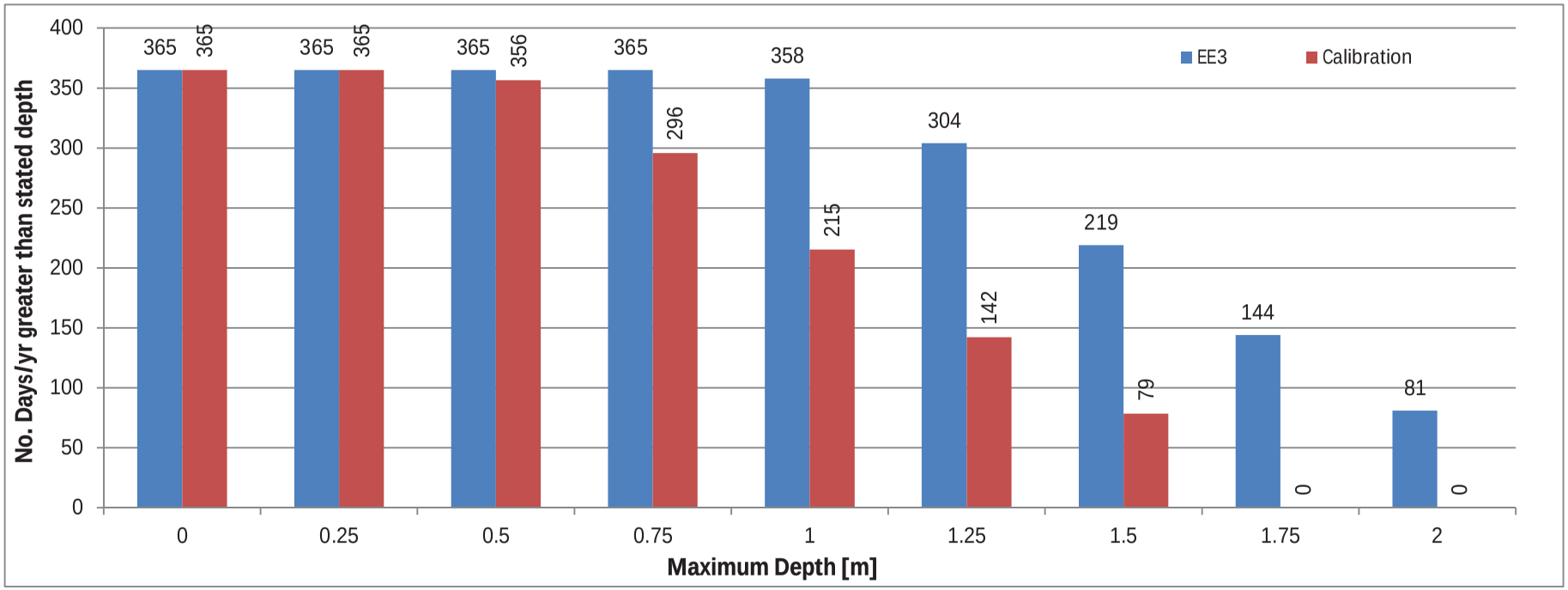
Figure 4.15b: Lake Ewlyamartup: Daily Water Balance - EE3



e.g. No of days/yr > 1.5 m depth = 219 days as per EE3
NB: EE3 applies to dredging 50,000 m3 over 10 ha, 0.5 m depth

This bar graph refers to water depth in the dredged area only, not the entire lake.

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Figure 4.15c: Effect on lake depth - EE3

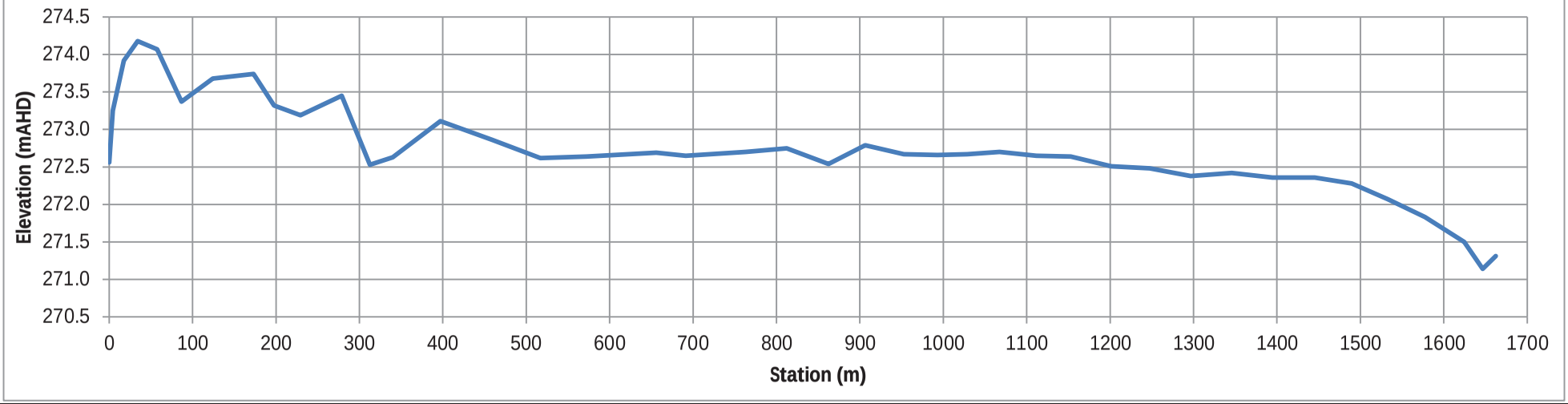

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Figure 4.16: Lake Ewlyamartup Longitudinal Profile of proposed Flushing Channel alignment (EE5 & EE6)

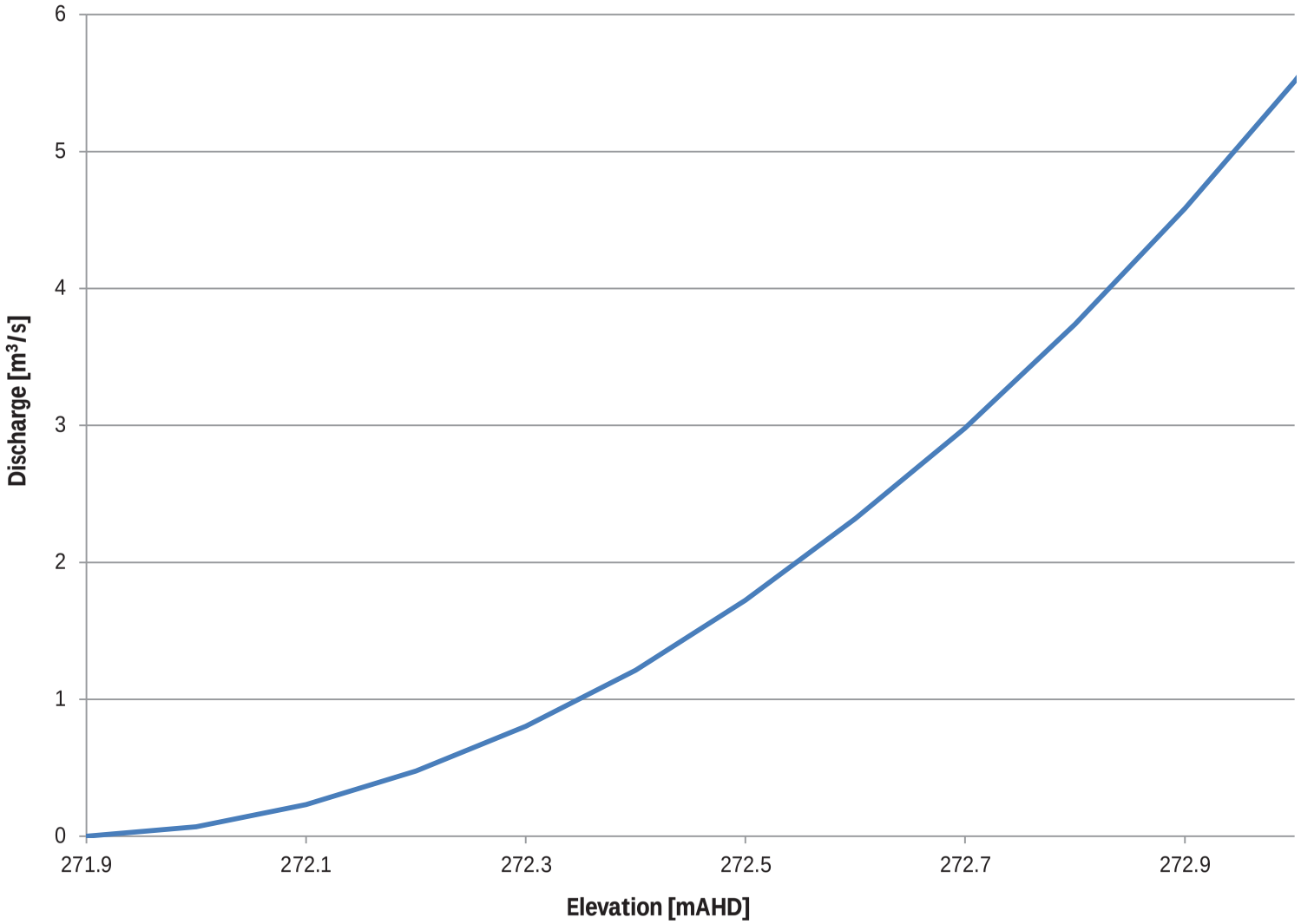

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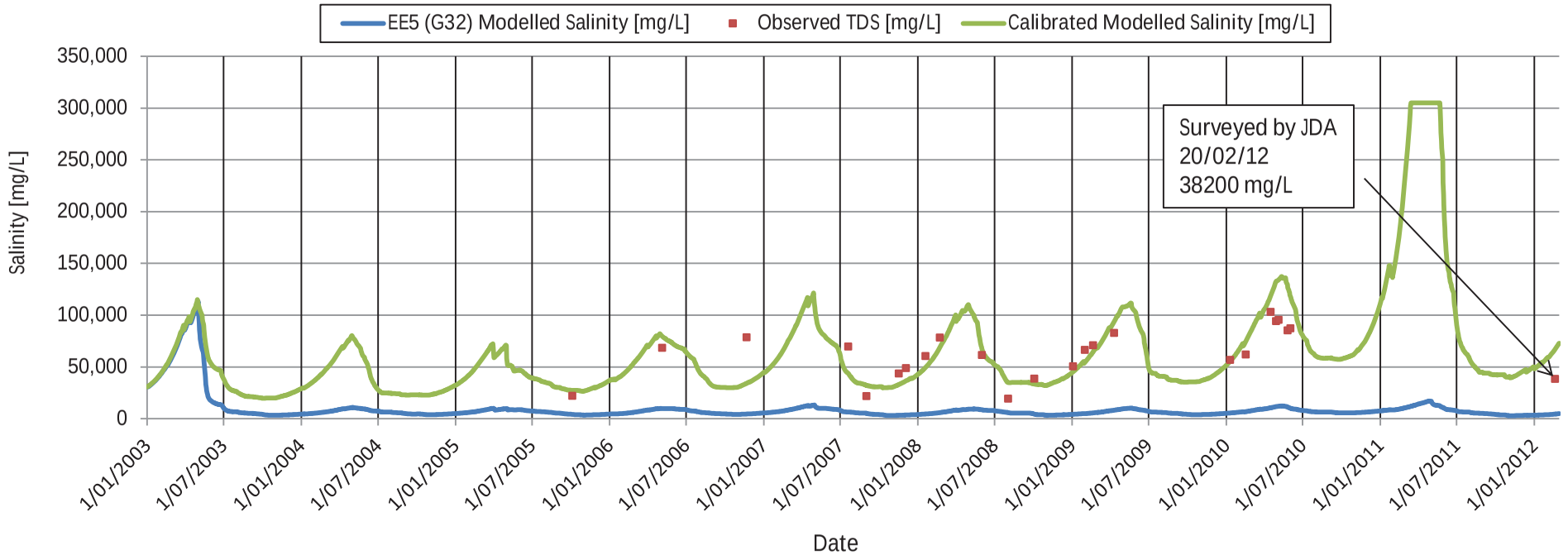
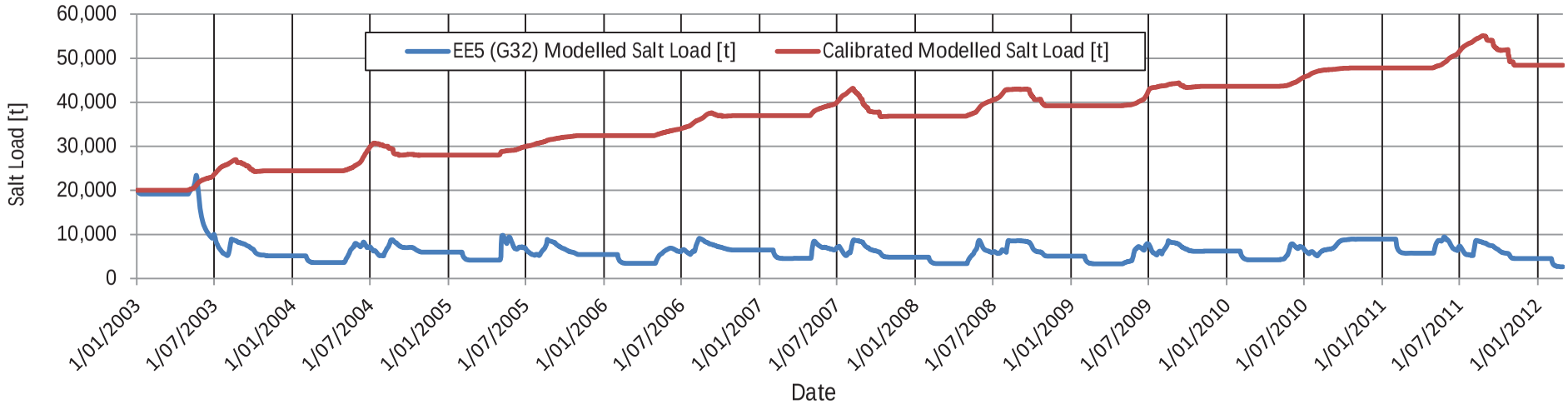
Figure: 4.17: Lake Ewlyamartup: Lake Outlet Rating Curve G32-EE5





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G32: Flushing Channel Invert 271.9 mAHD

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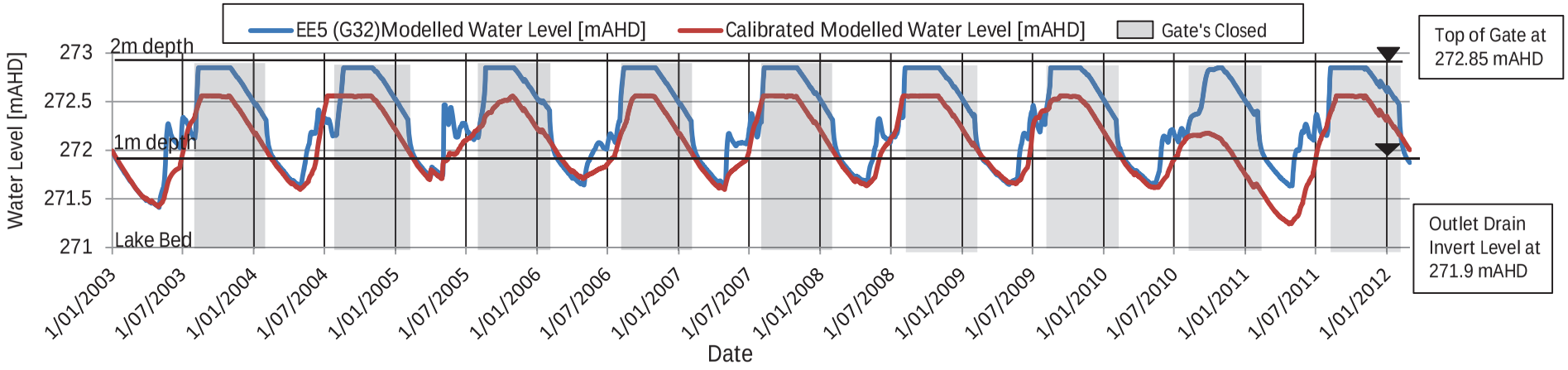
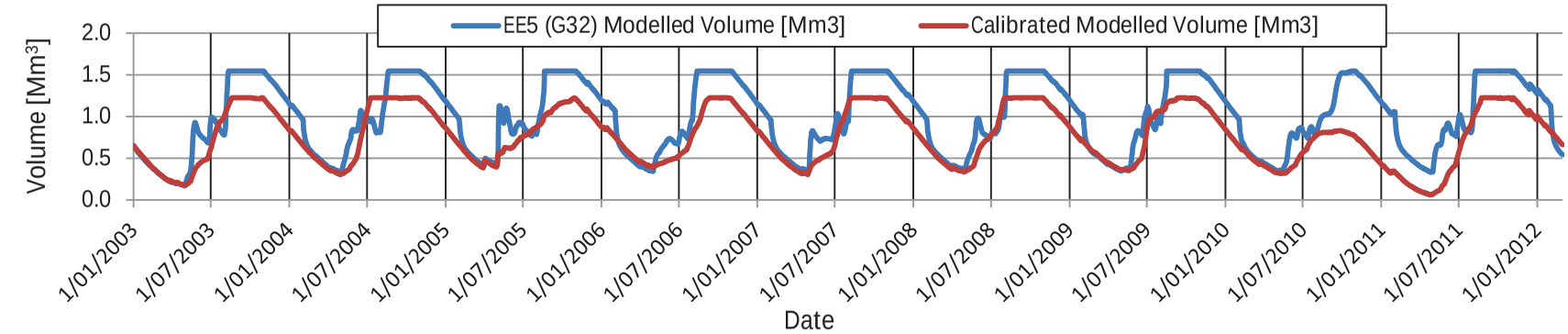
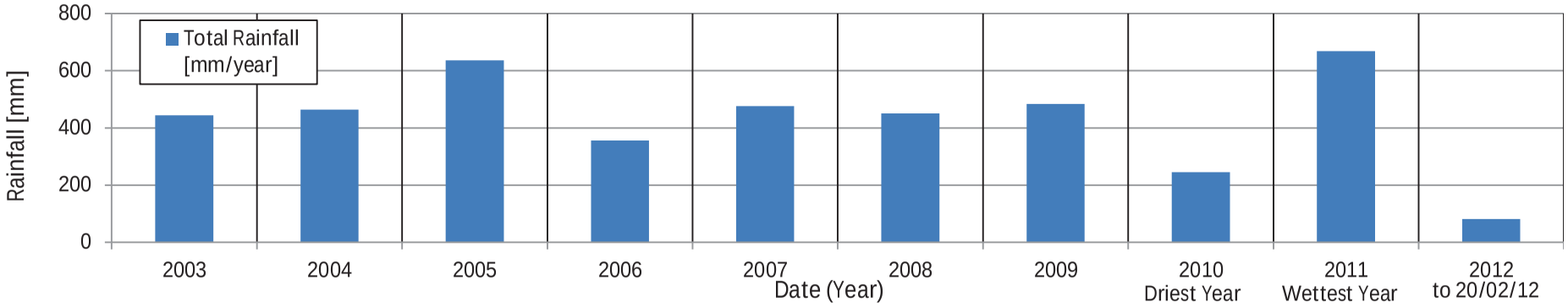
Figure 4.18a: Lake Ewlyamartup: Daily Salt Balance G32 - EE5

10.1.2







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Note: Gate open February to July
Gate closed August to January
Flushing Channel Invert at 271.9 mAHD

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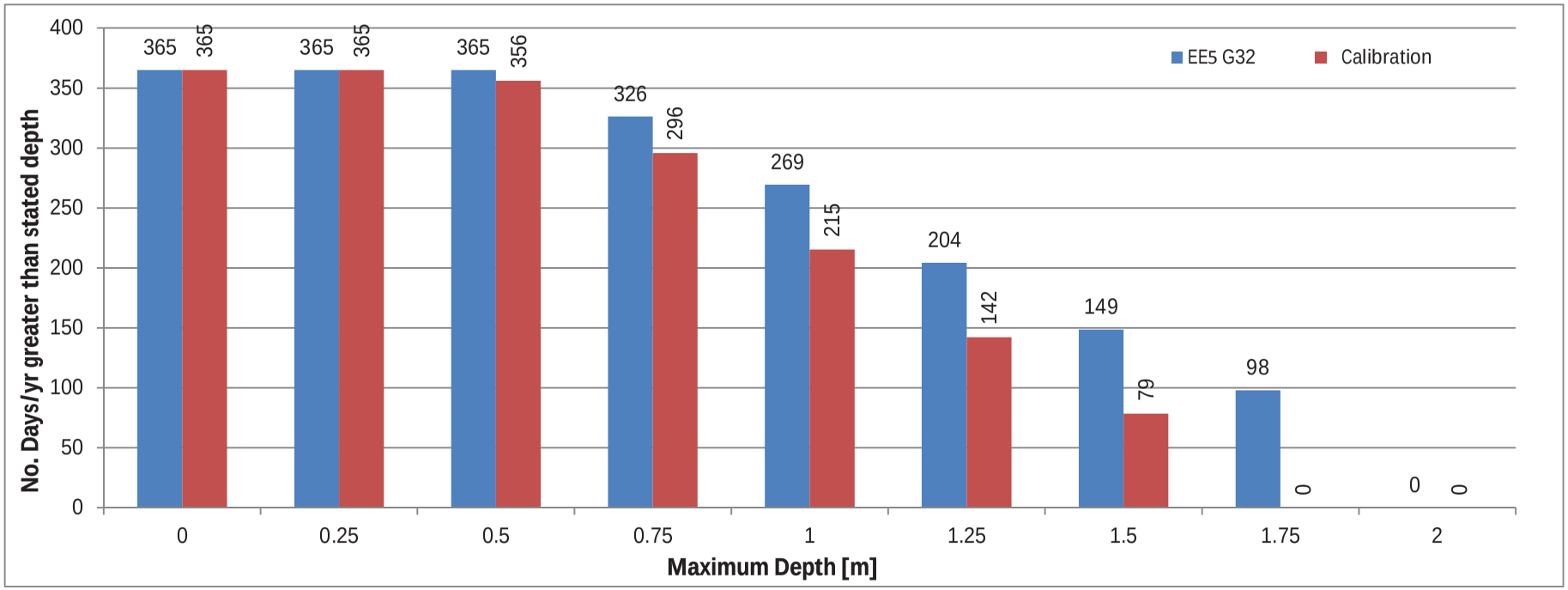
Figure 4.18b: Lake Ewlyamartup: Daily Water Balance G32- EE5



e.g. No of days/yr > 0.75 m depth = 326 days as per EE5G32

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Living Lakes Feasibility Study Stage 1: Part 2
Figure 4.18c: Effect on lake depth - EE G32

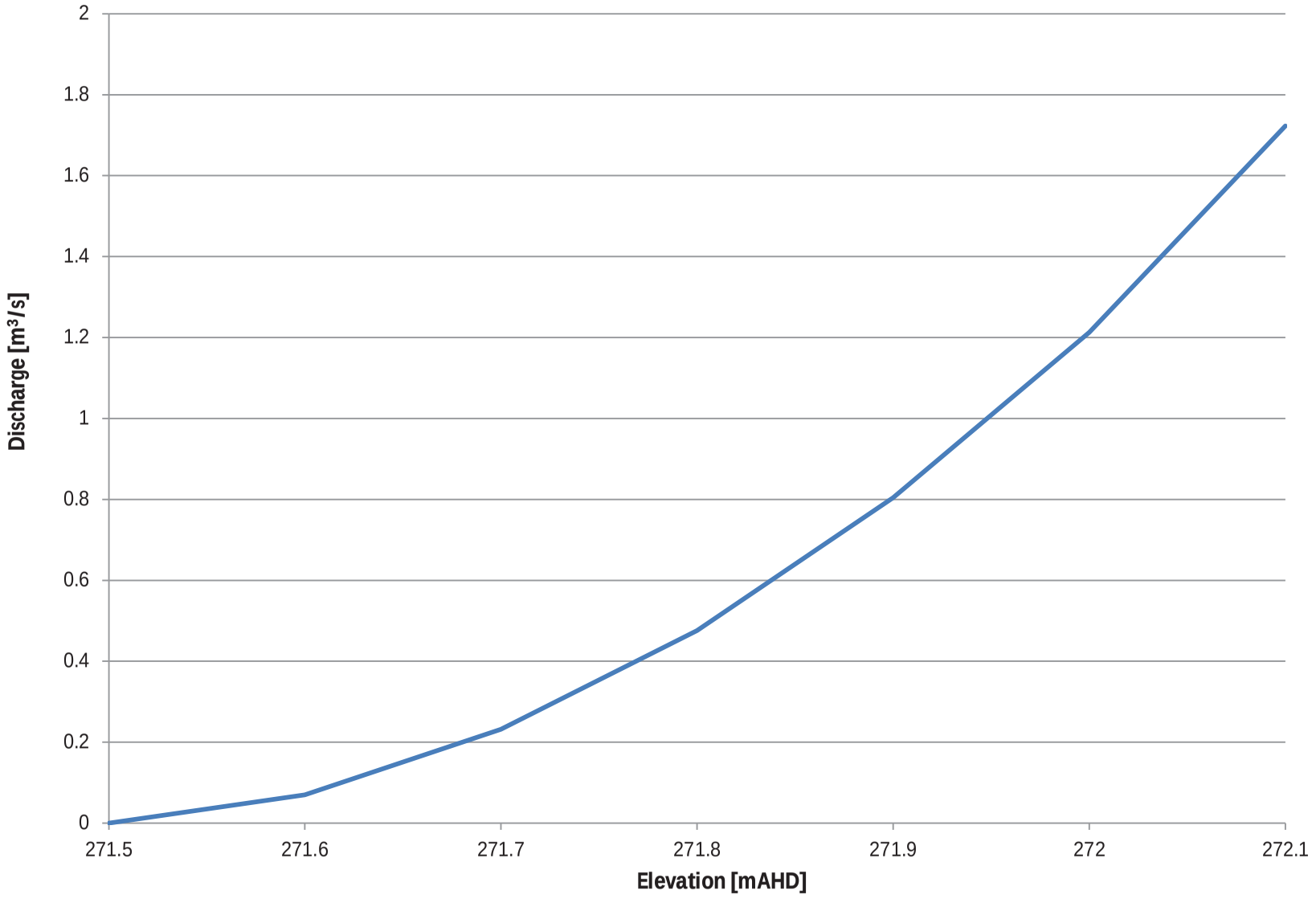

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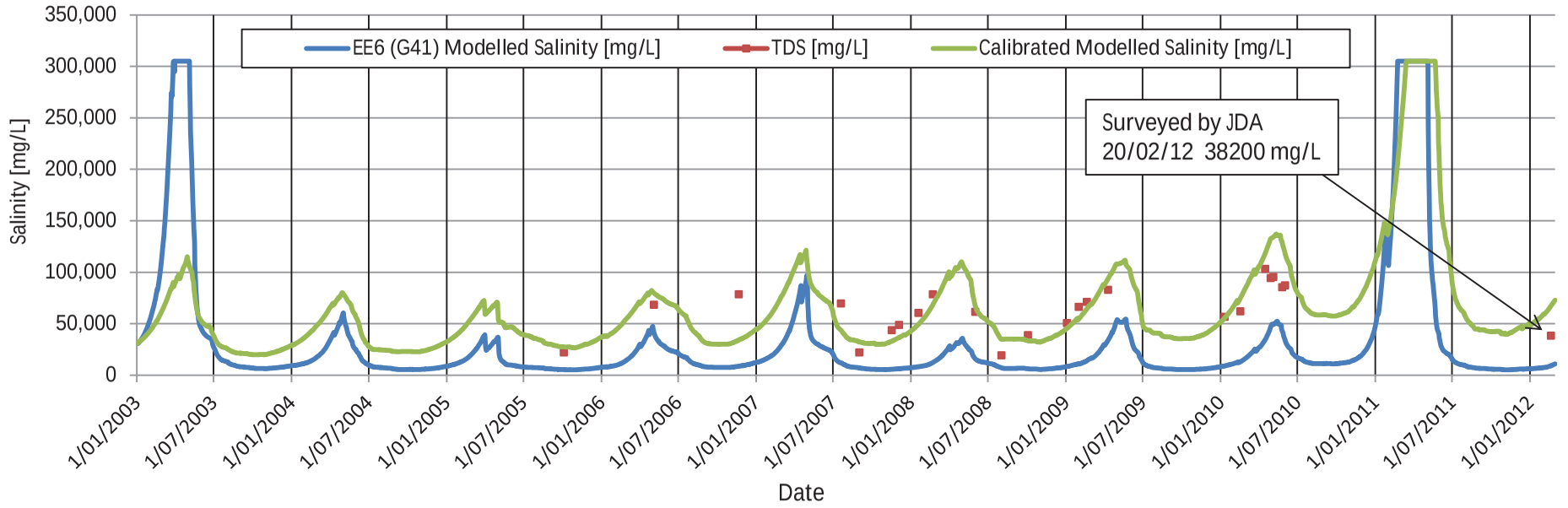
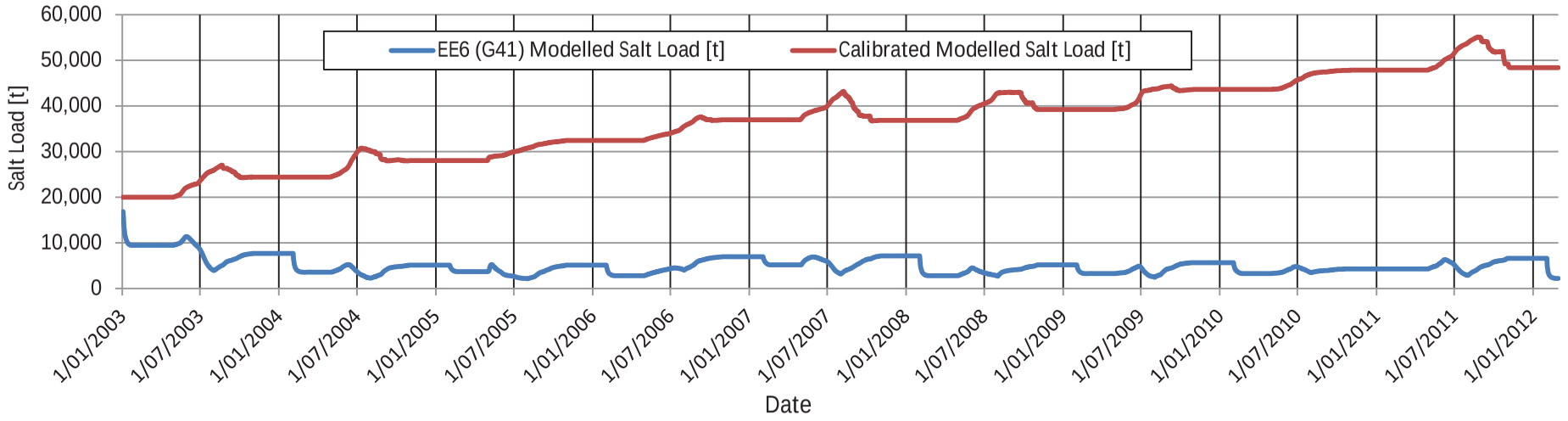
Figure 4.19: Lake Ewlyamartup: Lake Outlet Rating Curve - G41 EE6





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G32: Flushing Channel Invert 271.5 mAHD

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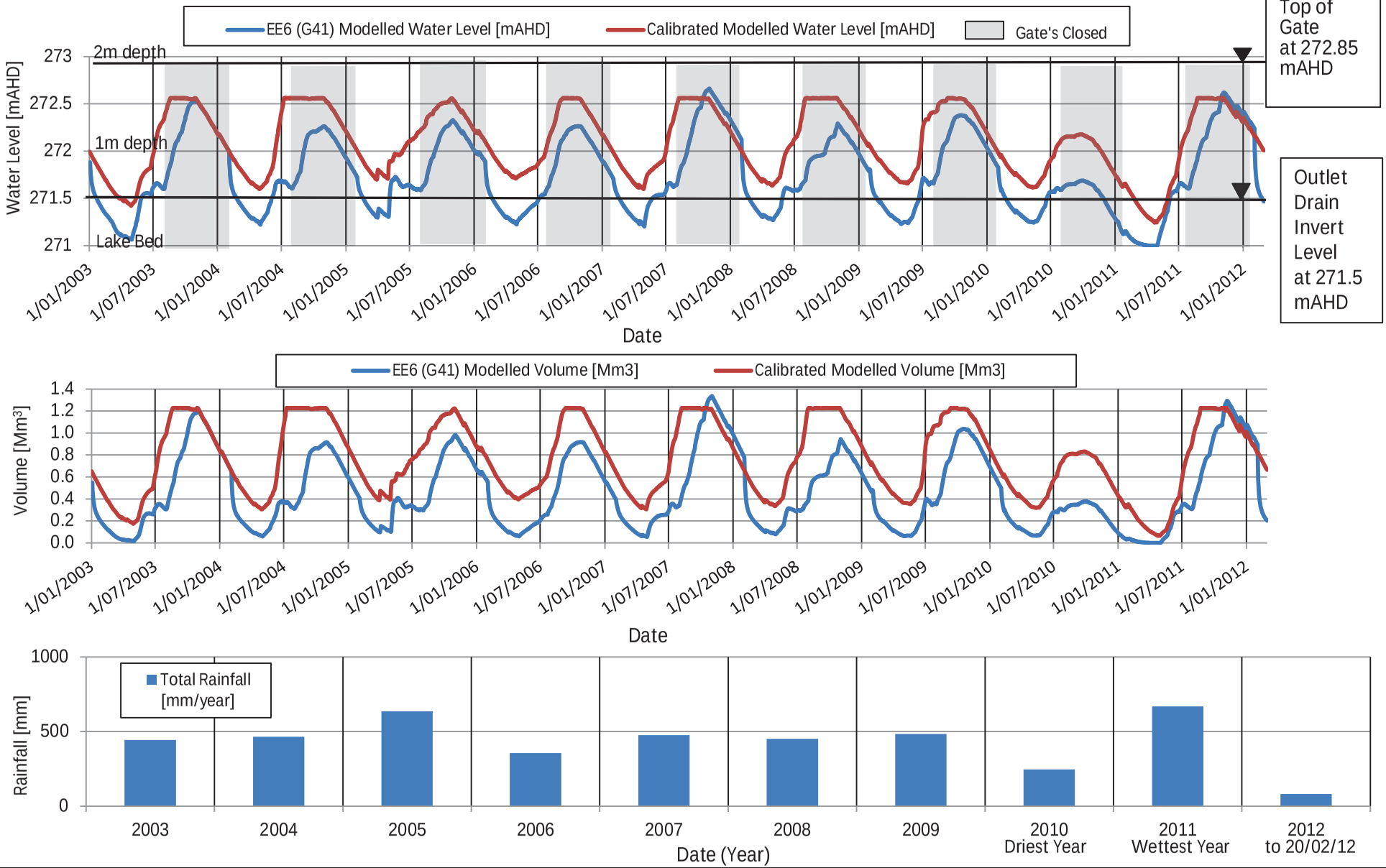
Figure 4.20a: Lake Ewlyamartup: Daily Salt Balance G41 - EE6

10.1.2



Job No: J4905

Note: Gate open February to July
Gate closed August to January
Flushing Channel Invert at 271.5 mAHD

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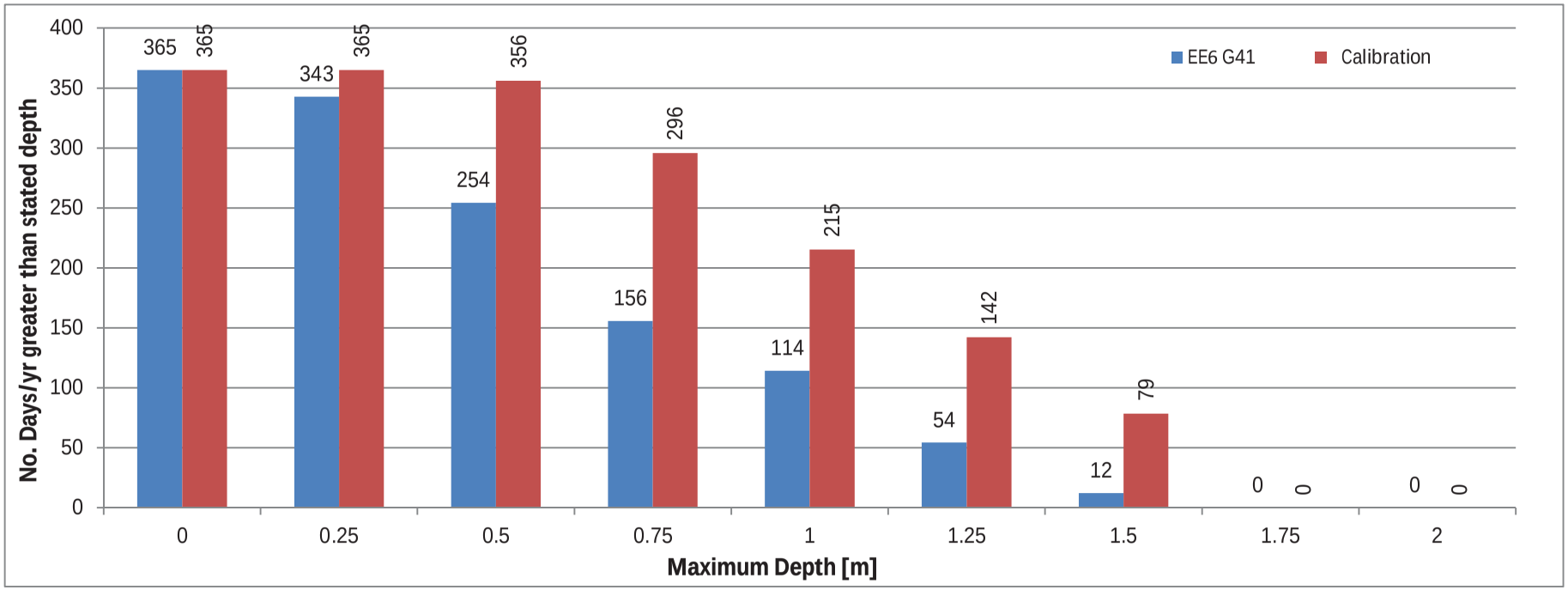
Figure 4.20b: Lake Ewlyamartup: Daily Water Balance G41 - EE6



e.g. No of days/yr > 0.75 m depth = 156 days as per EE6 41

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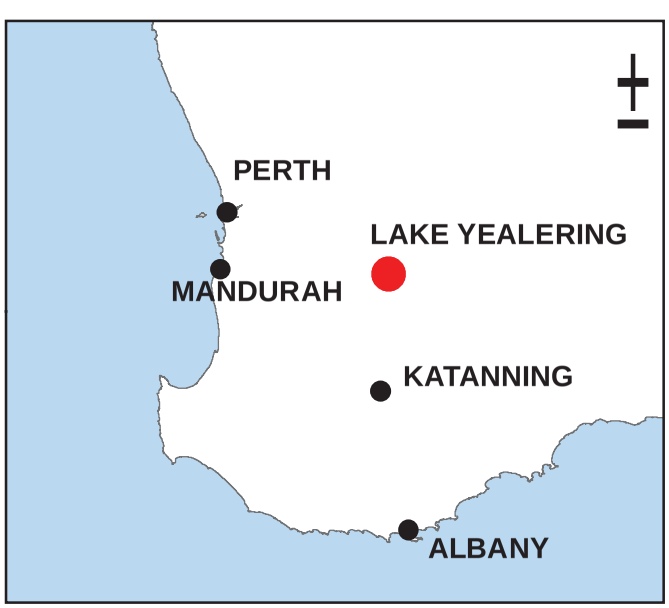
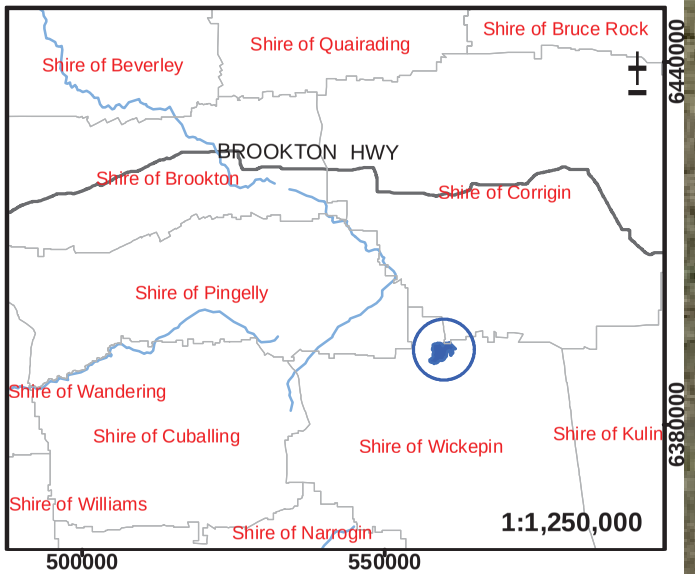
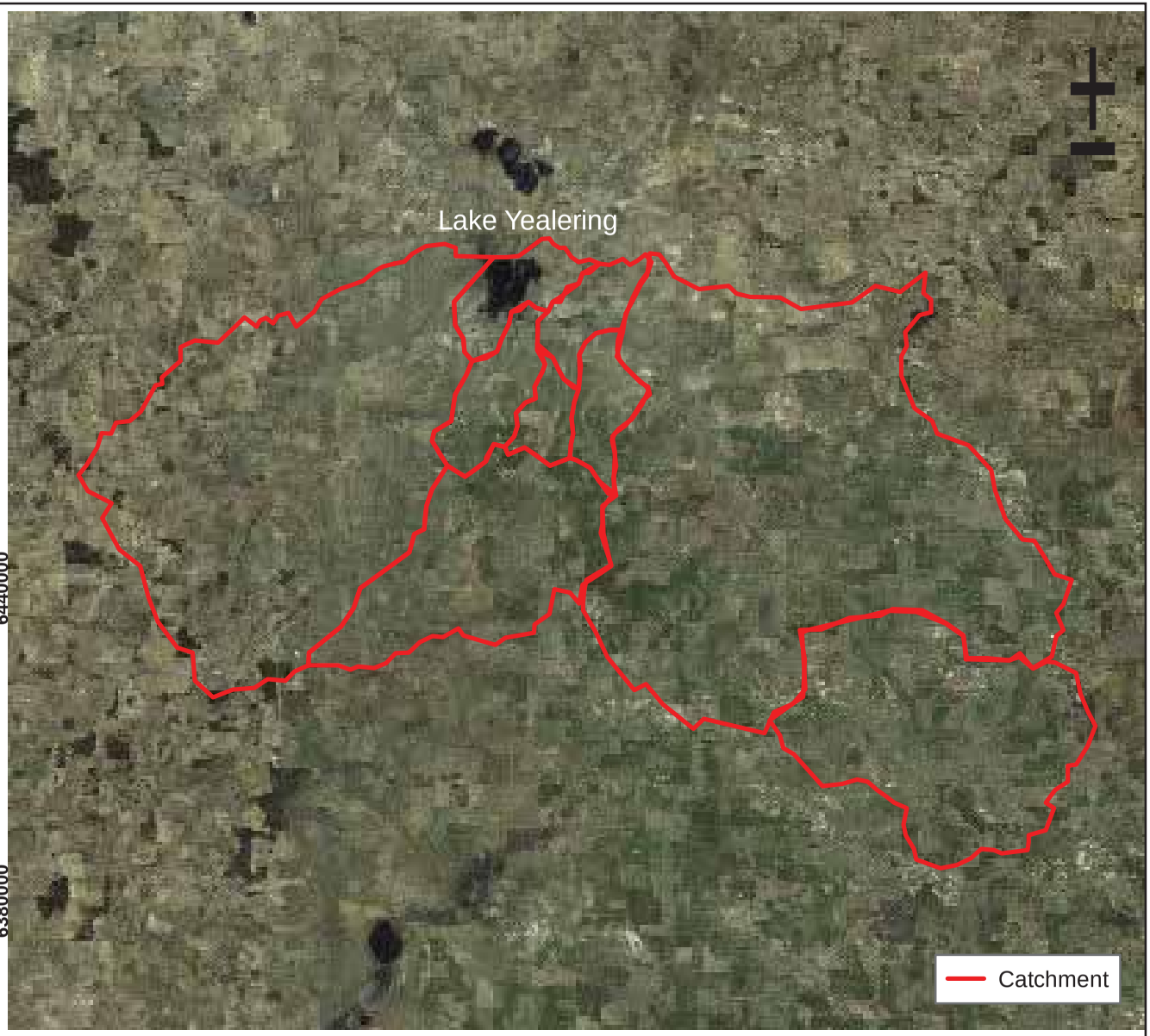
Living Lakes Feasibility Study Stage 1: Part 2
Figure 4.20c: Effect on lake depth - EE6G41







Scale: 1:447,301 0 2.5 5 10 15 20 Kilometers

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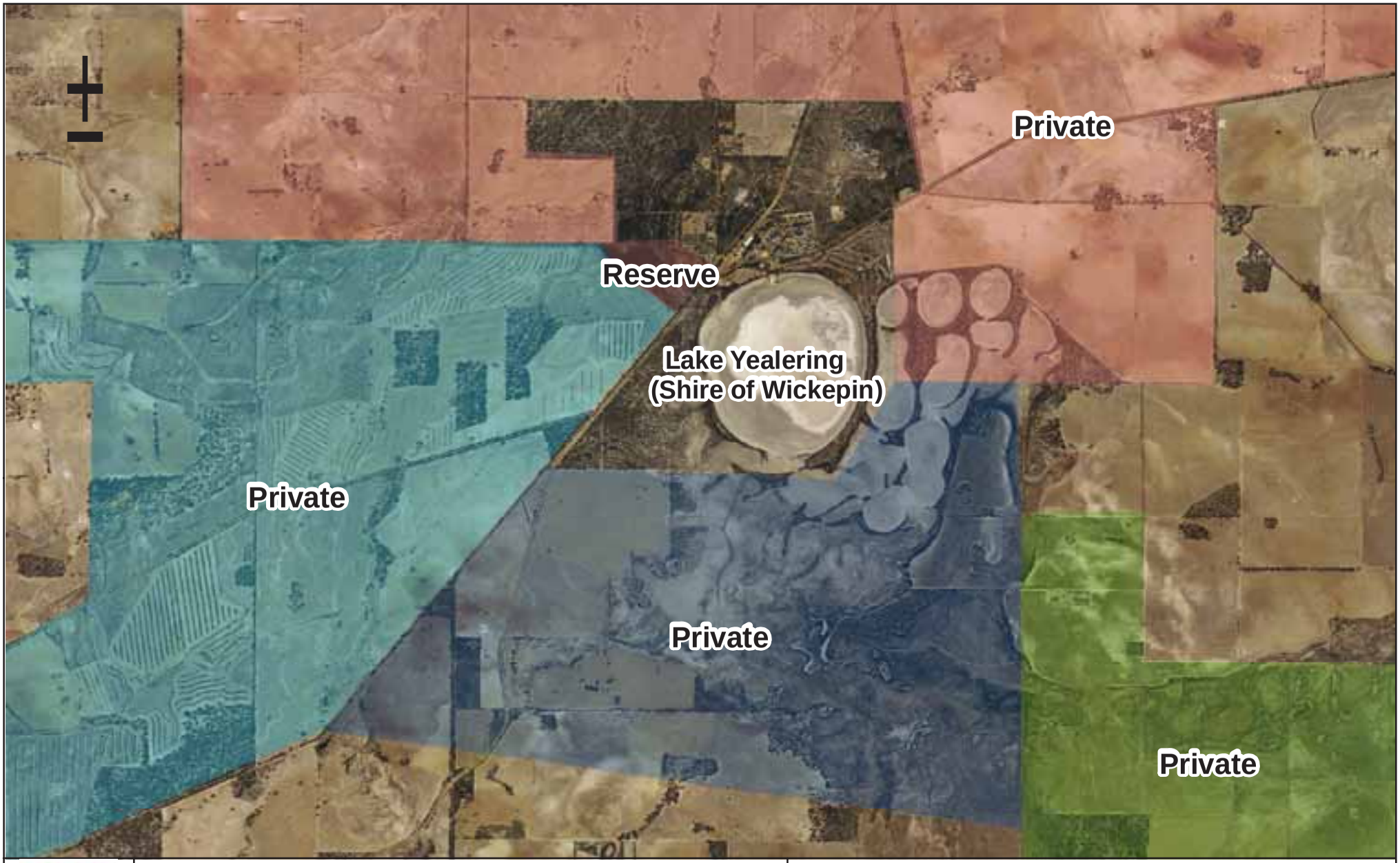
Living Lakes Feasibility Stage 1: Part 2 Report

Figure 5.1: Lake Yealering Location Map and Catchments

10.1.2



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0 500 1,000 1,500 2,000 Metres

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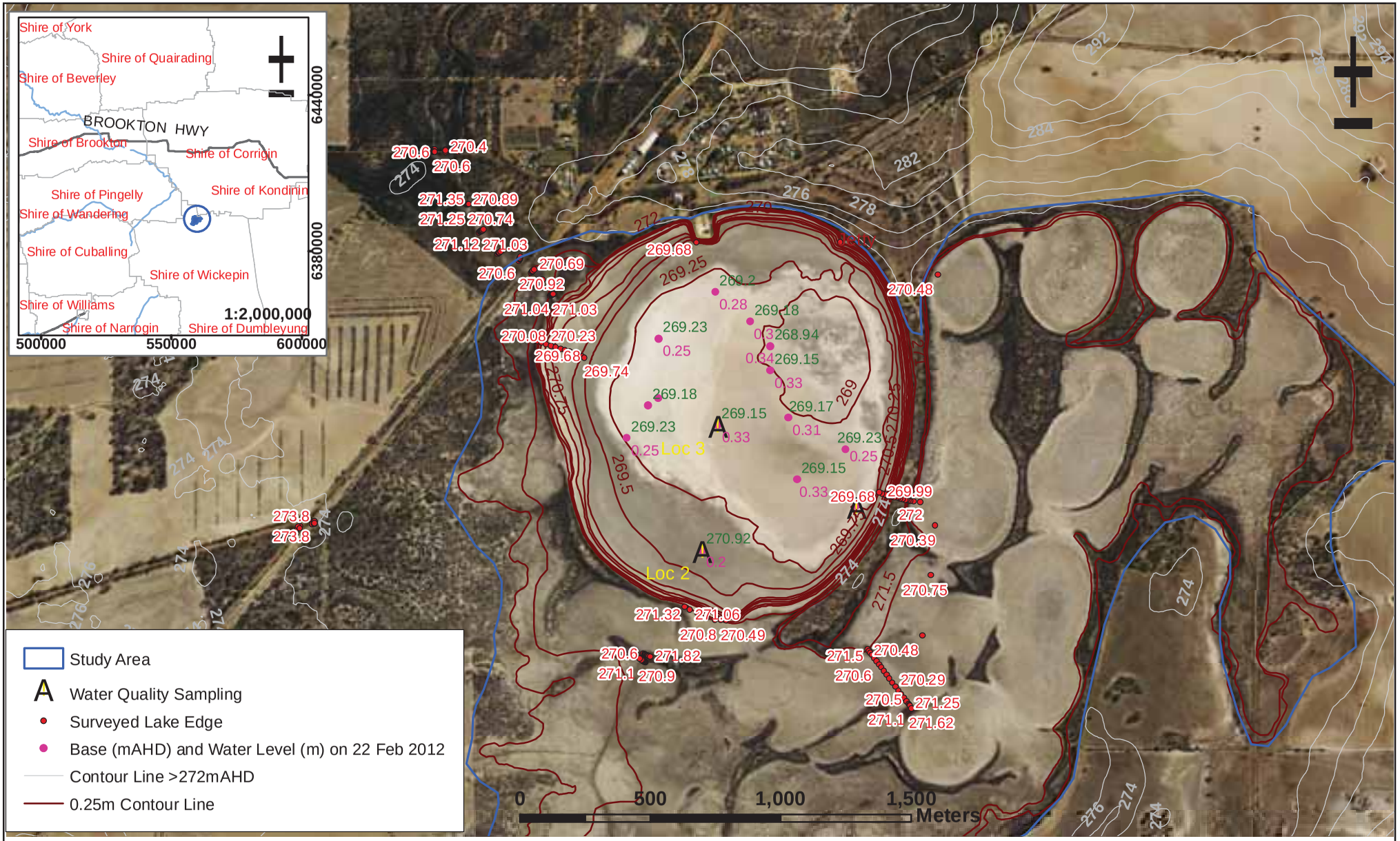
Living Lakes Feasibility Study Stage 1: Part 2
Figure 5.2: Lake Yealering Land Ownership

10.1.2



Data Source: JDA Survey on 22 Feb 2012, JBA Surveys (2012).

Job No. J4905
Scale:1:20,000

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Living Lakes Feasibility Study Stage 1: Part 2 Report

Figure 5.3: Lake Yealering: Lake and Bed Sampling Locations and Lake Bed Contours

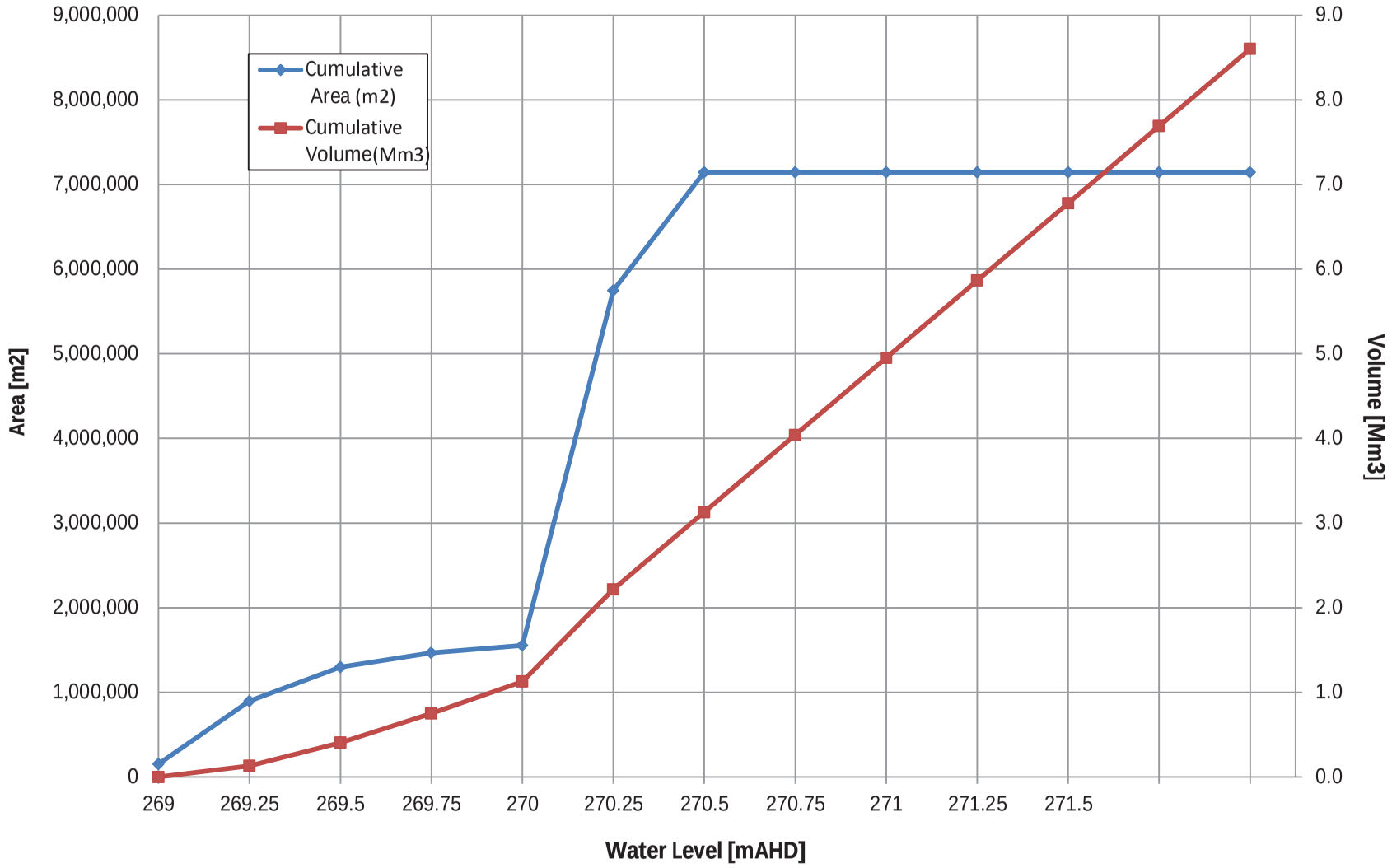

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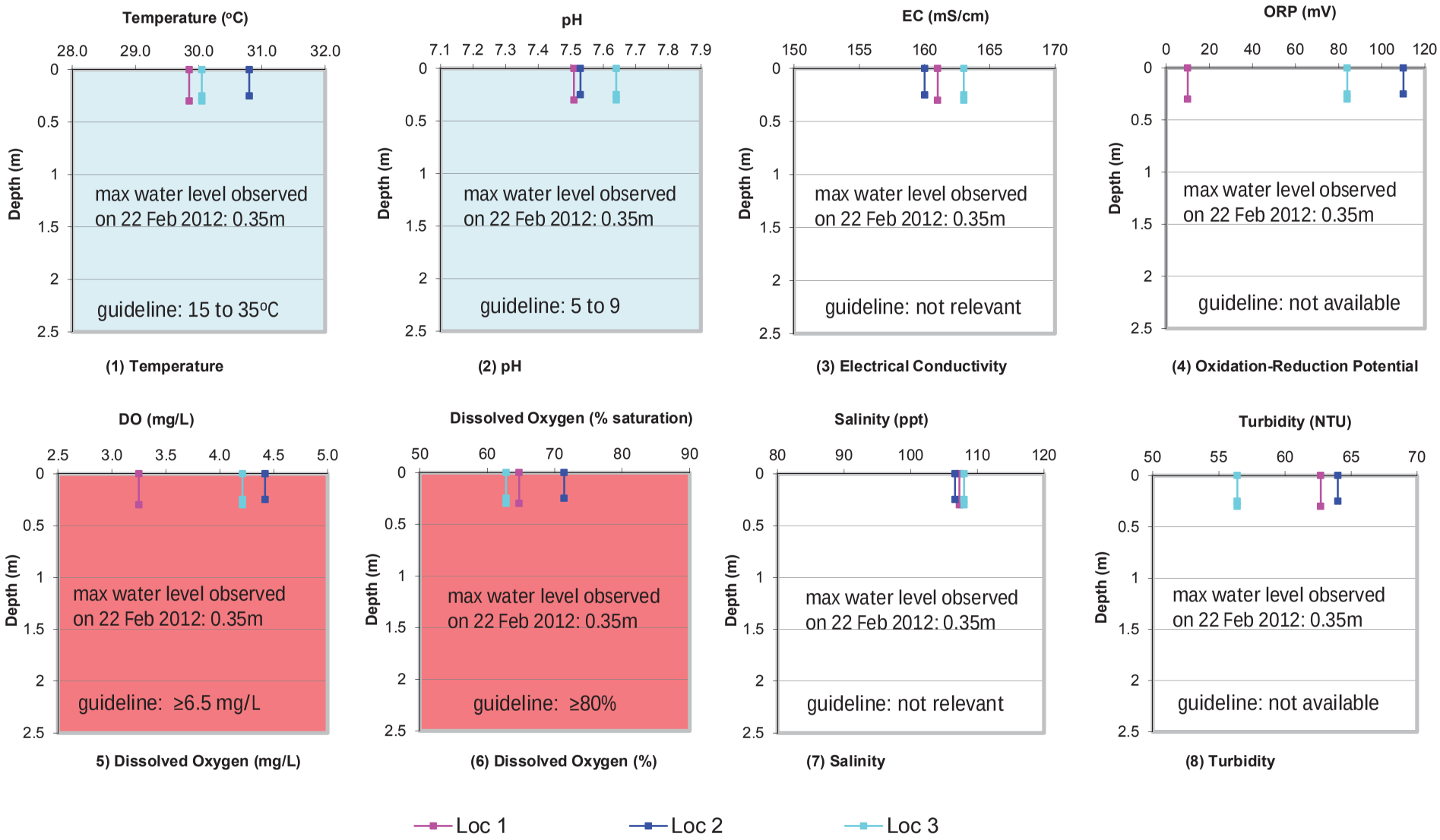
Figure 5.4: Lake Yealering : Lake Bathymetry



Notes:

1. Refer to Figure 5.3 for sampling locations

2. Guideline refer to ANZECC and ARMCANZ (2000) Guidelines for recreational water quality and aesthetic

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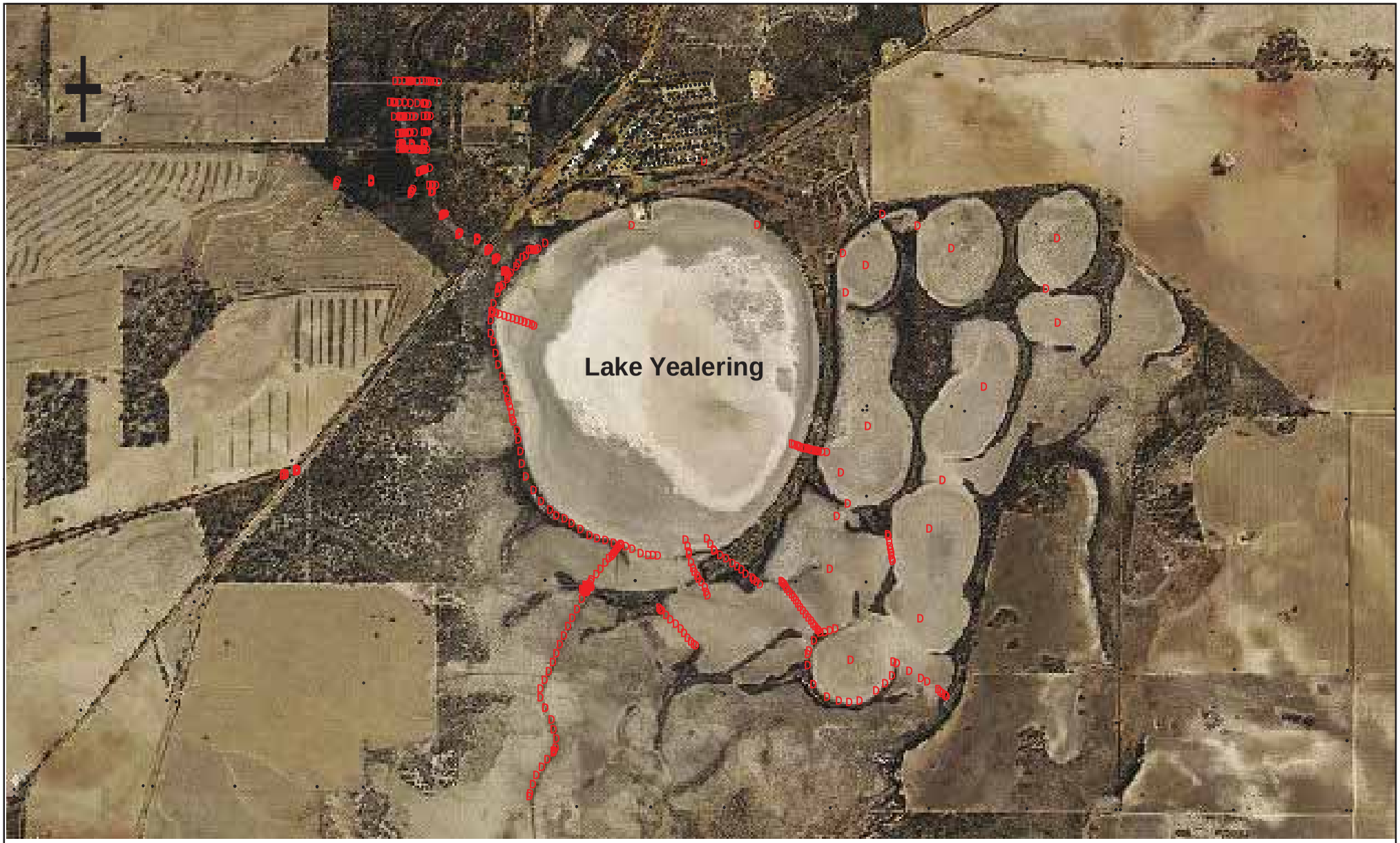
Living Lakes Stage 1 Feasibility Study - Wheatbelt and Adjoining Regions Part 2

Figure 5.5: Lake Yealering Water Quality Profiling



Data Source:

Job No. J4905
Scale:1:22,896

0 500 1,000 1,500 2,000 Meters

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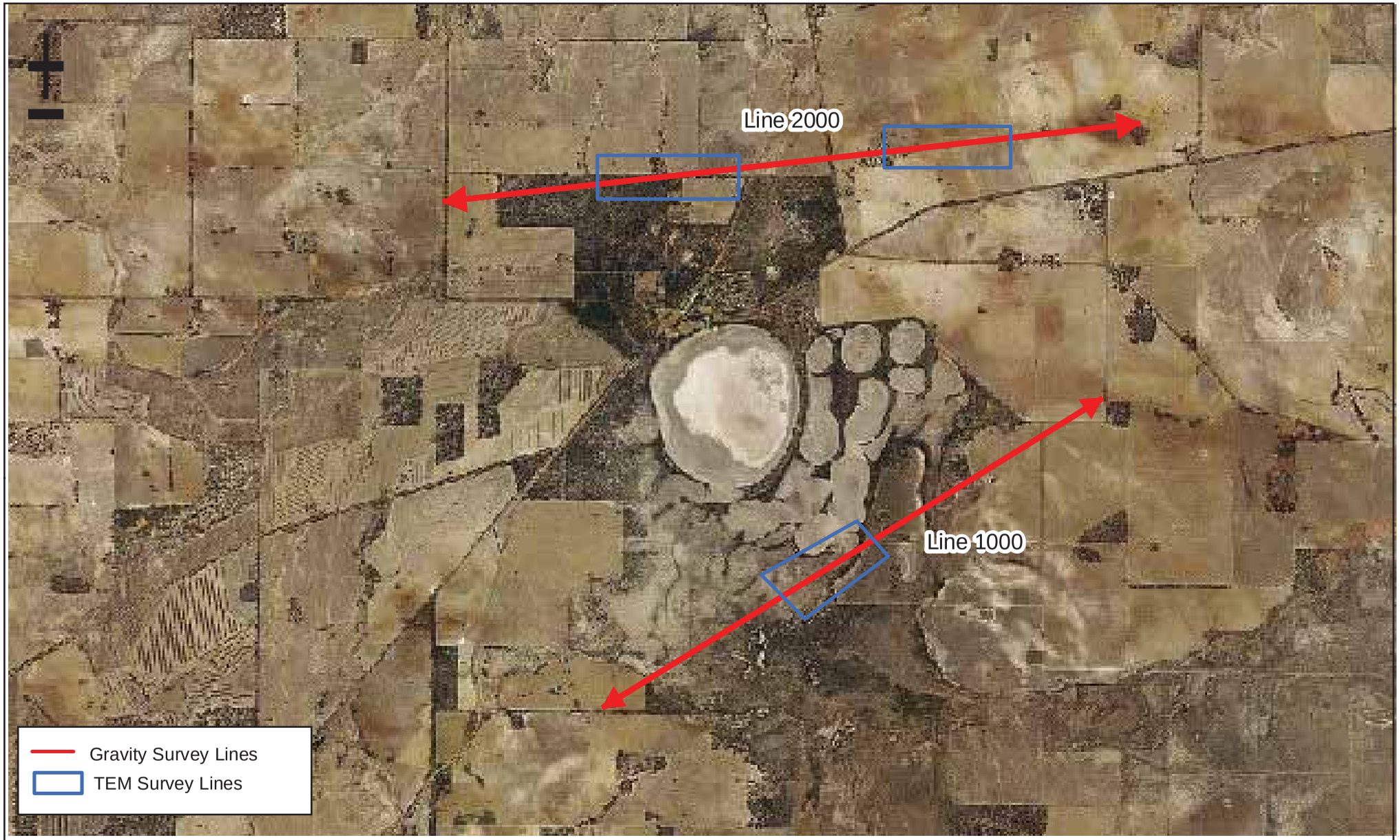
Living Lakes Feasibility Study Stage 1: Part 2
Figure 5.6: Lake Yealering Land Survey Locations

10.1.2



Data Source:

Job No. J4905
Scale:1:50,000
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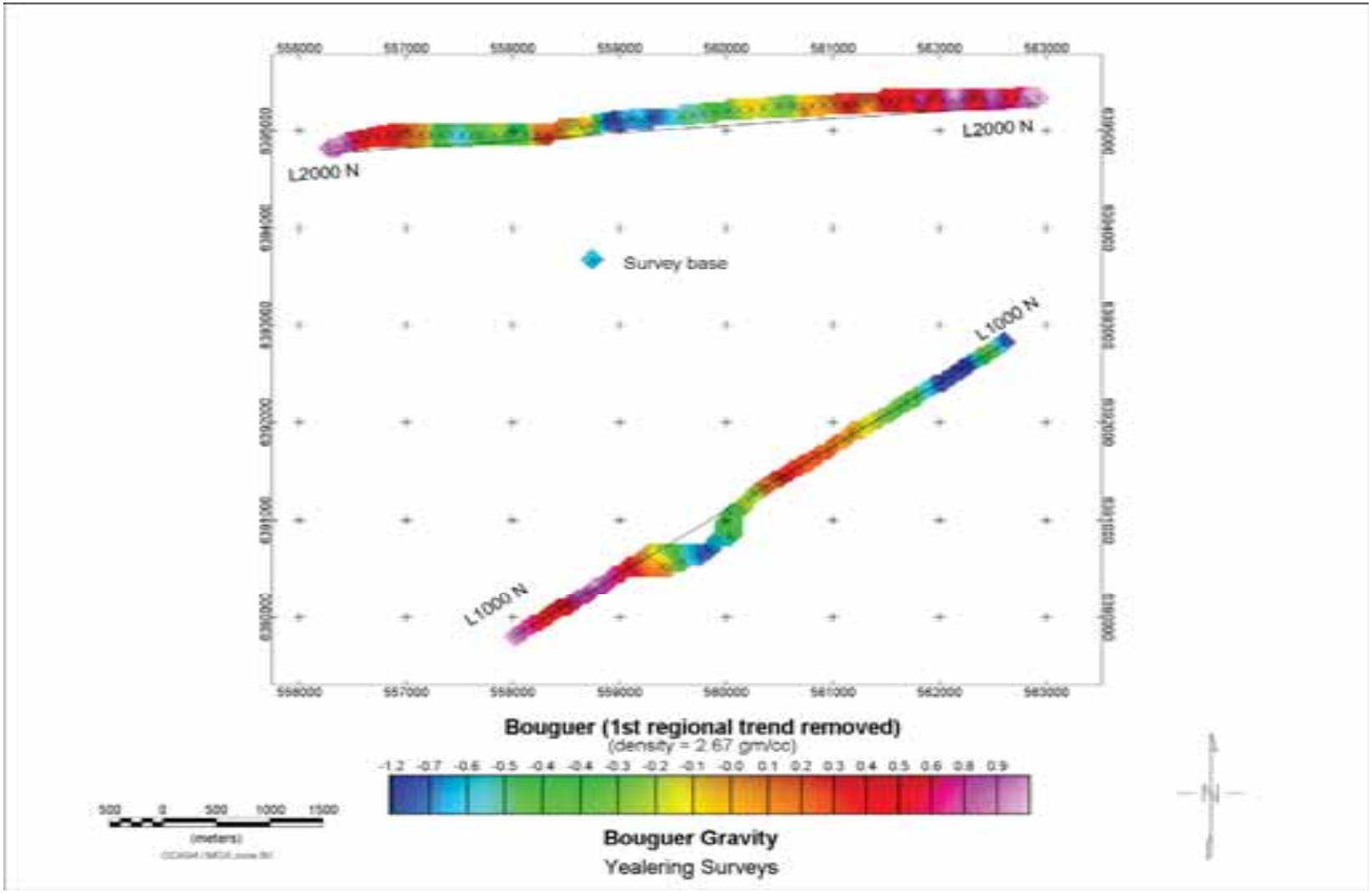
Living Lakes Feasibility Study Stage 1: Part 2

Figure 5.7a: Lake Yealering Geophysics Survey Lines (Fugro)

10.1.2



Job No. J4905

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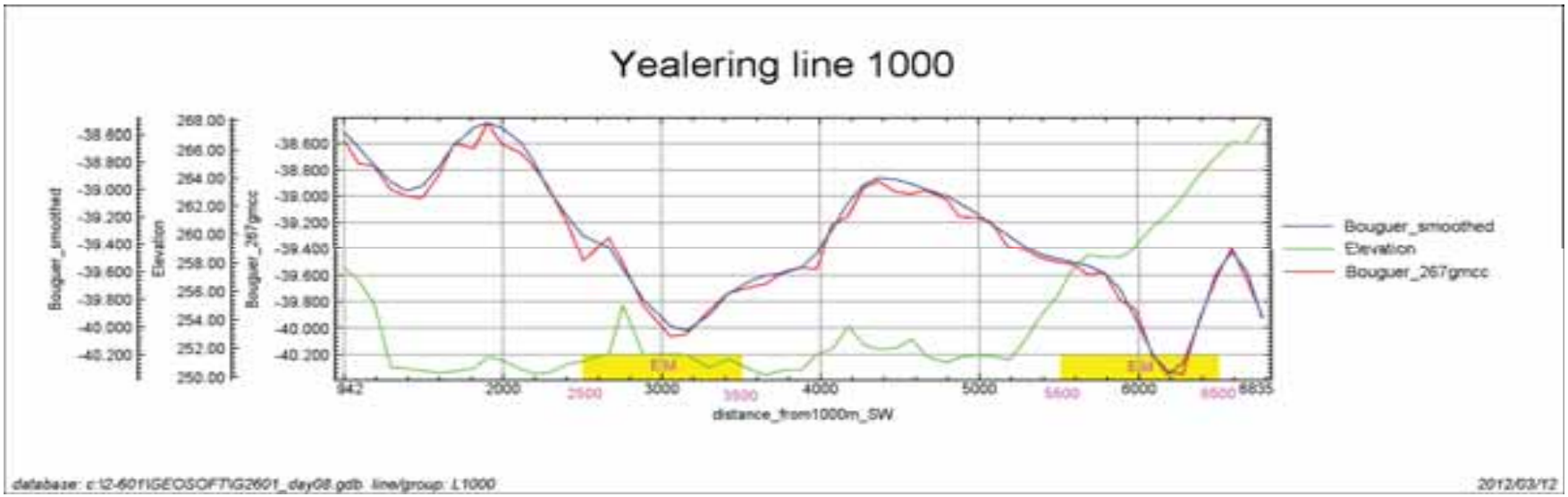
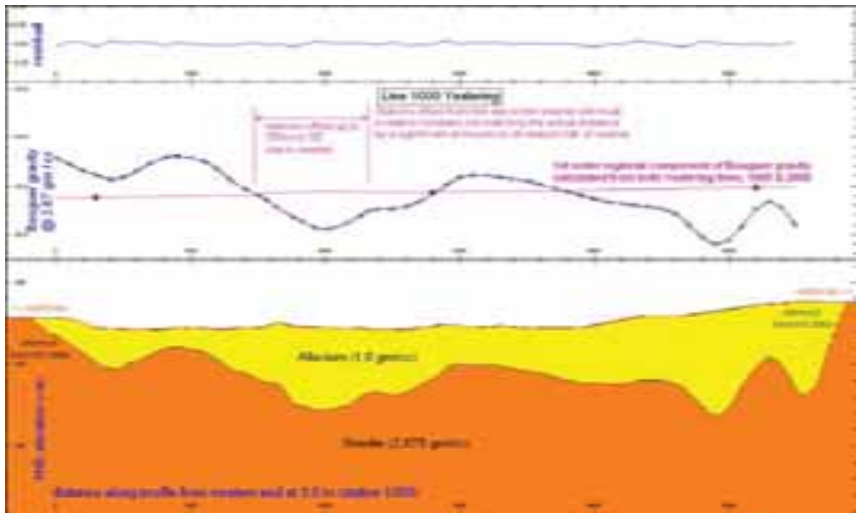
Figure 5.7b: Lake Yealering Gravity Transect Results





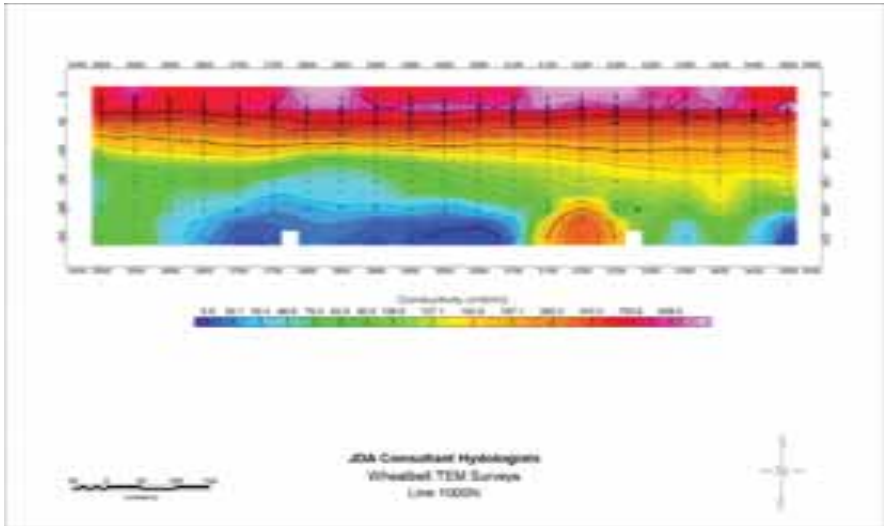


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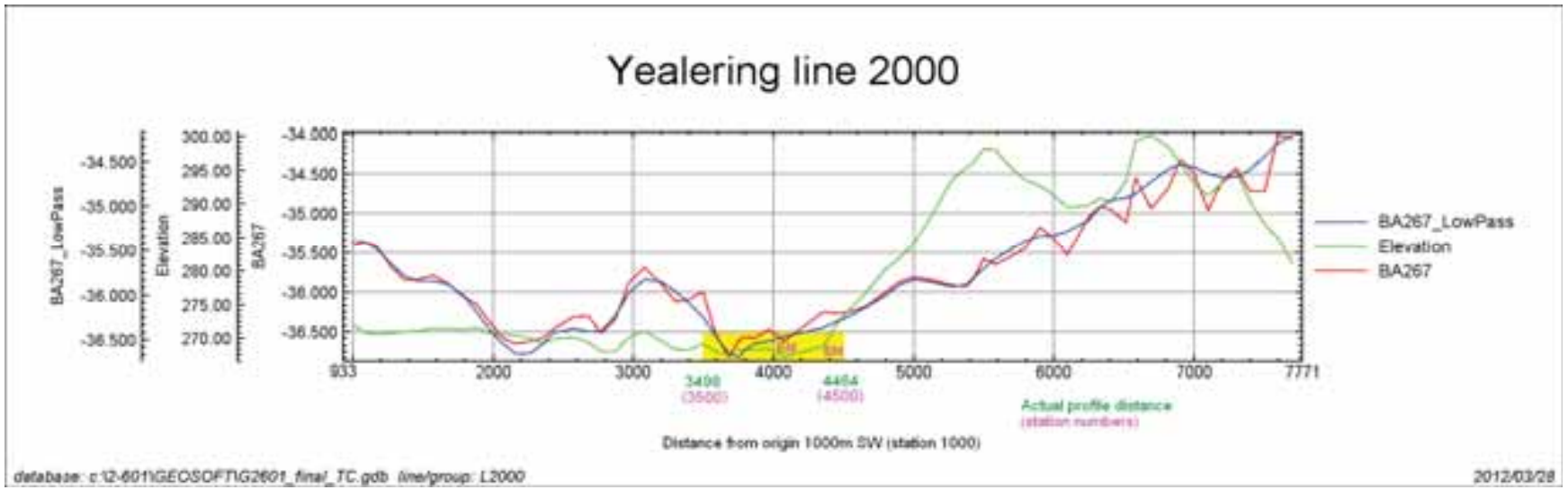
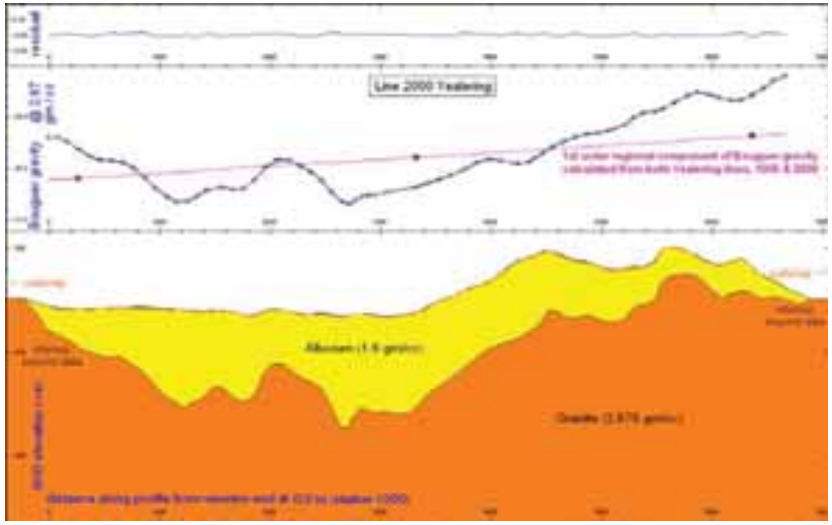
Figure 5.7c Lake Yealering Geophysical Survey Results

10.1.2





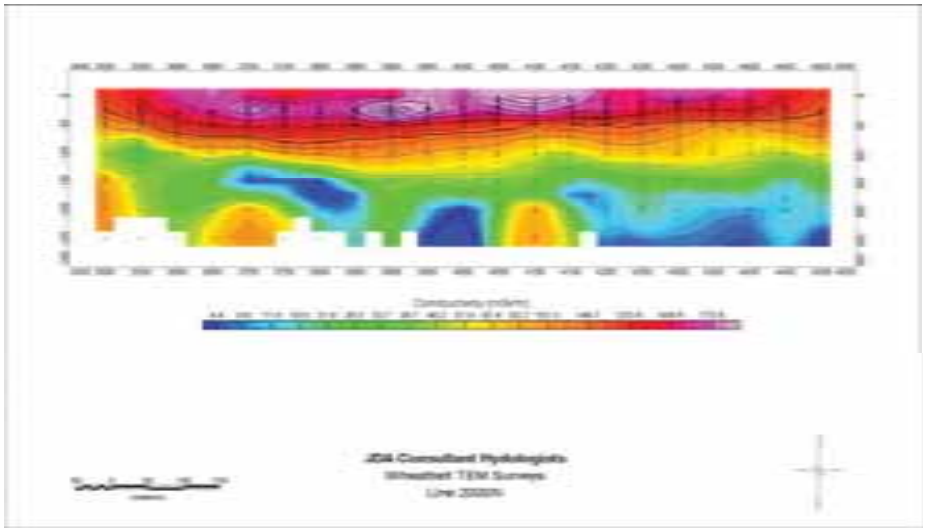


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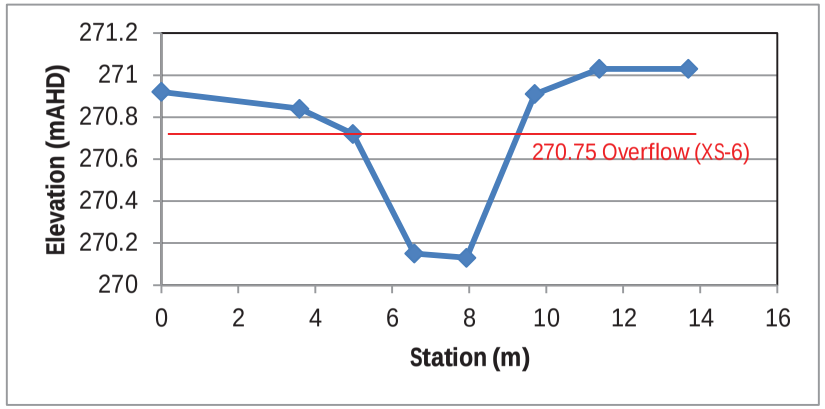
Figure 5.7d Lake Yealering Geophysical Survey Results

10.1.2

XS-1

Station (m)	Elevation (mAHD)
0	270.92
3.59	270.84
4.98	270.72
6.57	270.15
7.93	270.13
9.70	270.91
11.38	271.03
13.69	271.03



Note: 271.56 mAHD Max. recorded water level (1983)

Data Source: JBA Surveys works

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Living Lakes Feasibility Study Stage 1: Part 2

Figure 5.8a Lake Yealering: Surveyed Cross Section XS-1

10.1.2

XS-2

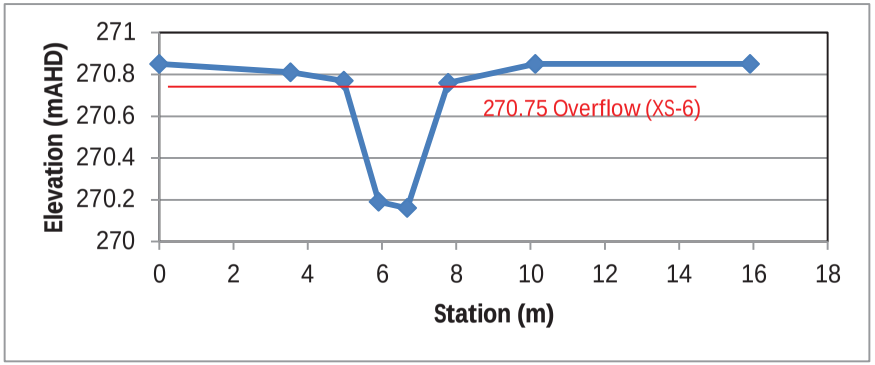
Station (m)	Elevation (mAHD)
0	270.85
3.54	270.81
4.97	270.77
5.91	270.19
6.68	270.16
7.78	270.76
10.13	270.85
15.91	270.85

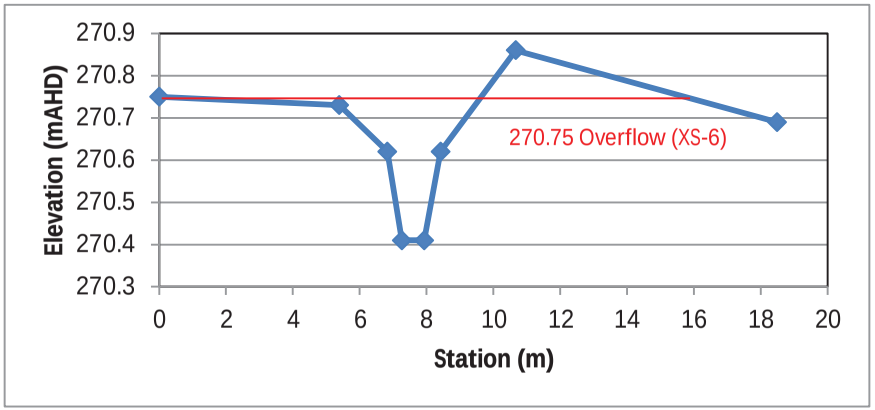
XS-3

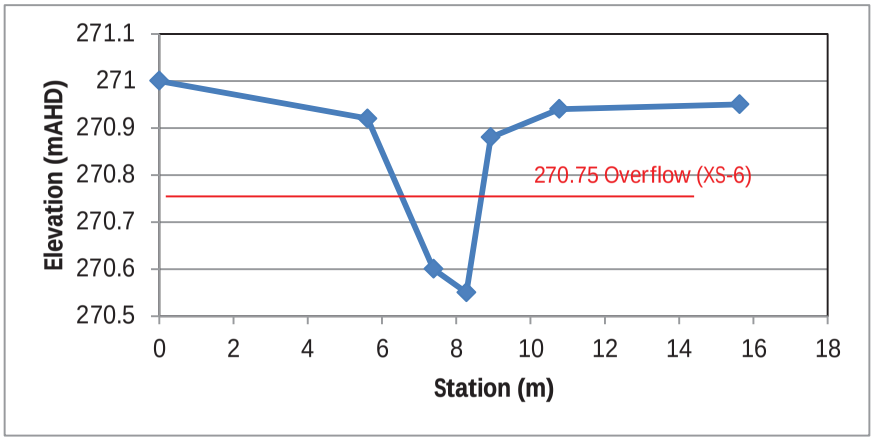
Station (m)	Elevation (mAHD)
0	270.75
5.39	270.73
6.83	270.62
7.26	270.41
7.93	270.41
8.42	270.62
10.67	270.86
18.49	270.69

XS-4

Station (m)	Elevation (mAHD)
0	271.00
5.61	270.92
7.39	270.6
8.27	270.55
8.93	270.88
10.77	270.94
15.63	270.95







Data Source: JBA Surveys works

Note: 271.56 mAHD Max. recorded water level (1983)

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Living Lakes Feasibility Study Stage 1: Part 2

Figure 5.8b Lake Yealering: Surveyed Cross Sections XS-2 to XS-4

10.1.2

XS-5

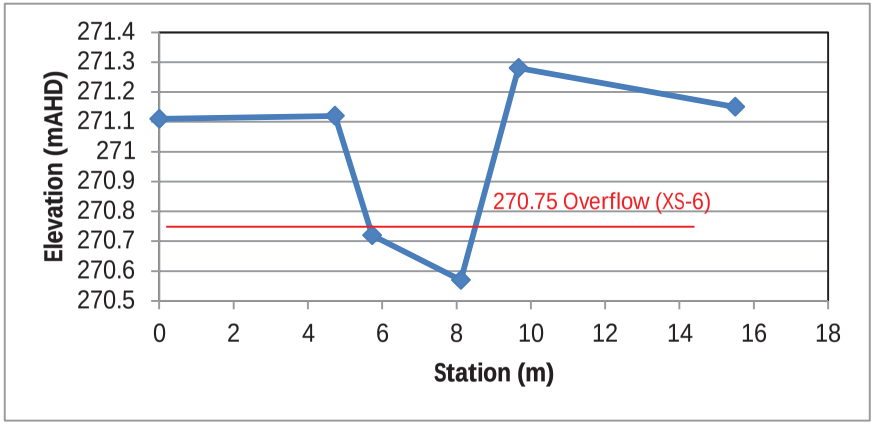
Station (m)	Elevation (mAHD)
0	271.11
4.73	271.12
5.73	270.72
8.12	270.57
9.67	271.28
15.5	271.15

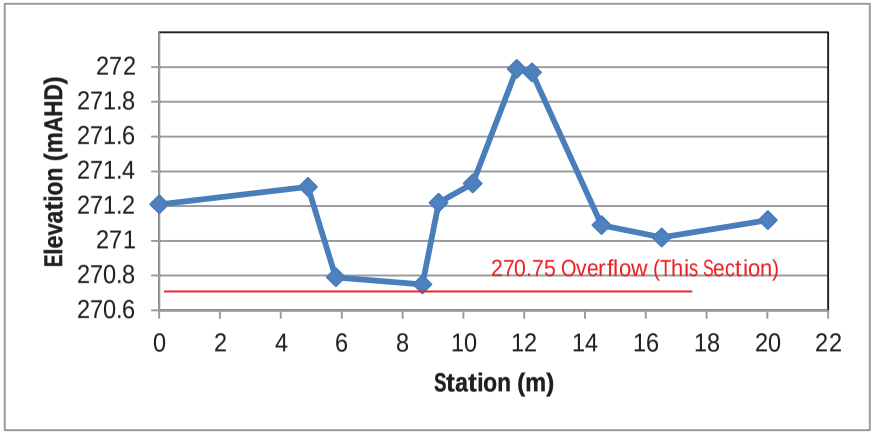
XS-6

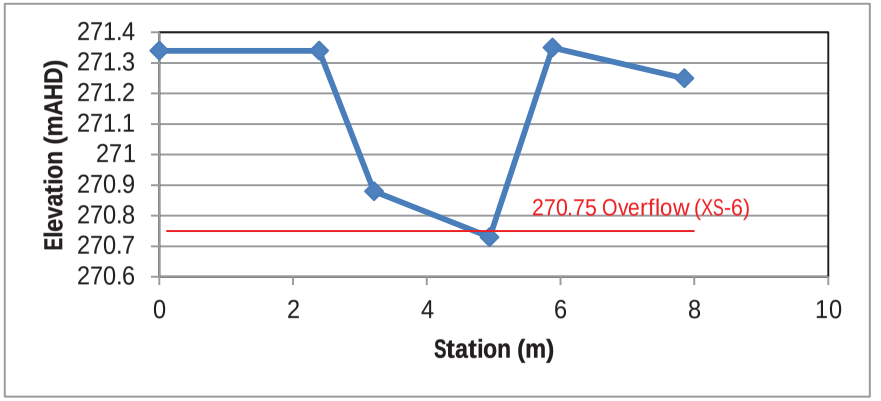
Station (m)	Elevation (mAHD)
0	271.21
4.89	271.31
5.81	270.79
8.66	270.75
9.19	271.22
10.31	271.33
11.76	271.99
12.26	271.97
14.55	271.09
16.53	271.02
20.02	271.12

XS-7

Station (m)	Elevation (mAHD)
0	271.34
2.39	271.34
3.21	270.88
4.94	270.73
5.88	271.35
7.85	271.25







Data Source: JBA Surveys works

Note: 271.56 mAHD Max. recorded water level (1983)

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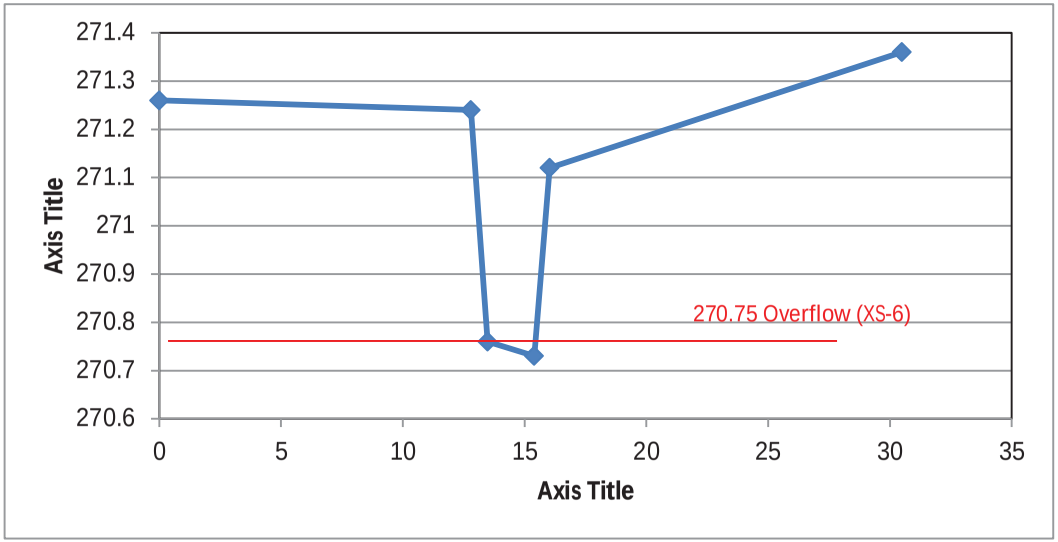
Living Lakes Feasibility Study Stage 1: Part 2

Figure 5.8c Lake Yealering: Surveyed Cross Sections XS-5 to XS-7

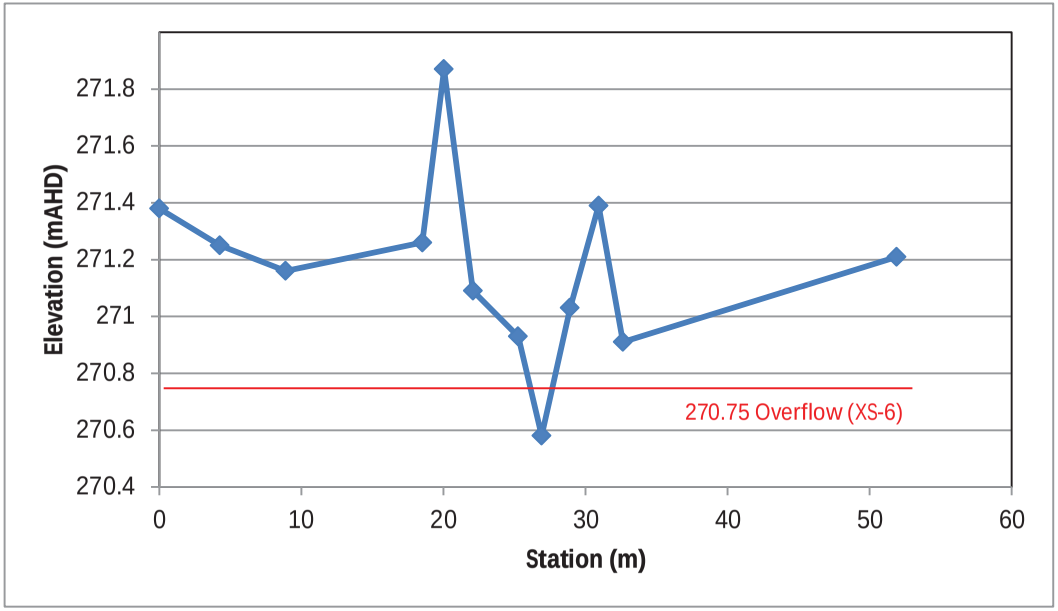
XS-8

Station (m)	Elevation (mAHD)
0	271.26
12.8	271.24
13.48	270.76
15.4	270.73
16.03	271.12
30.5	271.36



XS-9

Station (m)	Elevation (mAHD)
0	271.38
4.26	271.25
8.9	271.16
18.52	271.26
20.04	271.87
22.08	271.09
25.26	270.93
26.92	270.58
28.91	271.03
30.93	271.39
32.64	270.91
51.91	271.21



Data Source: JBA Surveys works

Note: 271.56 mAHD Max. recorded water level (1983)

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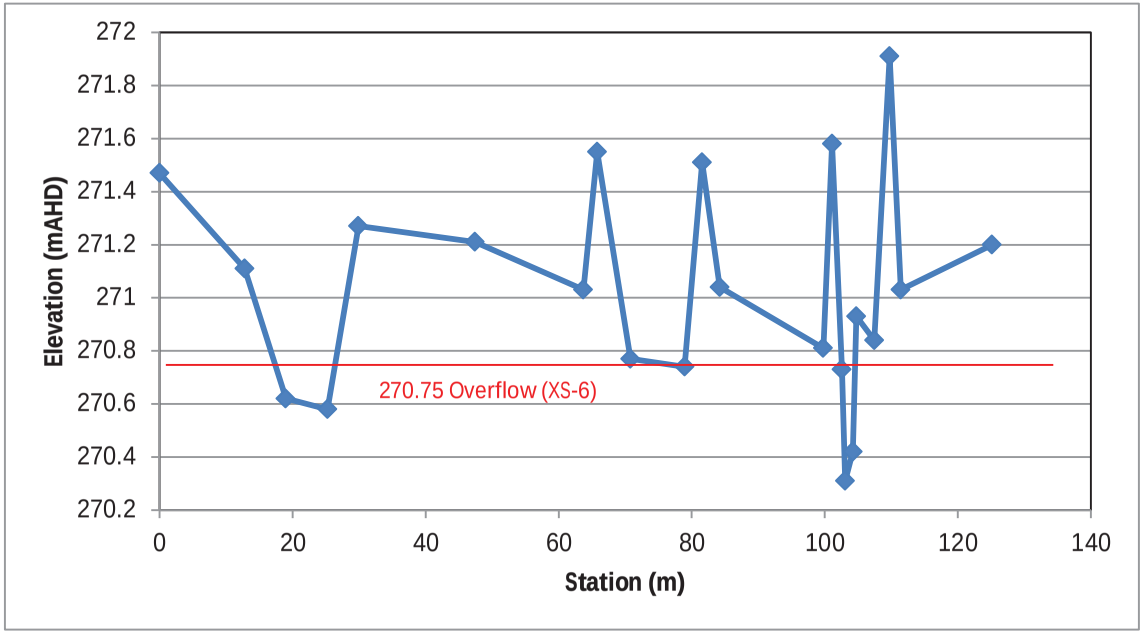
Living Lakes Feasibility Study Stage 1: Part 2

Figure 5.8d Lake Yealering: Surveyed Cross Sections XS-8 to XS-9

10.1.2

XS-10

Station (m)	Elevation (mAHD)
0	271.47
12.78	271.11
18.97	270.62
25.24	270.58
29.89	271.27
47.41	271.21
63.71	271.03
65.79	271.55
70.81	270.77
78.93	270.74
81.56	271.51
84.22	271.04
99.78	270.81
101.11	271.58
102.56	270.73
103.08	270.31
104.22	270.42
104.73	270.93
107.44	270.84
109.74	271.91
111.42	271.03
125.15	271.2



Data Source: JBA Surveys works

Note: 271.56 mAHD Max. recorded water level (1983)

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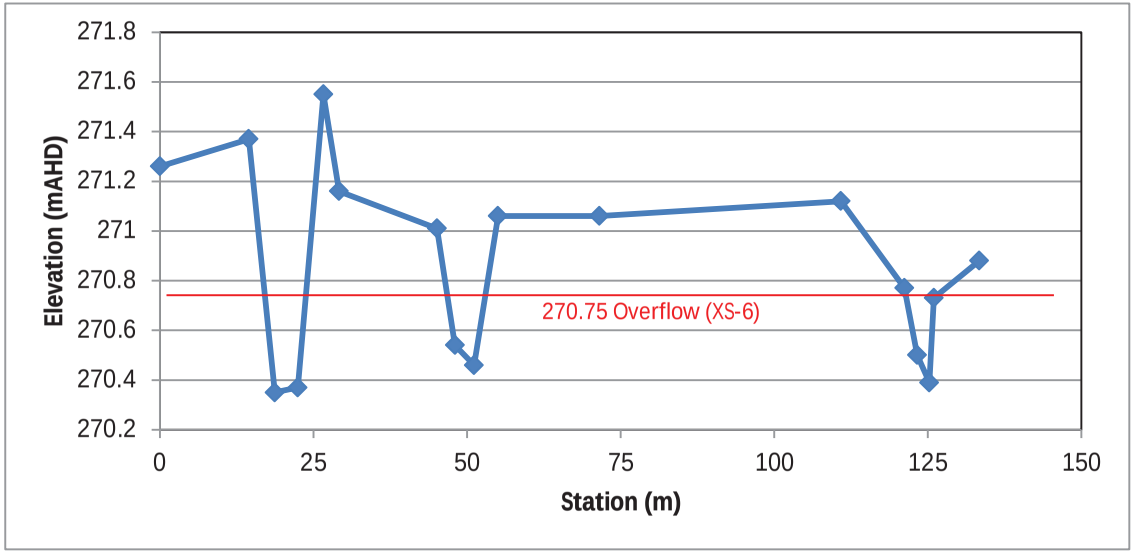
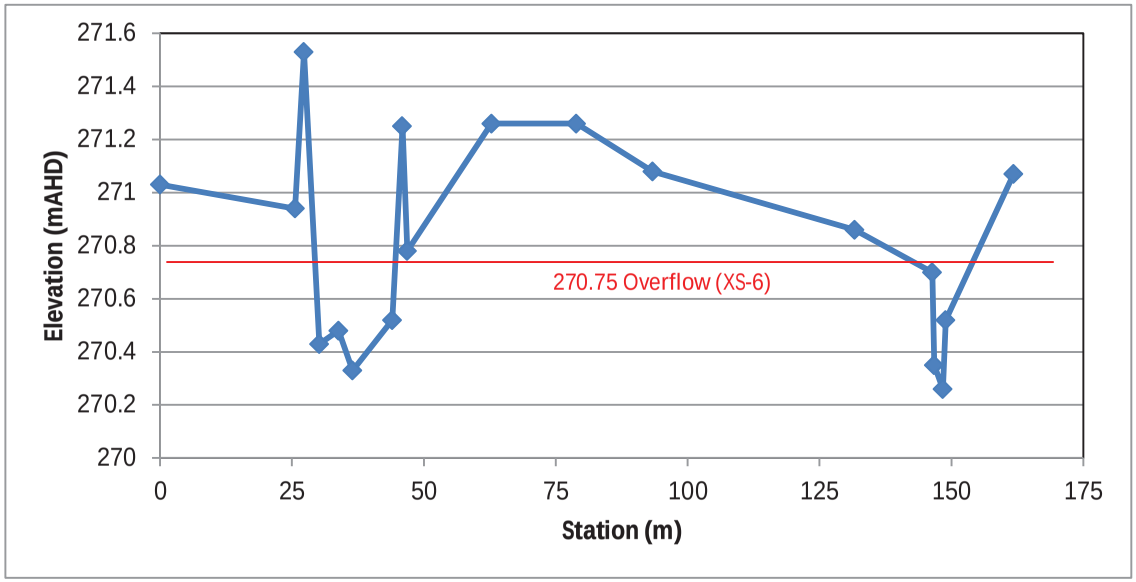
Living Lakes Feasibility Study Stage 1: Part 2

Figure 5.8e Lake Yealering: Surveyed Cross Sections XS-10

XS-11	Station (m)	Elevation (mAHD)
	0	271.26
	14.46	271.37
	18.72	270.35
	22.43	270.37
	26.64	271.55
	29.19	271.16
	45.12	271.01
	48.04	270.54
	51.13	270.46
	55.05	271.06
	71.56	271.06
	110.89	271.12
	121.23	270.77
	123.31	270.5
	125.27	270.39
	126.01	270.73
	133.39	270.88



XS-12	Station (m)	Elevation (mAHD)
	0	271.03
	25.61	270.94
	27.26	271.53
	30.19	270.43
	33.84	270.48
	36.49	270.33
	44.00	270.52
	45.93	271.25
	46.86	270.78
	62.82	271.26
	78.93	271.26
	93.39	271.08
	131.65	270.86
	146.39	270.7
	146.74	270.35
	148.38	270.26
	148.91	270.52
	161.82	271.07



Data Source: JBA

Note: 271.56 mAHD Max. recorded water level (1983)

Job No: J4905

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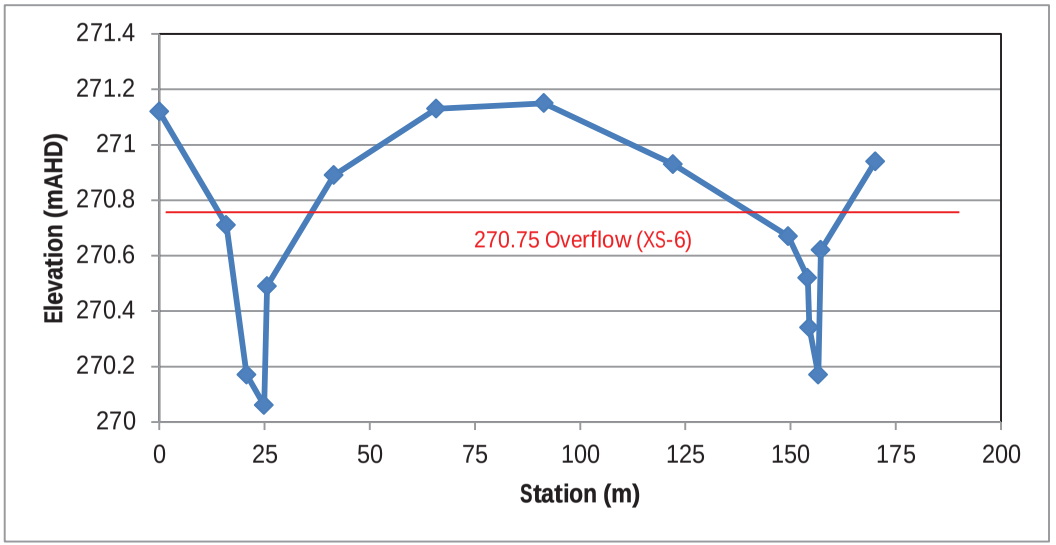
Living Lakes Feasibility Study Stage 1: Part 2

Figure 5.8f Lake Yealering: Surveyed Cross Sections XS-11 to XS-12

10.1.2

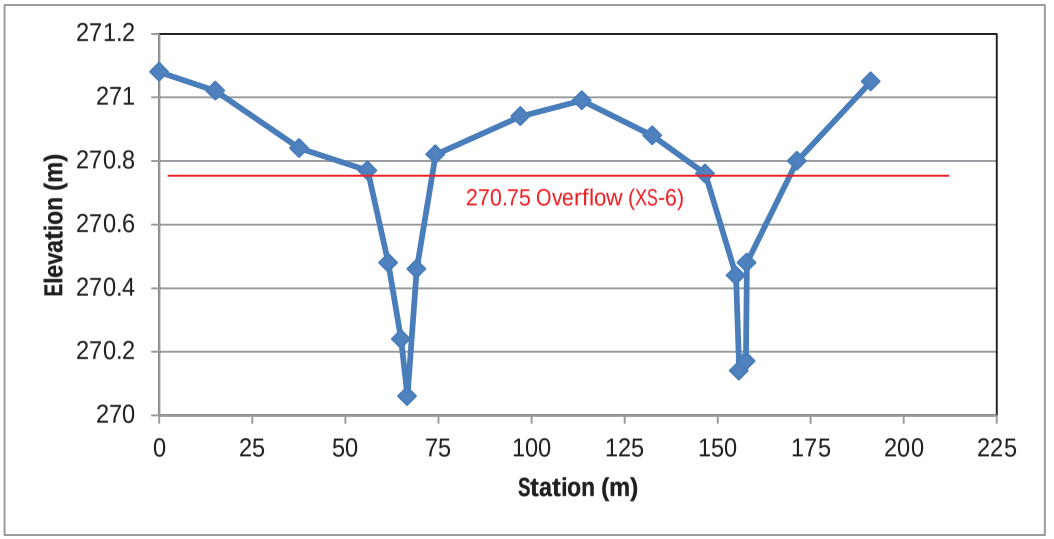
XS-13

Station (m)	Elevation (mAHD)
0	271.12
15.91	270.71
20.75	270.17
24.88	270.06
25.58	270.49
41.49	270.89
65.78	271.13
91.43	271.15
122.08	270.93
149.44	270.67
154.05	270.52
154.46	270.34
156.58	270.17
157.22	270.62
170.14	270.94



XS-14

Station (m)	Elevation (mAHD)
0	271.08
15.09	271.02
37.66	270.84
55.98	270.77
61.52	270.48
64.94	270.24
66.65	270.06
69.17	270.46
74.22	270.82
97.03	270.94
113.54	270.99
132.48	270.88
146.65	270.76
154.92	270.44
155.79	270.14
157.61	270.17
157.87	270.48
171.34	270.8
191.17	271.05



Data Source: JBA

Note: 271.56 mAHD Max. recorded water level (1983)

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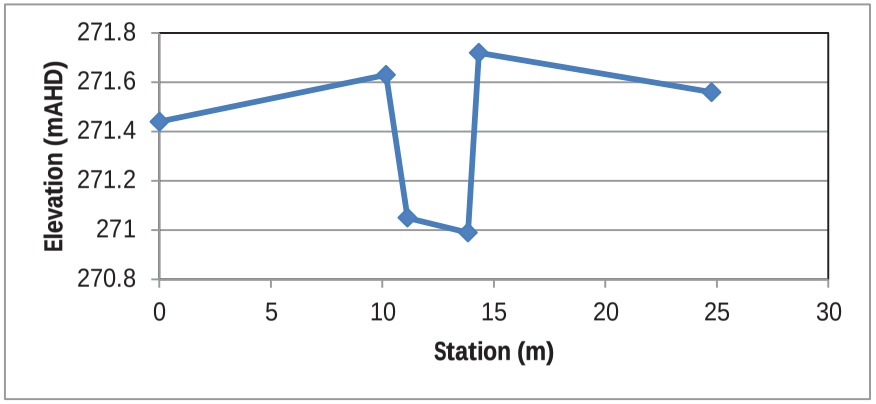
Living Lakes Feasibility Study Stage 1: Part 2

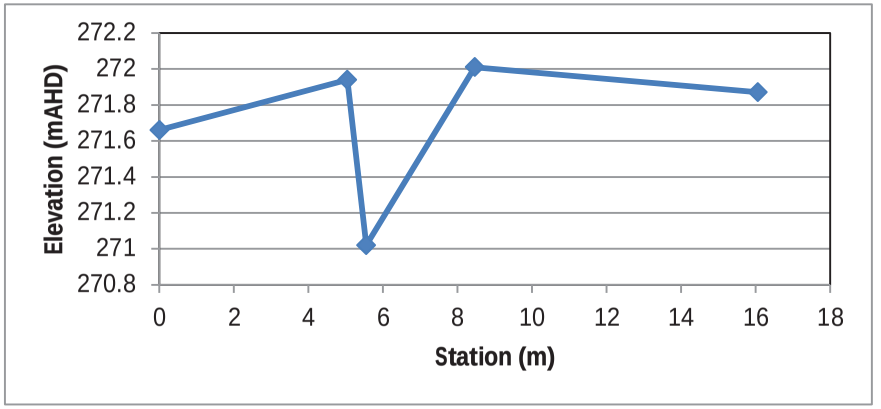
Figure 5.8g Lake Yealering: Surveyed Cross Sections XS-13 to XS-14

10.1.2

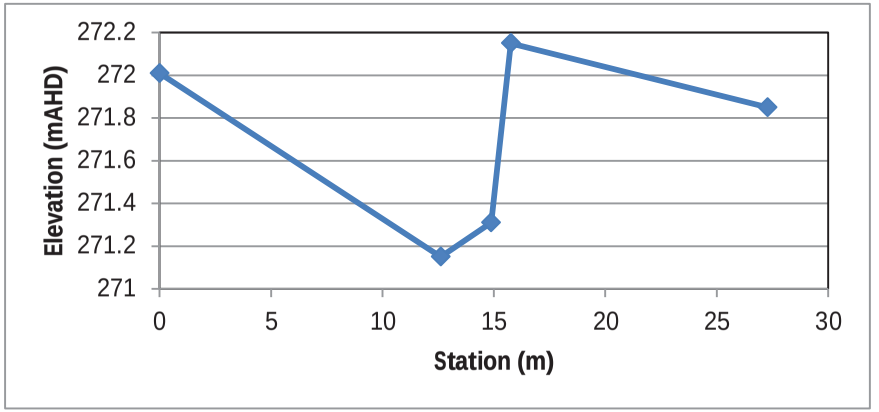
XS-L1	Station (m)	Elevation (mAHD)
	0	271.44
	10.17	271.63
	11.13	271.05
	13.84	270.99
	14.33	271.72
	24.77	271.56



XS-L2	Station (m)	Elevation (mAHD)
	0	271.66
	5.04	271.94
	5.55	271.02
	8.46	272.01
	16.06	271.87



XS-L3	Station (m)	Elevation (mAHD)
	0	272.01
	12.62	271.15
	14.88	271.31
	15.76	272.15
	27.28	271.85

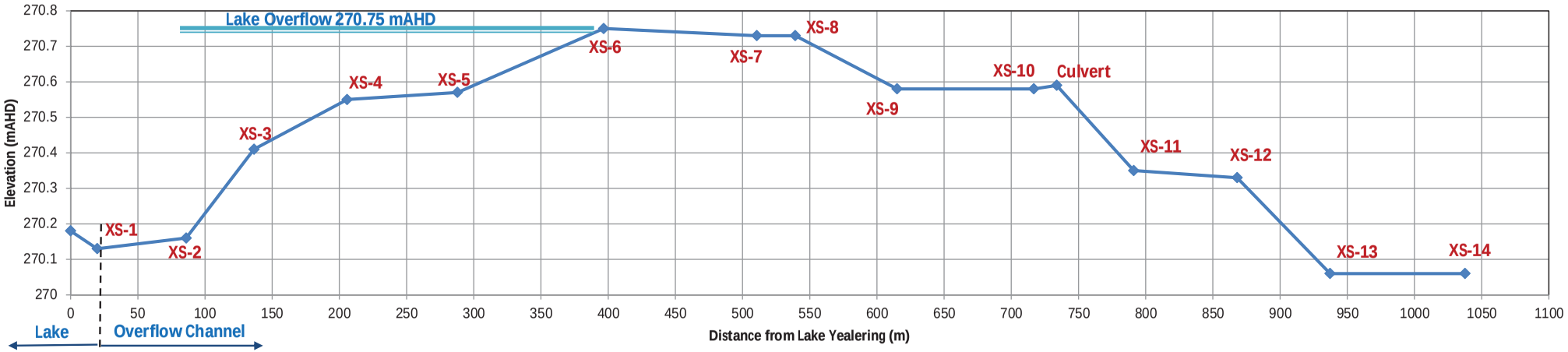


Data Source: JBA

Job No: J4905

Department of Regional Development and Lands
Living Lakes Feasibility Study Stage 1: Part 2

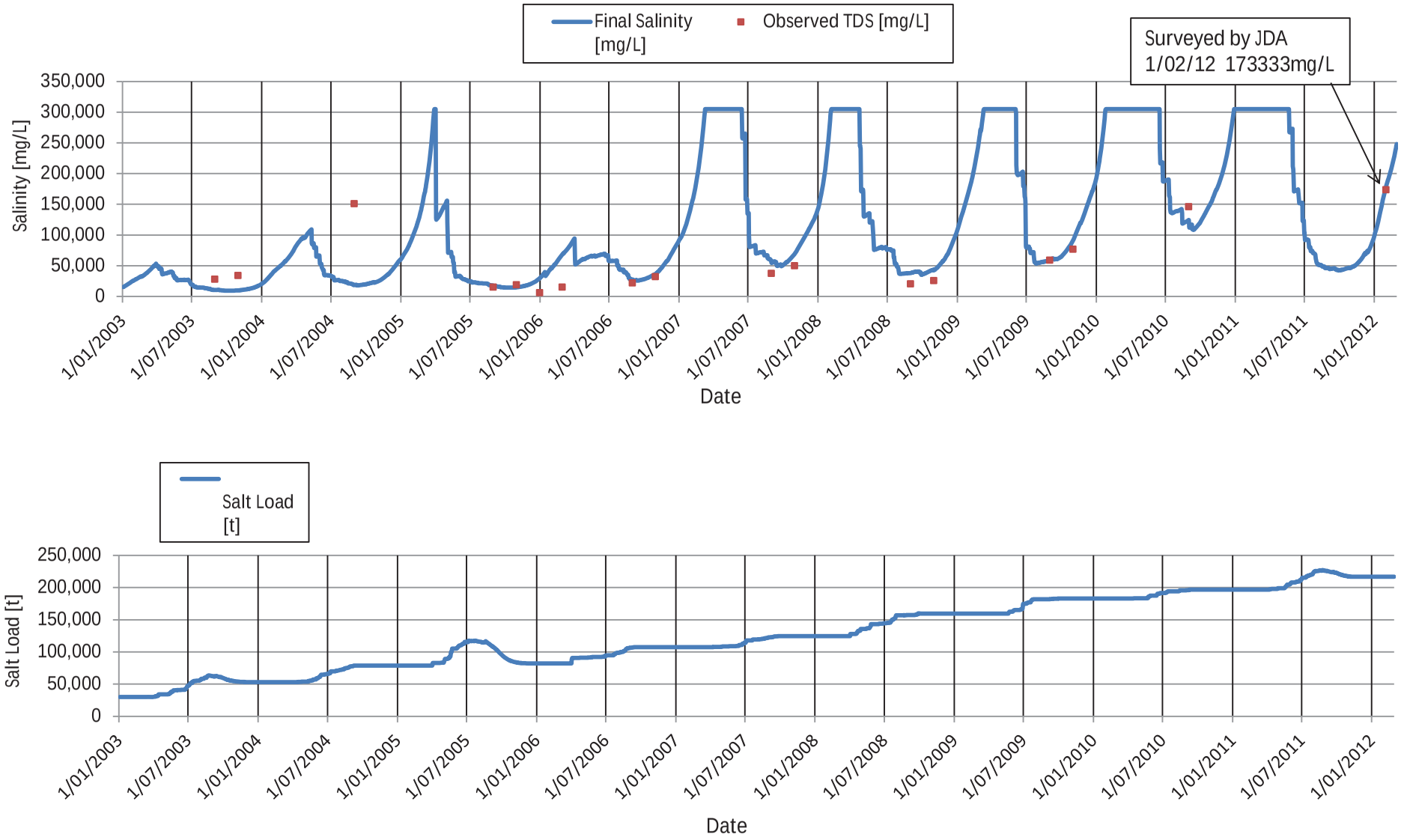
Figure 5.8h Lake Yealering: Surveyed Cross Sections XS-L1 to XS-L3



Data Source: JBA Surveys works

Job No. J4905

Department of Regional Development and Lands
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 5.9 Lake Yealering: Longitudinal Profile of Outflow Channel



Job No: J4905

Dept of Regional Development and Lakes
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure5.10a: Lake Yealering: Daily Salt Balance - Calibration

10.1.2

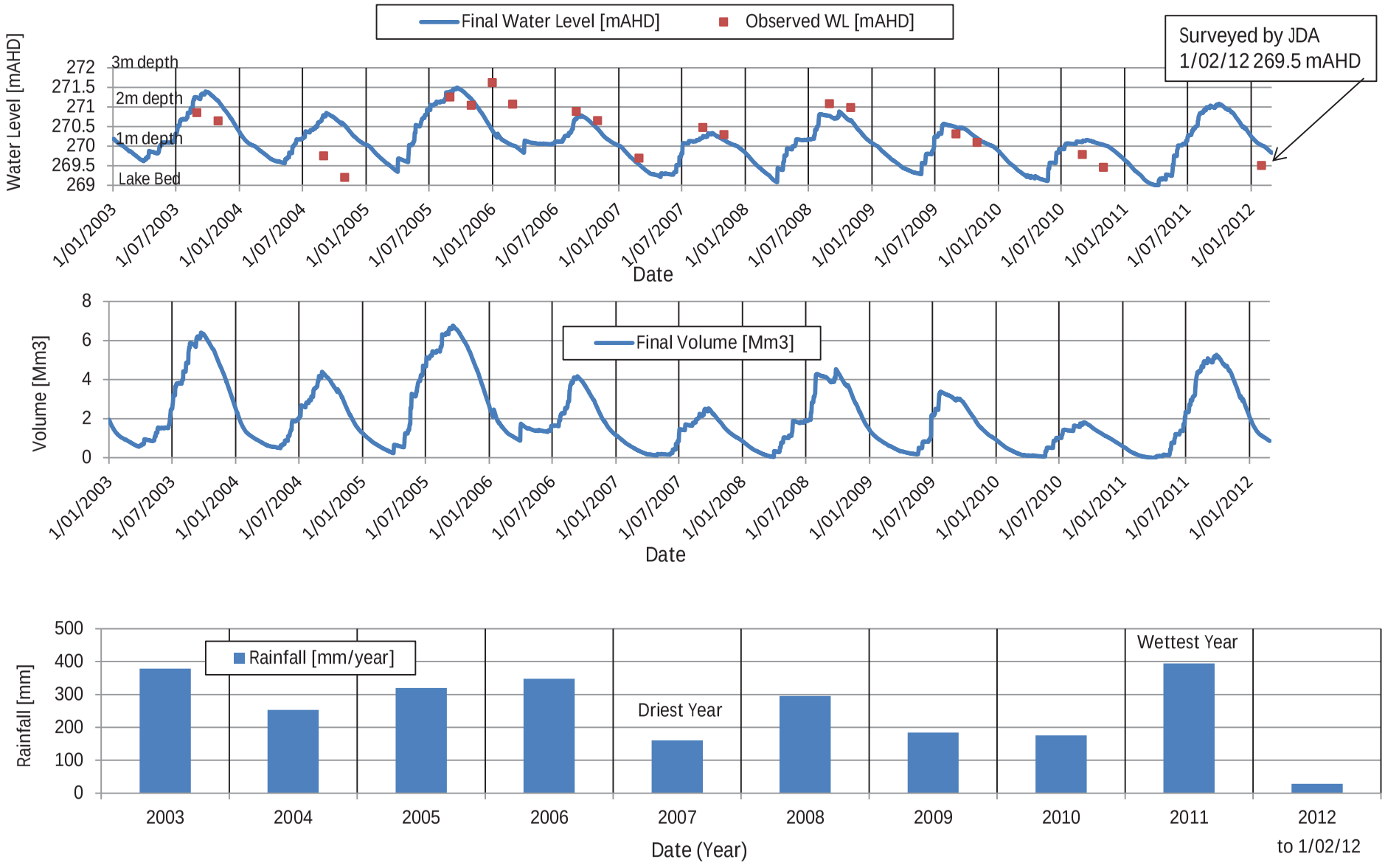


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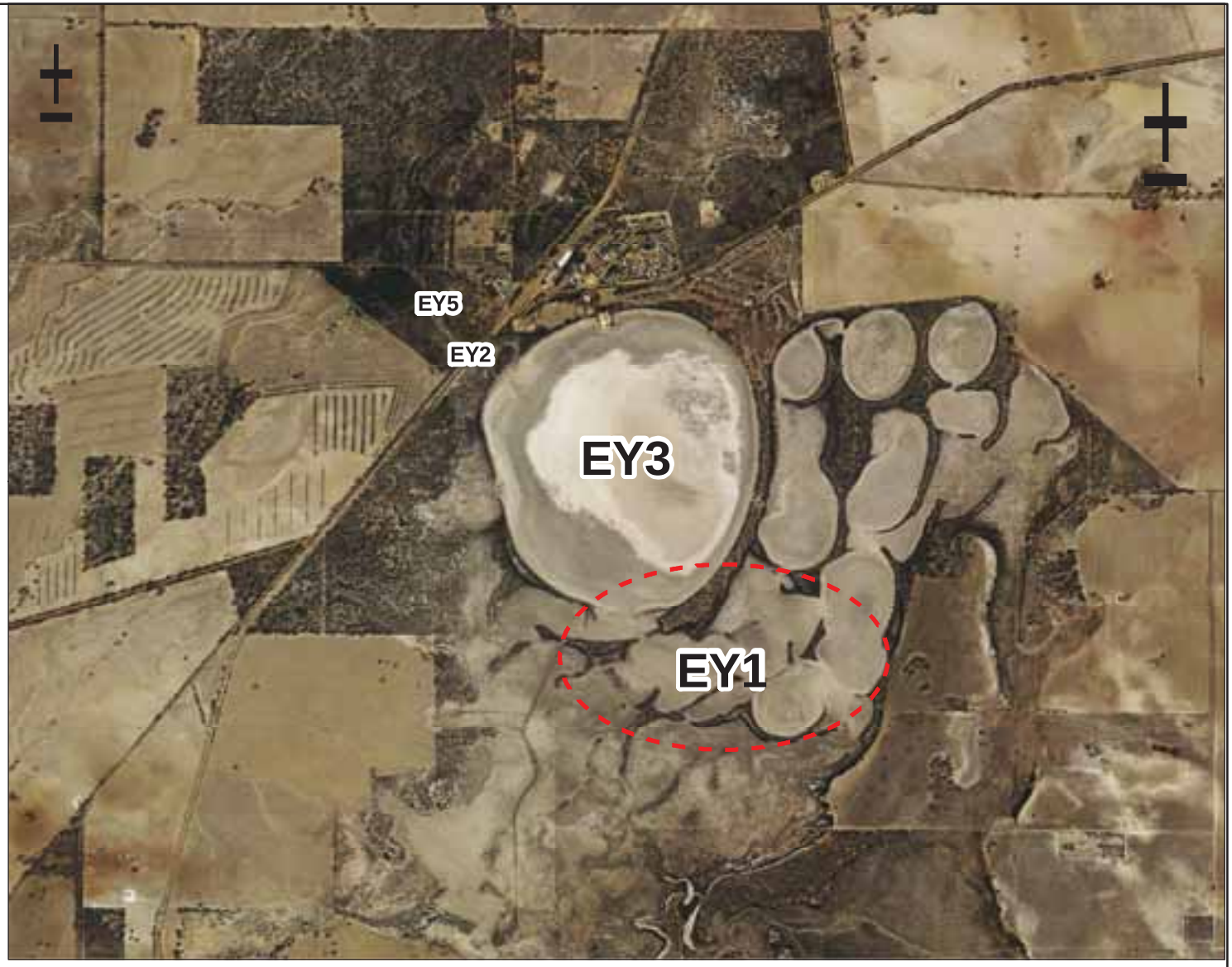
Figure 5.10b: Lake Yealering: Daily Water Balance - Calibration

10.1.2

Yealering Enhancement Option Locations

EY1 - Bunding off of Backswamps
EY2 - Improvement of Outlet Drain
EY3 - Dredging of Lake Bed
EY4 - Groundwater Replenishment
EY5 - Gated System on Outlet Drain



Data Source:

JDA

Job No. J4905
Scale:1:32,298

0 500 1,000 1,500 2,000 Meters

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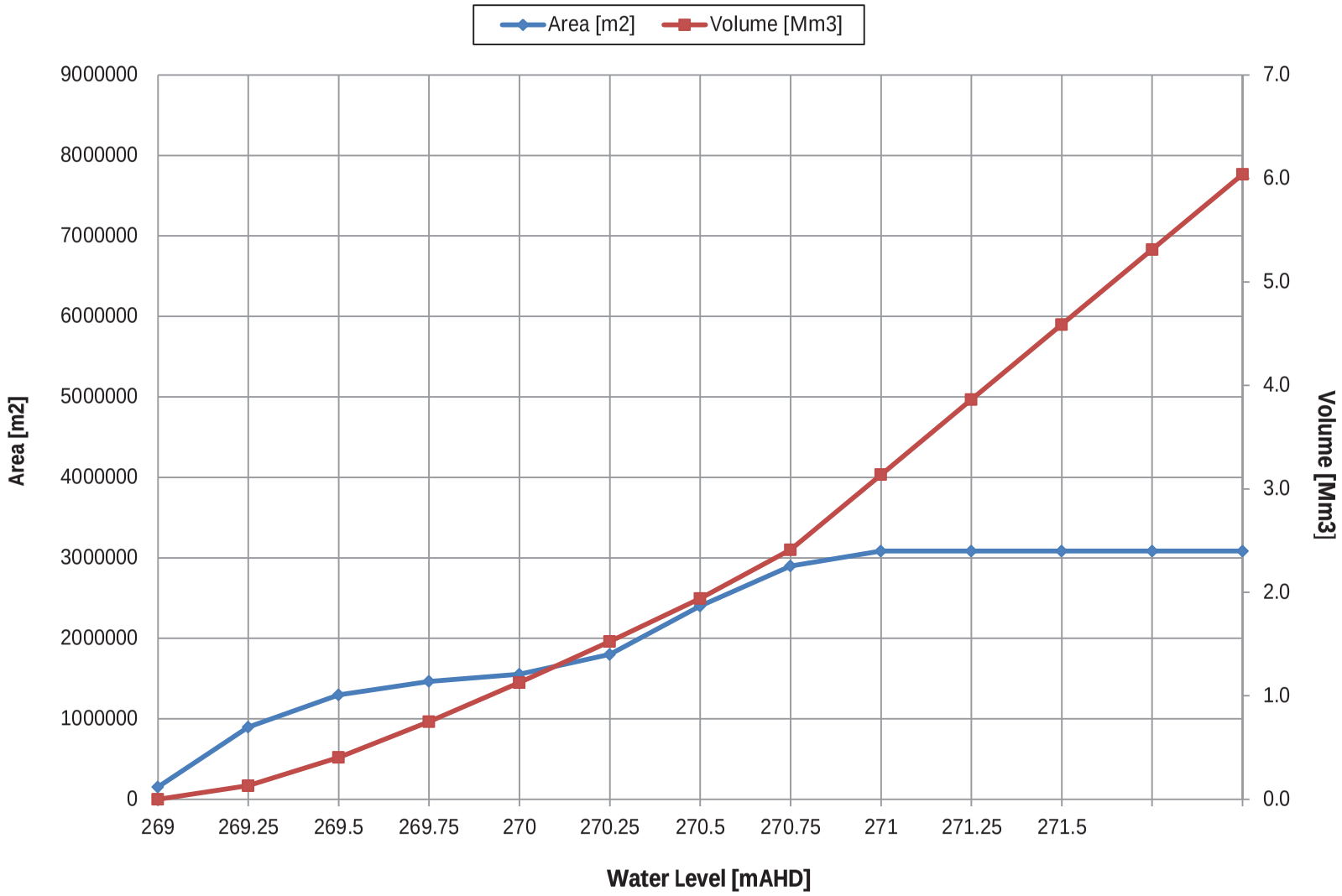
Living Lakes Feasibility Study Stage 1: Part 2

Figure 5.11:Lake Yealering Enhancement Option Locations

10.1.2



Job No: J4905

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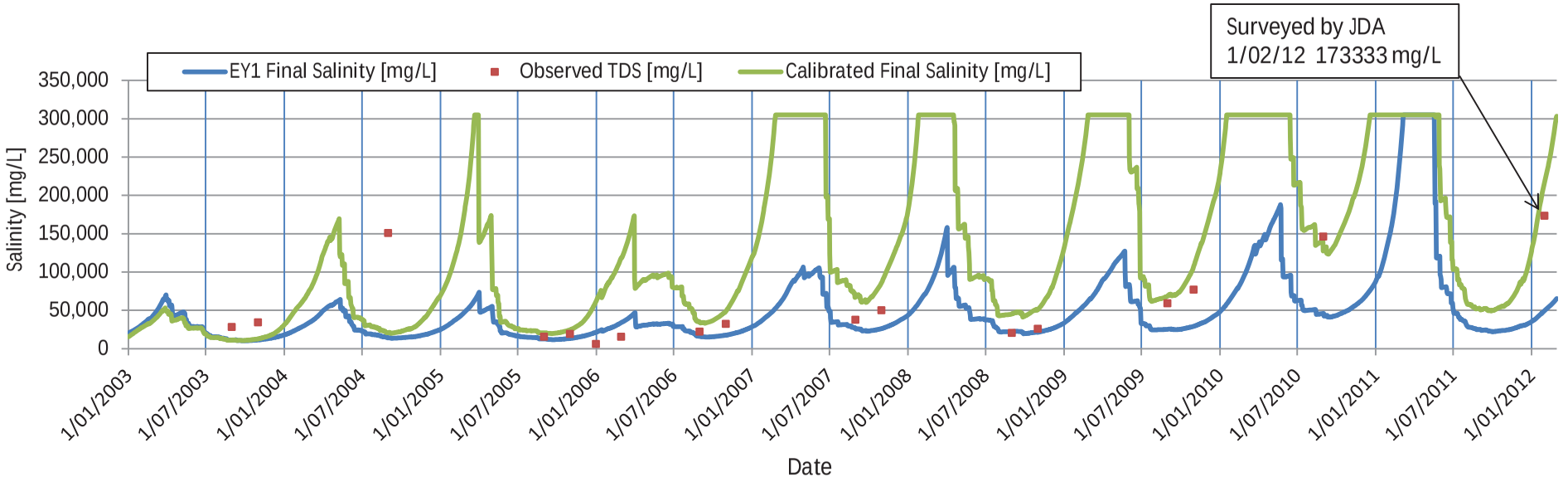
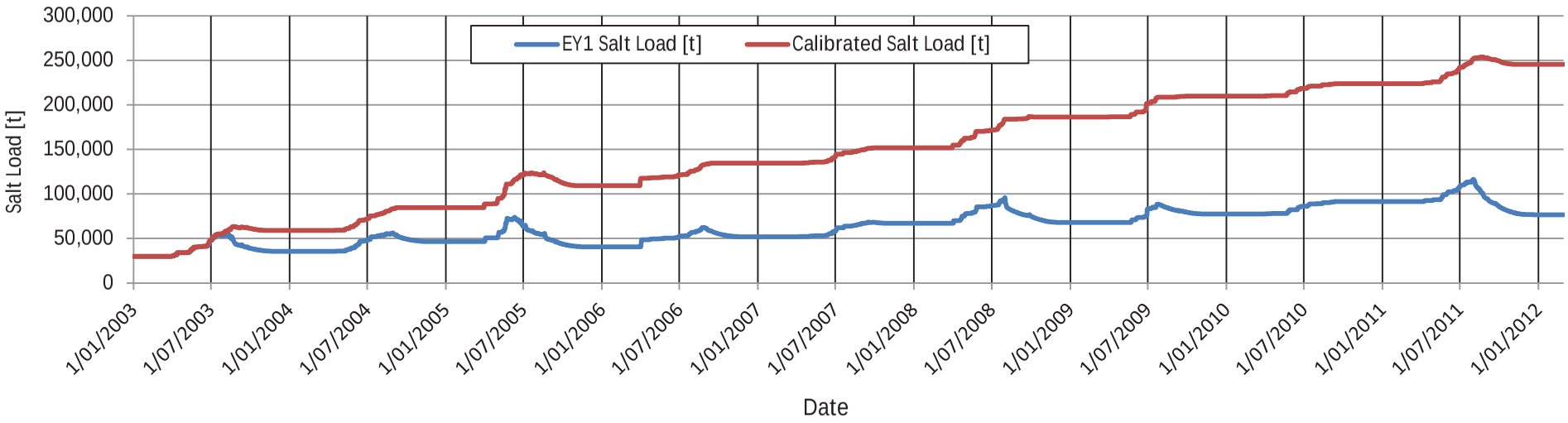
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 5.12: Lake Yealering: Refined Bathymetry EY1





Job No: J4905

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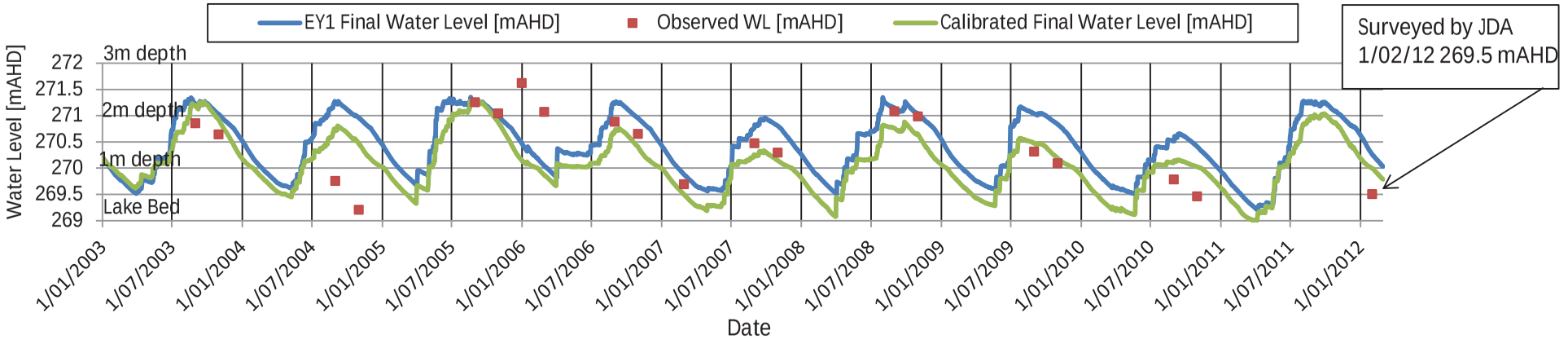
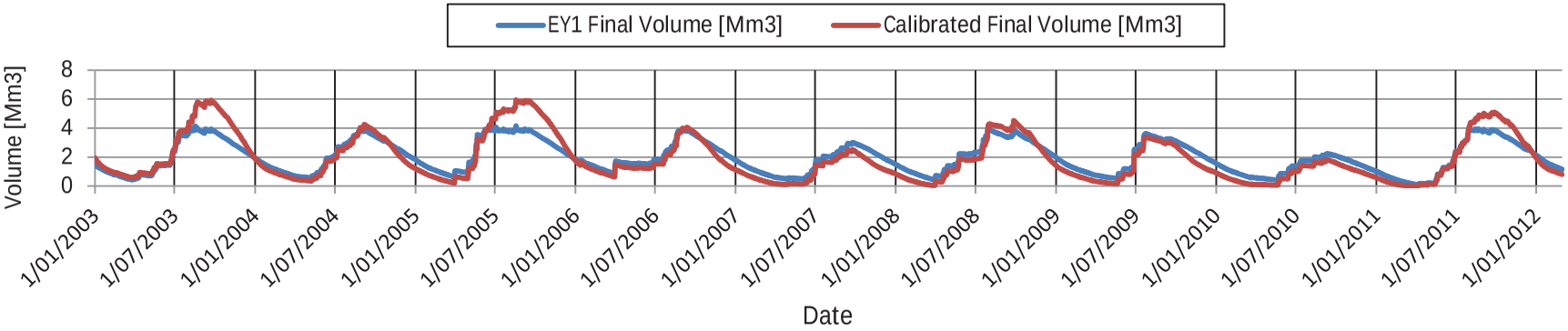
Living Lakes Feasibility Study Stage 1: Part 2 Report
Figure 5.13a: Lake Yealering: Daily Salt Balance - EY1

10.1.2





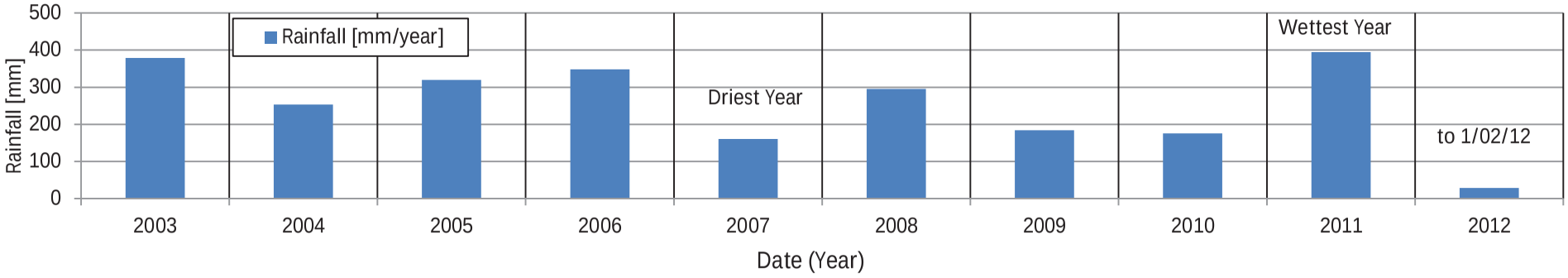


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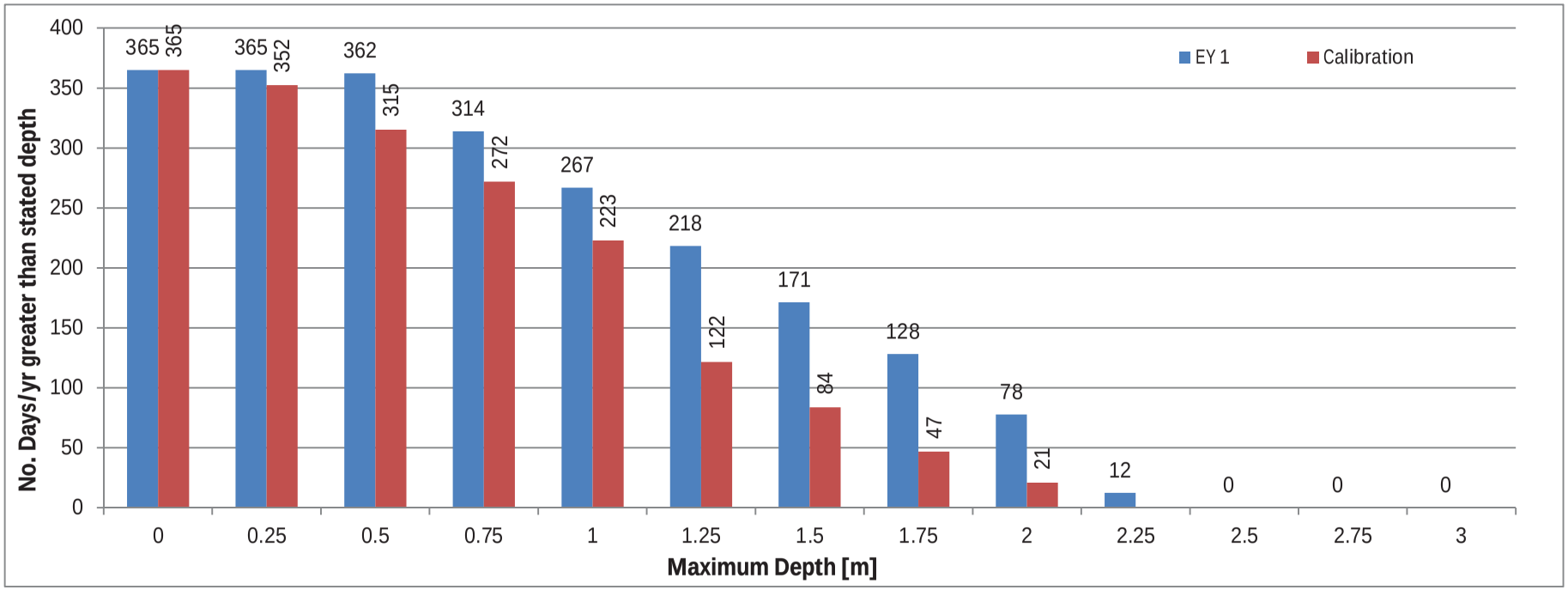
Figure5.13b: Lake Yealering: Daily Water Balance - EY1

10.1.2



e.g. No of days/yr > 0.75 m depth = 314 days as per EY 1

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Figure 5.13c: Effect on lake depth - EY 1

10.1.2

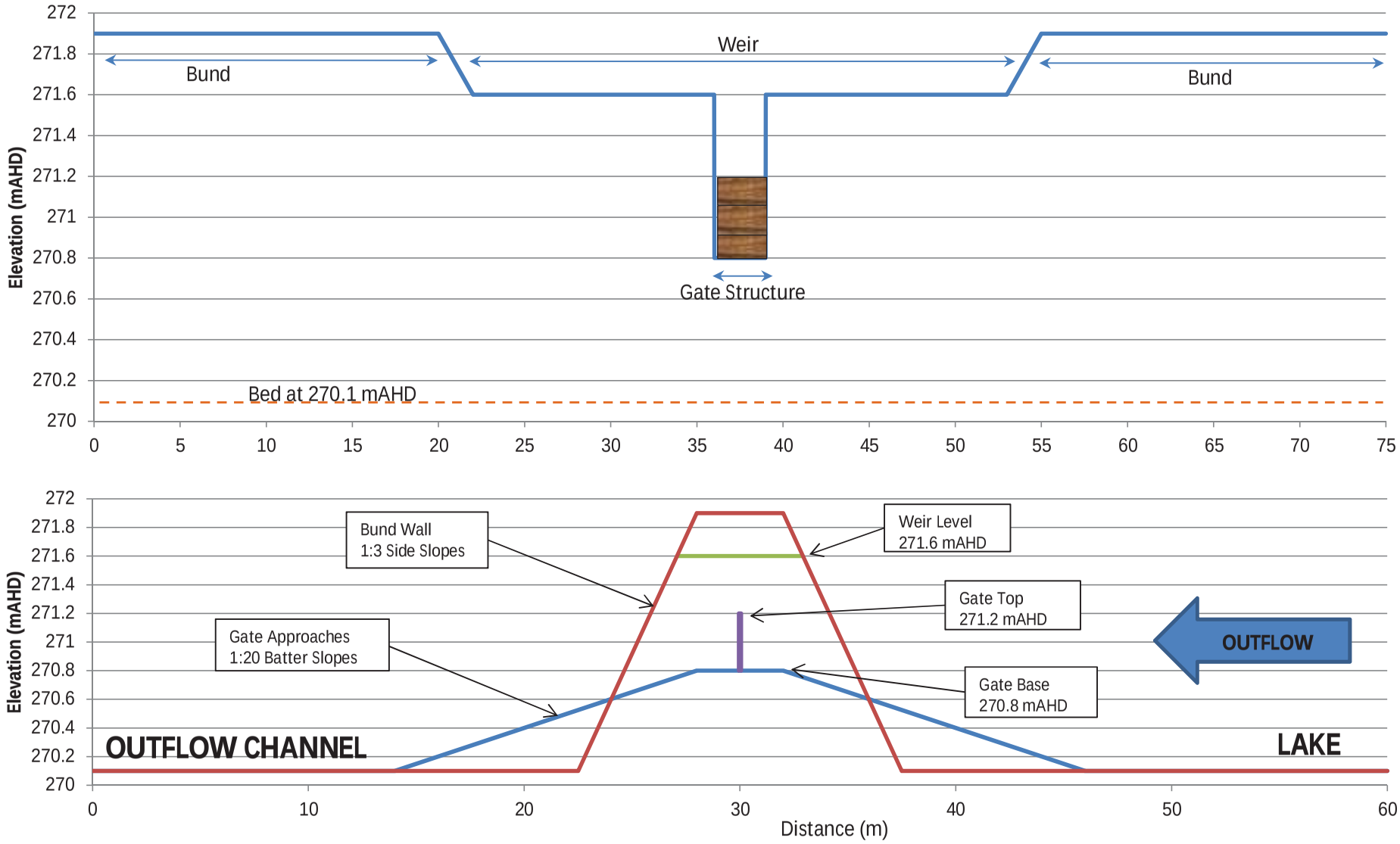

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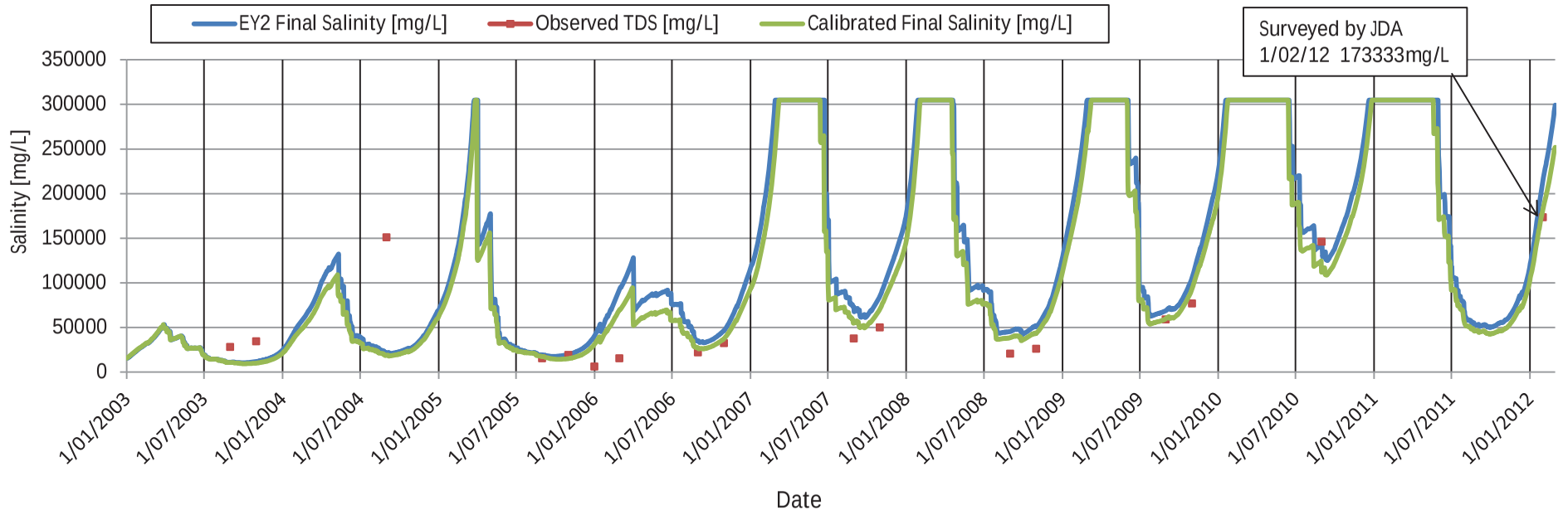
Figure 5.14: Lake Yealering Enhancement Option EY2 - Schematic of Gate and Weir Structure



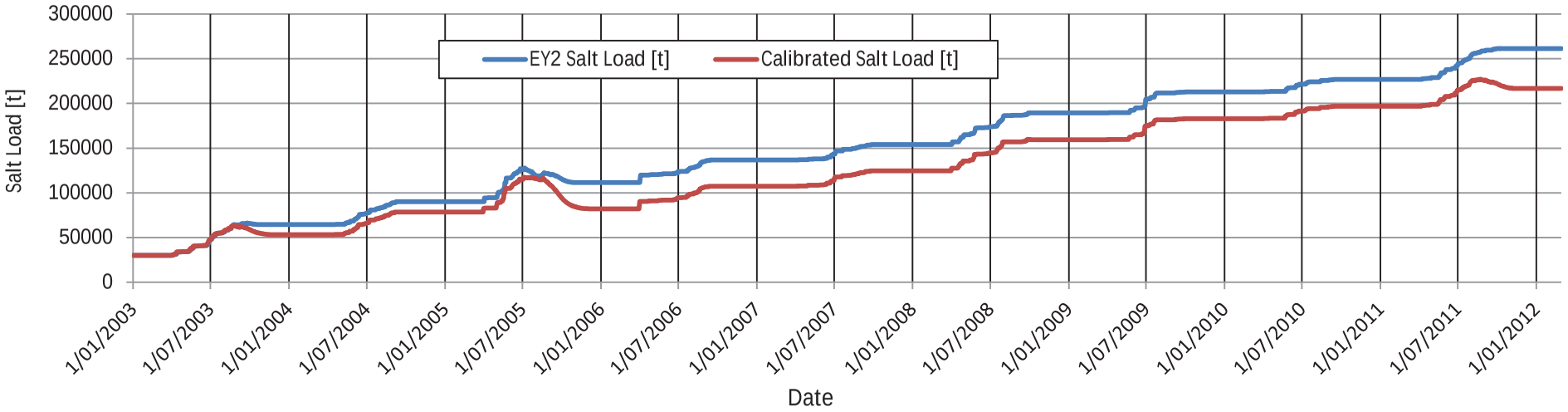


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Figure 5.15a: Lake Yealering: Gated Systems on Outlet Drain - EY2

10.1.2

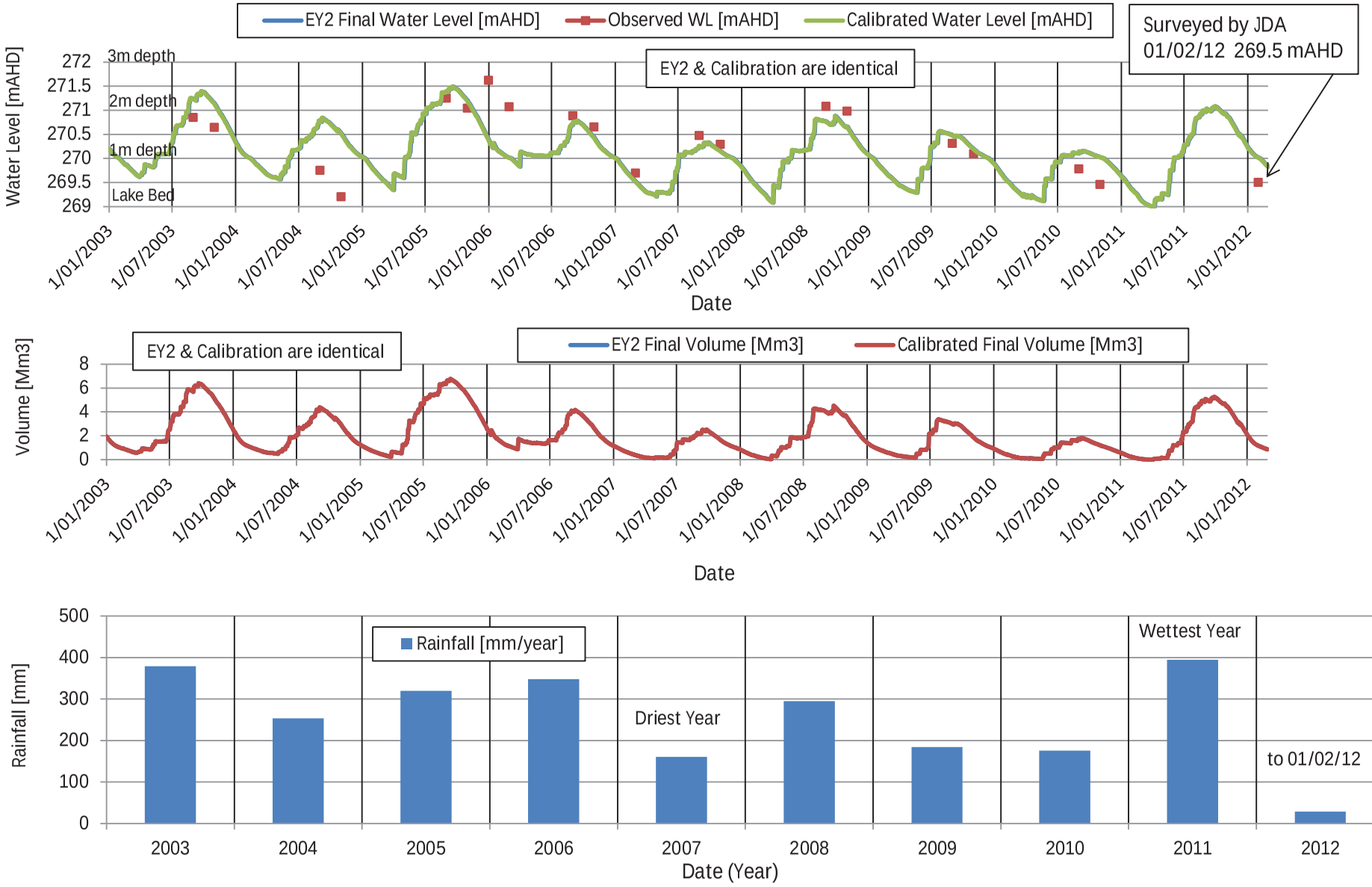

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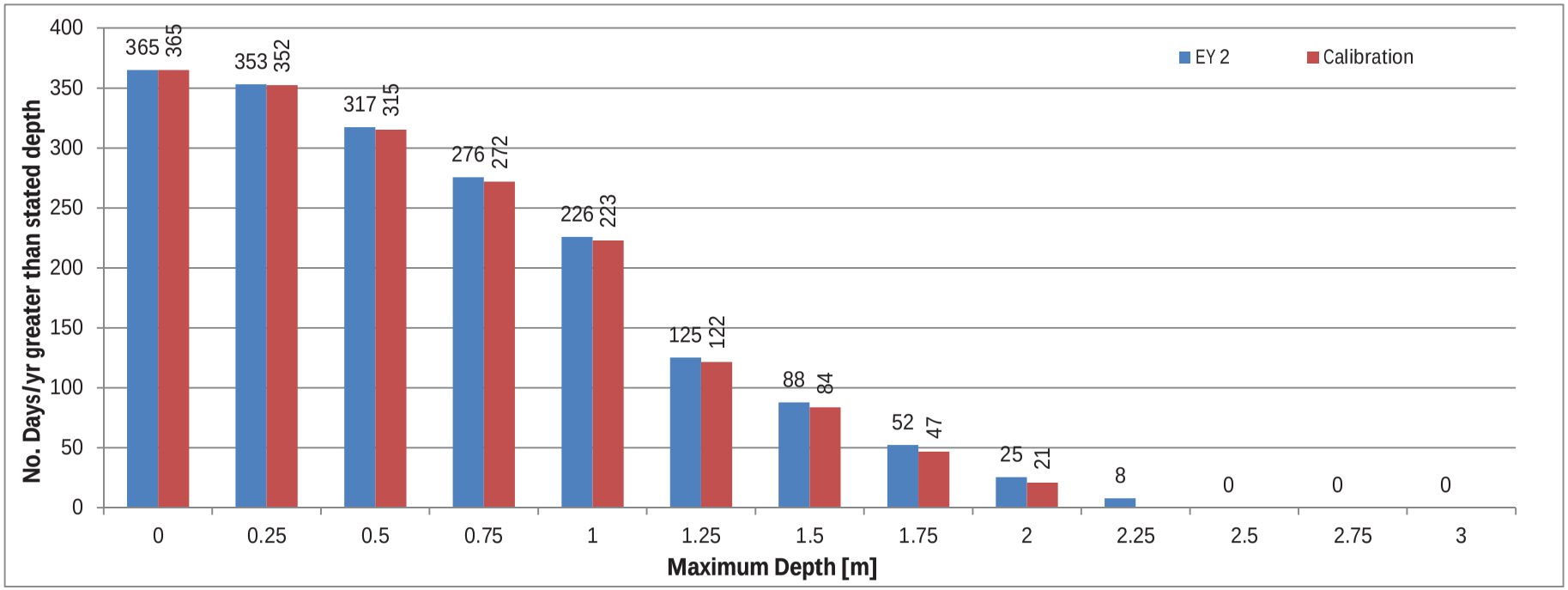
Figure 5.15b: Lake Yealering: Gated System on Outlet Drain- EY2

10.1.2



e.g. No of days/yr > 0.75 m depth = 276 days as per EY 2

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Figure 5.15c: Effect on lake depth - EY 2

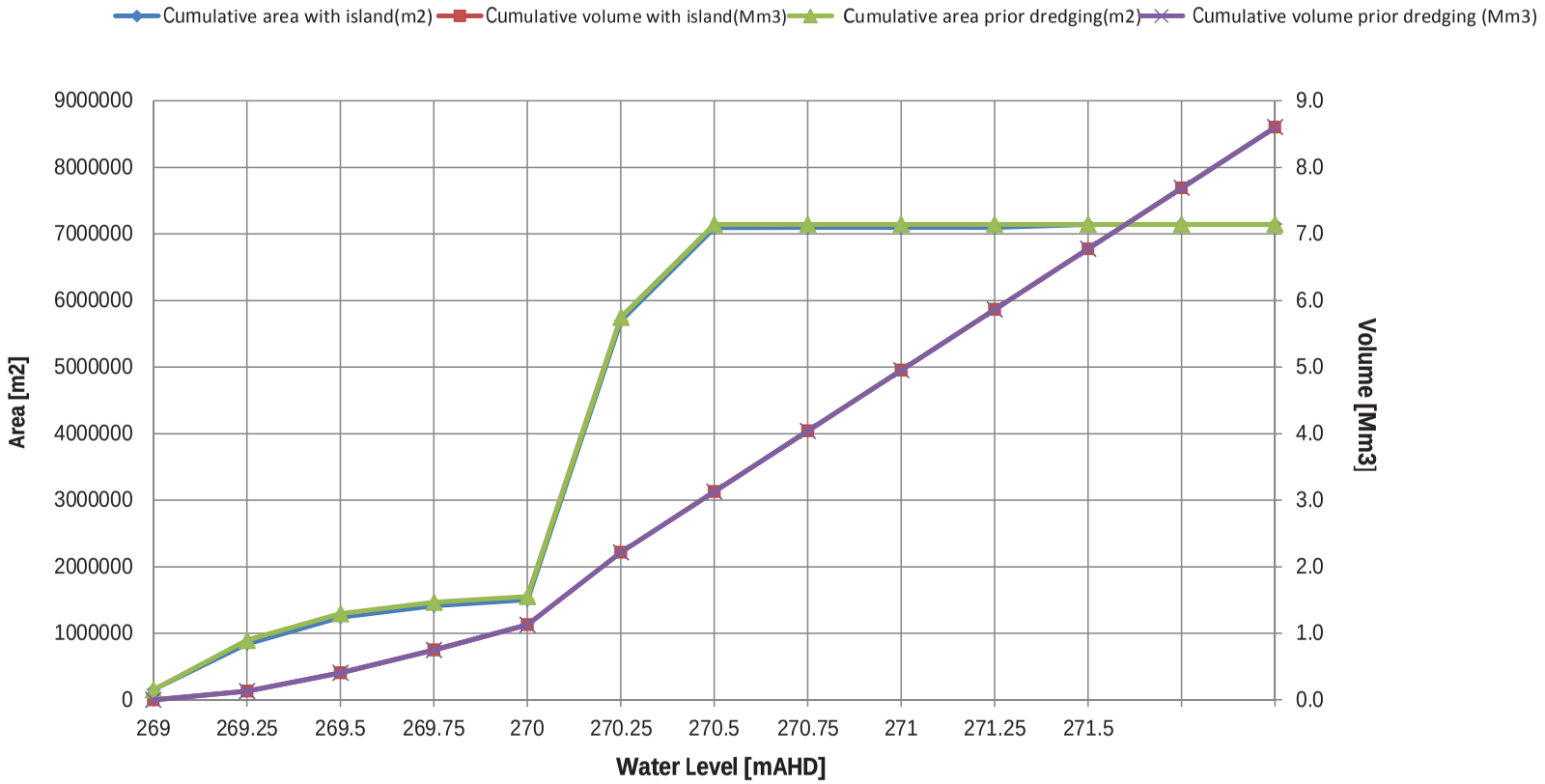

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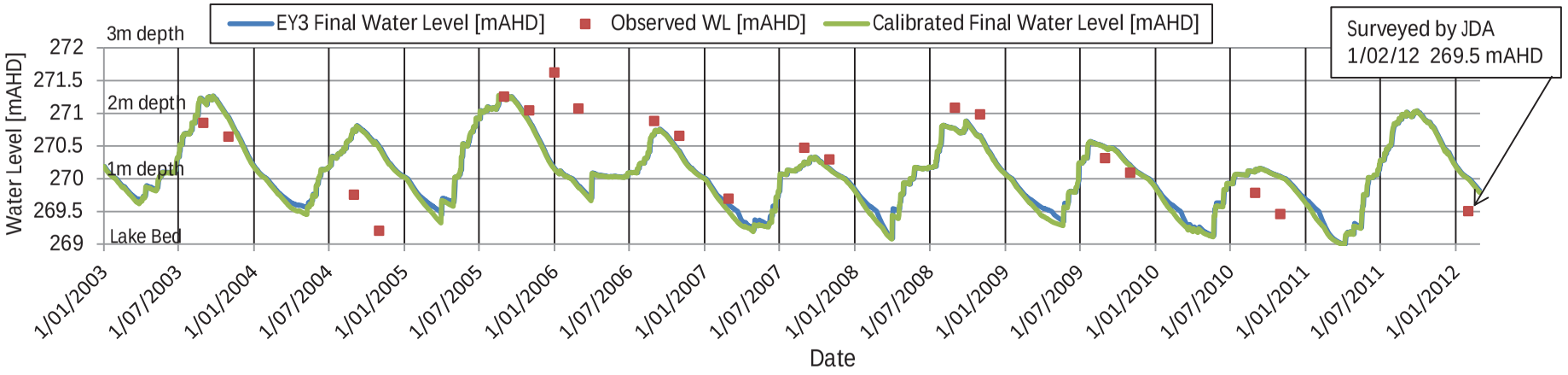
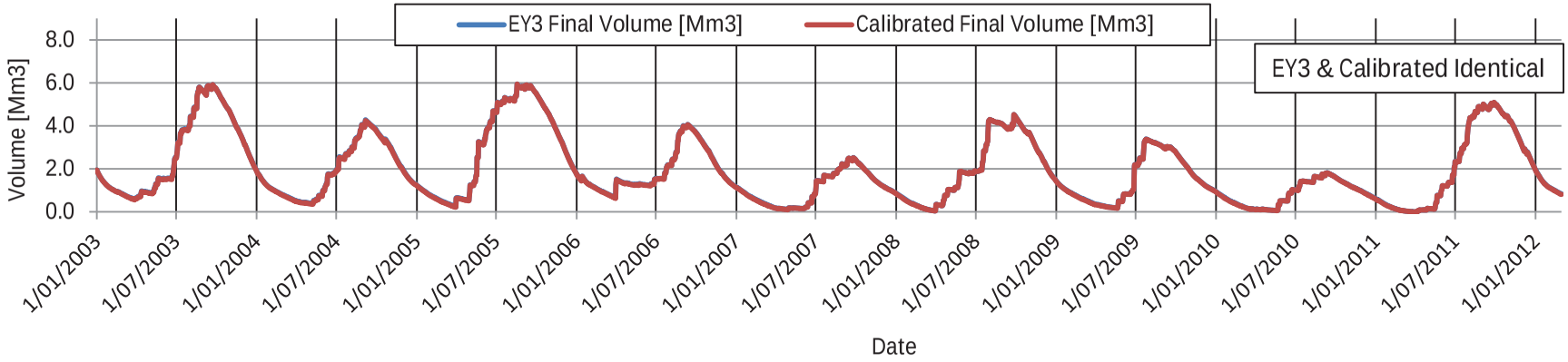
Figure 5.16: Lake Yealering: Lake Bathymetry - EY3





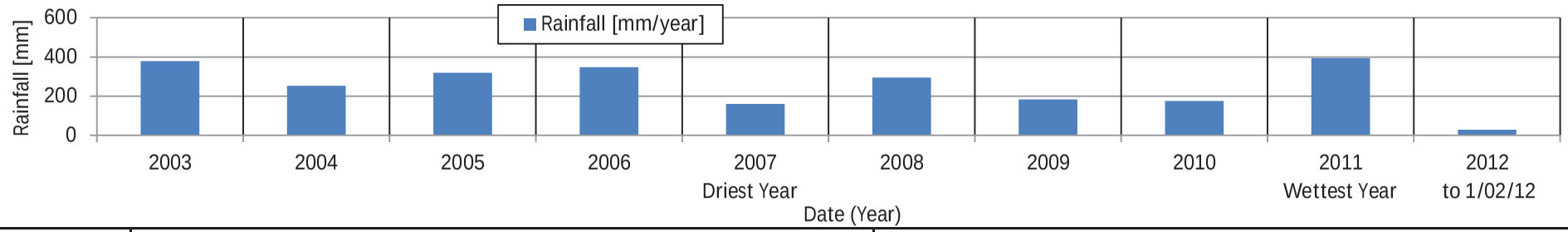


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Figure 5.17a:Lake Yealering:Daily Water Balance- EY3

10.1.2

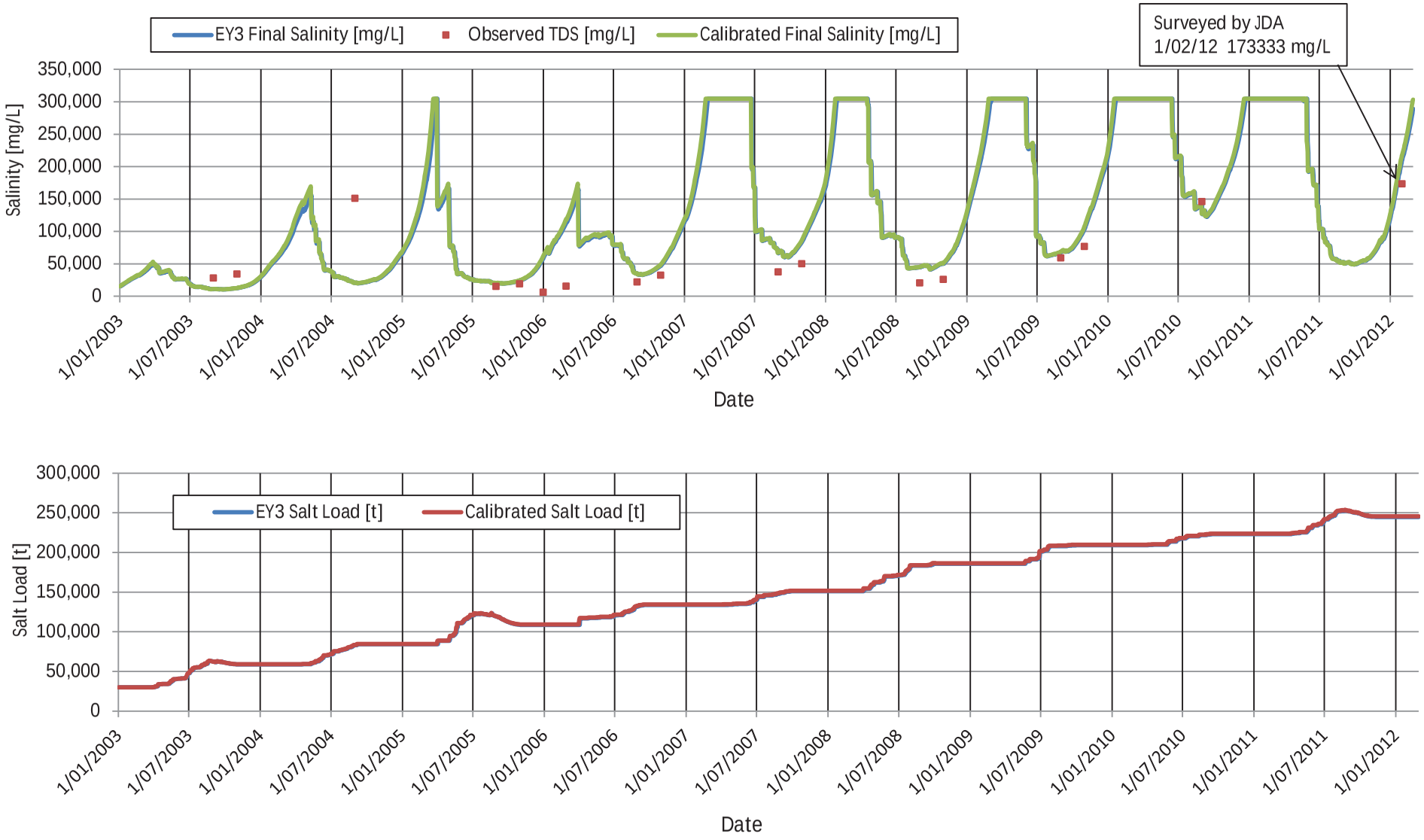

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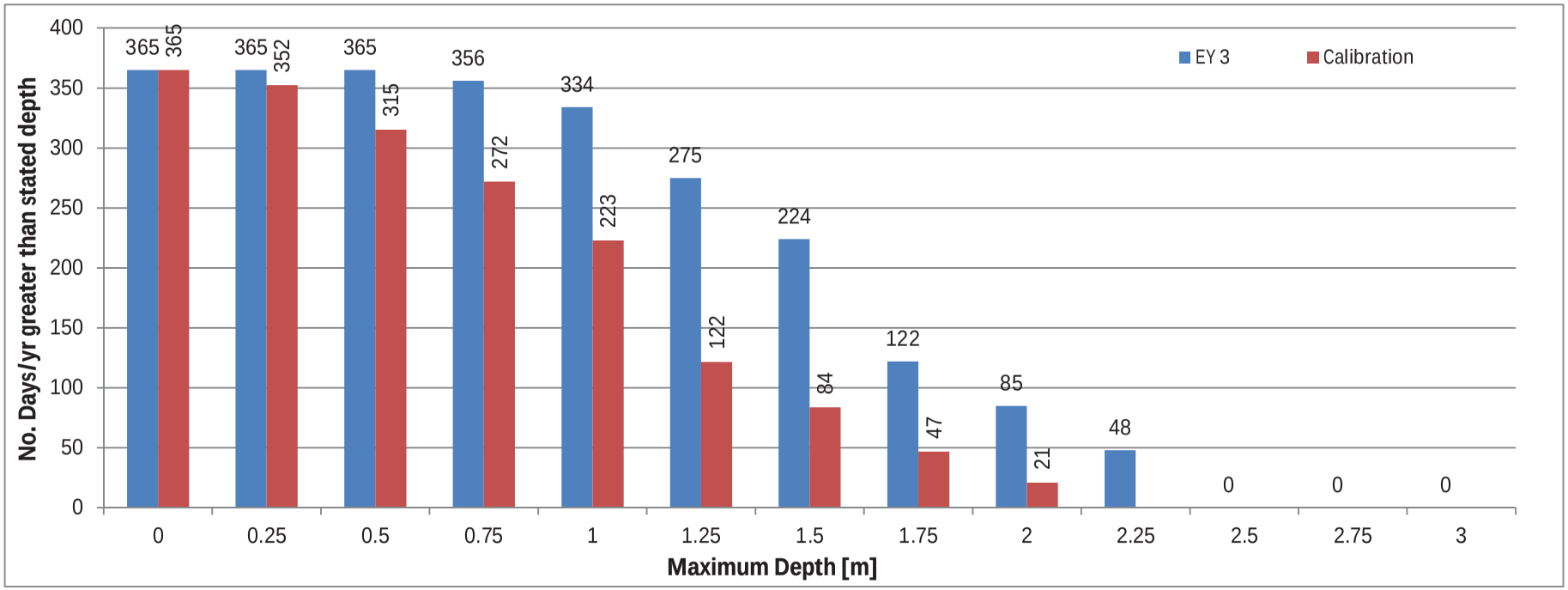
Figure 5.17b:Lake Yealering:Daily Salt Balance - EY3

10.1.2



e.g. No of days/yr > 0.75 m depth = 356 days as per EY3
NB: EY3 applies to dredging 50,000 m3 over 10 ha, 0.5 m depth.

This bar graph refers to water depth in the dredged area only, not the entire lake.

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Figure 5.17c: Effect on lake depth - EY 3

10.1.2

10.1.2

APPENDICES

APPENDIX 1:

Methodology – Field Methods

1.1. Lake Bathymetry
1.2. Lake Water Quality
1.3. Lake Bed Sediment
1.4. Land Survey
1.5. Geophysical Survey
1.6. Cost Estimates

JDA Consultant Hydrologists

1.1 Lake Bathymetry

Lake bathymetry is the underwater equivalent to topography, which shows a stage-area-volume relationship of a lake. At each lake water depths (m) were measured at multiple locations (recorded with GPS) from a dinghy. Multiple points of lake edge were surveyed to produce a lake datum (mAHD), from which the lake water depths readings were then converted into mAHD.

1.2 Lake Water Quality

1.2.1 Lake Water Quality Monitoring Sites and Dates

Water profiling and water quality sampling were carried out at five locations each in Lake Ewlyamartup and Lake Towerrining, and three locations in Lake Yealering. Inflow water sampling was also carried out in Lake Ewlyamartup, as well as inflow and back (outflow) swamps in Lake Towerrining.

1.2.2 Monitoring Parameters

The samples for water quality were collected from the surface water. The comprehensive parameters included in the monitoring of all three lakes (unless stated otherwise) are:

- Vertical profiles of temperature, salinity, dissolved oxygen (DO), pH, electrical conductivity (EC), oxidation-reduction potential (ORP), salinity, and turbidity;
- Physico-chemical properties (EC, pH, TDS, TSS);
- Major ions (Ca^{+2}, K^{+}, Mg^{+2}, Na^{+}, HCO_3^{-}, CO_3^{-2}, Cl^{-}, SO_4^{-2}, $NO3^{-}$, NO_2^{-}) concentrations;
- Metals (Al, Cd, Cr, Fe, Pb, Mn, Hg, Se, Zn, Cu, SiO_2) concentrations;
- Nutrients (TN, NO_3, NO_x-N, TKN, TP, FRP) and dissolved organic carbon (DOC) concentrations at water surface;
- Chlorophyll-*a* concentration at water surface of Lake Yealering;
- Algal identification and counts at surface water;
- *Escherichia coli* and thermo-tolerant coliform at water surface of Lake Towerrining;
- Secchi depth as a measurement of water transparency and light attenuation coefficient;
- Visual observation during each monitoring occasion to observe the appearance of algal blooming, excessive growth of aquatic plants, insects and over-inhabited by birds.

Lake water quality vertical profiling was performed using a Hydrolab-Quanta with a turbidity sensor from a dinghy. Readings were conducted just beneath the water surface to just above the lake bottom (about 5 to 10 mm above the lake bed). The readings just above the lake sediment were conducted several times to ensure a correct reading without stirring-up the sediment.

The water samples for algae identification and counts were collected from about surface to 0.5 m depth.

Lake bed/sediment samples were collected using Soil Corer lowered down to the lake bed.

Samples collected for chlorophyll-*a,* algal identification and counts were obtained around midday to ensure maximum algal population could be analysed. Samples collected for nutrients and

chlorophyll-*a* concentration, algal identification and counts were performed by NATA accredited laboratories.

1.2.3 Sample Identification, Transportation and Storage

The water samples were individually labelled and placed in an insulated container with a 3 kg bag of ice to maintain the 4^{o}C interim sample storage temperature protocol. The samples were then delivered to a NATA-accredited laboratory.

A JDA chain of custody (CoC) form (see Attachment 2) was used when delivering the water samples to the laboratory to ensure the integrity of the samples was not compromised. The CoC form indicates individuals handling the samples, the date and time of the water samples taken and delivered, the samples handling technique and the storage used in transporting.

1.2.4 Lake Water Quality Guideline and Trigger Values

The material for Australian Users of Guidelines for Recreation Water Quality and Aesthetics is currently being prepared. When completed, it will replace Chapter 5.2 of the ANZECC and ARMCANZ (2000) Guidelines. It is also intended that the new guidelines should be largely based on recommendations from the World Health Organization (WHO) including draft WHO Guidelines for Safe Recreational-water Environments: Coastal and Fresh-waters (WHO 1998) and WHO Health-based Monitoring of Recreation Waters: The Feasibility of a New Approach (The 'Annapolis' Protocol) (WHO, 1999). These documents will provide the impetus to develop a single Australian guideline document and will be part of the revised Guidelines (ANZECC and ARMCANZ, 2000).

Until these guidelines are endorsed, the interim guideline adopted from the Australian Water Quality Guideline for Fresh and Marine Waters (1992) should be applied, i.e. the ANZECC and ARMCANZ (2000) Guidelines for recreational water quality and aesthetic. The guidelines cover two categories of sporting activity: (1) sports in which the user comes into frequent contact with water, either as part of the activity or accidently, for example, swimming or surfing (primary contact), and (2) sports that generally have less-frequent body contact with water, for example boating or fishing (secondary contact). In this case, the water quality guidelines for primary contact are applied to the studied lakes.

Table B-1 provides a summary of ANZECC and ARMCANZ (2000) guidelines for Recreational Water Quality and Aesthetic-Primary Contact and NHMRC (2004) Australian Drinking Water Guidelines; relevant to apply to the three lakes.

TABLE 1.2: WATER QUALITY GUIDELINE VALUES

Parameters (all units in mg/L unless otherwise stated)	**ANZECC Guideline Values**[1)]	**Australian Drinking Water Guideline Values**[2)]
A. Physico-chemical		
pH	5 to 9	Aesthetic (A): 6.5 to 8.5
Temperature (^{o}C)	15 to 35	Health (H): Not Necessary
DO (Dissolved Oxygen) – mg/L, % saturation	≥6.5 (≥80%)	NA[4)]
TDS (Total Dissolved Solids) (mg/L)	≤1,000; NR[3)]	H: Not Necessary; A: ≤500 (A)
Total Hardness (mg/L)	≤500; NR[3)]	H: Not Necessary; A: ≤500
B. Ions Concentration		
Na^{+} (Sodium; mg/L)	≤300; NR[3)]	H: Not Necessary; A: ≤180
NH_3^{+} (Ammonia; mg/L)	≤0.01; NR[3)]	H: Not Necessary; A: ≤0.5
Cl^{-} (Chloride; mg/L)	≤400[3)]; NR[3)]	H: Not Necessary; A: ≤250
SO_4^{-2} (Sulphate; mg/L)	≤400[3)]; NR[3)]	H: ≤500; A: ≤250
NO_3^{-} (Nitrogen in Nitrate; mg/L)	≤44	≤50 (H)
NO_2^{-} (Nitrogen in Nitrite; mg/L)	≤3	≤3 (H)
S^{-2} (Sulphide; mg/L)	≤0.05	NA[4)]
C. Nutrients		
NO_x_N (Nitrogen in Nitrogen oxides; mg/L)	≤10	NA[4)]
NH_3_N (Nitrogen in Ammonia; mg/L)	≤0.01	H: Not Necessary; A: ≤0.4
D. Metals		
As (Arsenic; mg/L)	≤0.05	≤0.007 (H)
Ba (Barium; mg/L)	NA[4)]	≤0.7 (H)
Bo (Boron; mg/L)	NA[4)]	≤4 (H)
Cd (Cadmium; mg/L)	≤0.005	≤0.002 (H)
Cr (Chromium; mg/L)	≤0.05	≤0.05 as Cr(VI) (H)
Cu (Copper; mg/L)	≤1	≤2 (H); ≤1 (A)
Fe (Iron; mg/L)	≤0.3	NA[4)]
Hg (Mercury; mg/L)	≤0.001	≤0.001 (H)
Mn (Manganese; mg/L)	≤0.1	≤0.05 (H); ≤0.1 (A)
Ni (Nickel; mg/L)	≤0.1	≤0.02 (H)
Pb (Lead; mg/L)	≤0.05	≤0.01 (H)
Sb (Antimony, mg/L)	NA[4)]	≤0.003 (H)
Se (Selenium; mgL)	≤0.01	≤0.01 (H)
Zn (Zinc; mg/L)	≤5	≤3 (A)
E. Microbiology		
Algae Density (cells/mL)	≤20,000	NA[4)]
Cyanobacteria Density (cells/mL)	≤15,000	NA[4)]
E. coli or thermotolerant coliforms (cells/100mL)	NA[4)]	0[2)]
Faecal coliform (cells/100mL)	≤150	NA[4)]
Enterococci (cells/100mL)	≤35	NA[4)]
F. Optical Property		
Natural visual clarity (% reduction from surface)	≤20%	NA[4)]
Natural reflectance of the water (% change)	≤50%	NA[4)]
Colour (points on the Munsell Scale)	≤10	NA[4)]

Notes:

1) ANZECC and ARMCANZ (2000) Guidelines for Rectreational Water Quality and Aesthetic – Primary Contact see Table 5.2.2, Table 5.2.3, Table 5.2.4.

2) Australian Government National Health and Medical Research Council Natural Resource Management Ministerial Council (2004). National Water Quality Management Strategy: Australian Drinking Water Guidelines (ADWG). Chapter 6 and Table 10.10. Guideline values are provided for Health (H) and Aesthetic (A).

3) Not relevant to apply.

4) Not available.

1.3. Lake Bed Sediment Analyses

1.3.1 Lake Bed Sediment Sampling Method

Lake bed/sediment samples were collected from 2 locations in Lake Ewlyamartup, 5 locations in Lake Towerrining, and 3 locations in Lake Yealering, using Soil Corer lowered down to the lake bed. The locations for sediment sampling are shown in Figures 3.3, 4.3 and 5.3 of the main report.

The objective of soil sampling and data collection was to assess the presence or absence of:

- Total Nutrients
- Heavy metals;
- Actual ASS (AASS) and Potential ASS (PASS).

1.3.2 Lake Bed Field Test

Targets of the lake bed sediment investigation are Potential Acid Sulfate Soils (PASS) and Actual Acid Sulfate Soils (AASS).

The following information and field tests were recorded as part of the soil sampling procedures:

- Full grid reference of each sampling location using Australian Metric Grid and its current surface height in m AHD;
- Field description for each soil profile including:
  - soil texture, grain size, roundness, sorthing and sphericity using the Australian Soil and Land Survey Field Handbook (McDonald et al, 1990) as a guide;
  - soil colour using a Munsell colour chart;
  - mottling, organic matter, moisture content, watertable level and other diagnostic features (e.g. jarosite, shell), if any.
- Field tests were conducted on a small amount of the soil samples, to measure the pH in distilled water (pH_F), the pH in addition of 30% hydrogen peroxide (pH_{FOX}), and to note the reaction strength qualitatively (light, medium, high, extreme). The pH measurements were undertaken immediately after the sampling.
- Table 1.4.2 is used to determine whether lab sample is taken or not.

Field soil logs are given in Appendix 2.

TABLE 1.3.1: POTENTIAL ACID SULFATE SOILS (PASS) FIELD TESTS

pH value	Result	Comments
$pH_F \leq 4$	Actual acid sulphate soils (AASS) indicating oxidation of sulphides	This is generally not conclusive because highly organic soils such as peats and occasionally heavily fertilised soils may also give $pH_F \leq 4$
$pH_F \leq 3.7$	Expected if jarosite exists in the sample	This is also an AASS. Jarosite needs a pH of 3.7 or lower to form, Horizons containing some jarosite and some other mottling (iron, grey) may have a pH>3.7, if the sample contains a mixture of jarosite and higher pH soil. This depends on the level of oxidation and the ability of soil to 'hold' the acid.
$pH_F > 7$	Expected in waterlogged, unoxidised, or poorly drained soils	Marine muds commonly have a pH>7 and this reflects seawater (pH 8.2) influence. It may be a PASS after oxidation with H_2O_2.
$4 < pH_F \leq 5.5$	An acid soil	Investigate further for possible ASS link, e.g. AASS with shell presence.

TABLE 1.3.2: ACTUAL ACID SULFATE SOILS (AASS) FIELD TESTS

pH_F	pH_{FOX} (at completion of reaction)	ΔpH	Reaction rate	Result	Comments/Possible explanation
3.5	3.3	0.2	L	AASS present	Oxidation has occurred and sulphuric acid has formed in the past. This soil may not have much more potential to oxidise further as the pH_F and pH_{FOX} are similar
3.7	1.4	2.3	X or V	AASS present; PASS: strong indication	Oxidation has occurred in the past. This soil has the potential to oxidise further indicated by the strong reaction, appreciable ΔpH and very low final pH_{FOX}
6.5	2.1 (1.9)*	4.4	X or V	No AASS; PASS: strong indication	This soil is not yet oxidised but has the ability to produce sulphuric acid if exposed. Little buffering capacity in the soil. Lab analysis using SPOCAS could confirm this.
8.5	3.0 (3.2)*	5.5	H	No AASS; PASS: likely	The initial pH may be reflecting a strong seawater influence (pH 8.2) or some form of dissolved carbonates. The large ΔpH indicates a strong likelihood of PASS. Lab analysis using SPOCAS and reacted calcium (Ca_A) could confirm this.
8.0	2.0 (6.0)*	?	H	No AASS; PASS: strong indication, considerable buffering capacity	The initial alkaline pH_F indicates seawater or some form of dissolved carbonates influence. The initial large decrease in pH indicatges the soil is likely to contain sulphides. The pH measured after 20minutes may indicate a large % of shell dissolving into solution as the acid contacts it (a small amount of HCl added to a sample of soil could confirm its presence). Lab analysis using SPOCAS and reacted calcium (Ca_A) confirm this,
5.5	5.4 (5.3)*	0.2	X or V	No AASS; PASS: unlikely	The strong reaction is probably due to the presence of manganese in the soil sample.
5.5	3.8 (3.5)*	2.0	H	No AASS; PASS: possible	The strength of the reaction indicates possible organic matter. There may be some sulphides present also. Lab analysis using S_{CR} could confirm this.

A combination of three factors is considered in arriving at a 'positive field sulphide identification':

- A reaction with hydrogen peroxide – the strength of the reaction with peroxide is a useful indicator but cannot be used alone. Organic matter, coffee rock and other soil constituents such as manganese oxides can also cause a reaction. Care should be exercised in interpreting a reaction on surface soils and high organic matter soils such as peats and coffee rock and some mangrove/estuarine muds and marine clays. This reaction should be rated, e.g. low reaction (L), medium reaction (M), high reaction (H), extreme reaction (X), and volcanic reaction (V).
- The actual value of pH_{FOX}. If pH_{FOX}<3 and a significant reaction occurred, then it strongly indicates a PASS. The more the pH_{FOX} drops below 3, the more positive the presence of inorganic sulphides, and hence the PASS.
- A much lower pH_{FOX} than field pH_F. The lower the final pH_{FOX} value and the greater the difference between the pH_{FOX} compared to the pH_F, the more indicative of the presence of PASS. This difference may not be as great if starting with an already very acid pH_F (close to 4), but if the starting pH is neutral or alkaline then a larger change in pH should be expected. Where fine shell, coral or carbonate is present the change in pH may not be as large due to buffering. The 'fizz test' (effervescence with 1M HCl) should be used to test for carbonate and shell.

Of these three factors, the final pH_{FOX} value is the most conclusive indicator, and the lower the final pH_{FOX}, the more confident one can be that PASS may be present.

TABLE 1.3.3: IDENTIFICATION PASS AND AASS BASED ON FIELD TESTS

pH value and reaction	Result	Comments
A strong reaction of soil with peroxide – X or V	A useful indicator but cannot be used alone	Organic matter, coffee rock, and other soil constituents such as manganese oxides can also cause a reaction. Care must be exercised in interpreting a reaction on surface soils and high organic matter soils such as peats and coffee rocks, and some mangrove/estuarine muds and marine clays.
pH_{FOX} value at least one unit below field pH_F and reaction to peroxide	May indicate PASS but depends on the initial and resultant pH	The greater the difference between the two measurement (ΔpH), the more indicative the value is of a PASS. The lower the final pH_{FOX}, the better the indication of a positive result (e.g. a 1 unit change from pH 8 to 7 would not indicate PASS, however a 1 unit change from pH 3.5 to 2.5 would be indicative).
pH_{FOX}<3, strong reaction with peroxide, and large ΔpH	Strongly indicates PASS – potential for the soil to produce sulfidic acid upon oxidation	The lower the pH_{FOX}<3, the more positive the likely presence of sulphides. A combination of all three parameters (reaction strength, unit pH change, and final pH_{FOX} result) is most confirmatory.
pH_{FOX} of 3 to 4, and reaction to peroxide	The rest is less positive and is a borderline result	Sulfide may be present however organic matter may also be responsible for the decrease in pH. Laboratory analyses are required to confirm if sulphides are present.
pH_{FOX} of 4 to5	The test is neither positive or negative	Sulfides may be present either in small quantities and be poorly reactive under quick test field conditions, or the sample may contain shell/carbonate, which neutralises some or all acid produced by oxidation. Equally the pH_{FOX} value may be due to the production of organic acids and there may be no sulfides present in this situation. In such cases, the chromium reducible sulphur (S_{CR}) method would be best to check for the presence of iron sulphides.
pH_{FOX}>5 and little or no drop in pH from pH_F but reaction to peroxide	Little net acidifying ability is indicated	On soils with neutral to alkaline field pH and shell or white concretions present, the fizz test with 1M HCl should be used to test for carbonates. The SPOCAS method should be used to check for any oxidisable sulphides and the presence of self-neutralising ability.

1.3.3 Lake Bed Sediment Lab Analyses

The parameters included in the monitoring of all three lakes (unless stated otherwise) are:

- Total Nitrogen and Total Phospshorus;
- Metals (Al, Cd, Cr, Fe, Pb, Mn, Hg, Se, Zn, Cu, SiO2) concentrations; SPOCAS suite for Actual ASS (AASS) and Potential ASS (PASS) analysis, if soil field pH before oxidation (pH_F)) or pH after oxidation with hydrogen peroxide (pH_{FOX}) is less than 5.5.

1.4 Land Survey

Land survey was performed by JBA surveyors in February 2012. The survey involved taking spot heights and cross sections, as well as invert levels of relevant culverts and drainage channels around each Lake. Where required landholder permission was obtained as well as a Regulation Four from DEC.

1.5 Geophysical Survey

Ground based Geophysical survey was performed by FUGRO in February and March 2012 on Lake Ewlyamartup and Yealering. The survey involved two components.

Firstly a gravity survey was conducted along two transects at each lake to determine the locations of any potential paleo-channels. The results from this survey enabled the initial transects to be redefined for a more comprehensive TEM survey. The TEM survey was performed at two locations for each lake. Where required landholder permission was obtained as well as a Regulation Four from DEC.

1.6 Cost Estimation of Enhancement Options

Capital costs associated with each of the Enhancement Options have been based on Rawlinson (2009). This book gives cost estimates for a full range of construction items including those most relevant to the enhancement Options described in the Report namely clearing of vegetation, excavation of drains and dredging. The estimates have been corrected to 2012 values and to Wheatbelt location.

APPENDIX 2:

Methodology – Modelling

1.1. Monthly Salt and Water Balance
1.2. XP-Storm Hydraulic Model

JDA Consultant Hydrologists

1.1 Monthly Salt and Water Balance

The salt and water balance spreadsheet model includes the following fluxes:

- Lake surface;
- Catchment runoff;
- Evaporation from lake surface;
- Outflow from lake;
- Salinity in lake inflow;
- Salinity in lake outflow;
- Change of lake storage volume;
- Change in lake salt load.

The model starts with initial condition of water level (or volume) and salinity (or salt load).

The model has an overflow cut-off level (mAHD) and if the water level exceeds this level the excess is removed down to the overflow level.

1.2 XP-Storm Hydraulic Model

Description:

XP-Storm is a comprehensive model for dynamic modelling of storm water and river systems. It simulates natural rainfall-runoff processes and flow in engineered and natural systems including ponds, rivers, lakes and floodplains.

XP-Storm model is used to calibrate the hydraulic model of the lakes to the existing available historical data such as lake volume, depth, inflow and outflow.

Methodology:

XP-Storm models the inflow and outflow to the lakes which includes the runoff through the creeks upstream of the lakes as the inflow using the surveyed cross sections, lake stage-area-volume relationships and outflow from the lakes. It estimates water surface elevation along the creeks lead to the lakes, water surface elevation variation of the lakes and outflow from the lake through the outlets.

The inflows are estimated using the model for catchments above the lakes with reference to the methodology described in Australian Rainfall & Runoff (AR&R) (Institute of Engineers Australia 2000) for calibration. The actual rainfall data is used and assumed to be spatially uniform across the catchments.

The hydraulic model considers and models all existing structures such as culverts, bridges, re-diversion dam and spillway and models the flow through them properly. The water elevation variation in lakes is calibrated with historical lake elevation if available and recent water level measured by JDA which were carried out with GPS in multiple locations.

The cross sections data, natural surface elevation of high points, culverts and bridges invert levels have been extracted from JBA Surveys works and used in XP-Storm models which have been setup for modelling the lakes.

XP-Storm modelling is carried out in both Runoff and Hydraulic simulation modes. The simulation period is considered January 2003 to February 2012. The daily rainfall data over the period 2003-2012 for catchments above the lakes is used by the model to simulate the inflow hydrograph for the creeks leading to the lakes. Then the hydraulic simulation starts over the period 2003-2012 estimating water surface elevation and flow in all cross sections of the inflow creek to the lake, variation of lake water surface elevation according to stage-area-volume relationship of the lake, water surface elevation and flow along the downstream channel of the lakes.

The output of the XP-Storm model in the form of variation of simulated inflow to the lakes versus time is used to model salt and water balance of the lakes.

APPENDIX 3:

Community Consultation Attendance

1. Lake Towerrinning
2. Lake Ewlyamartup
3. Lake Yealering

1. Lake Towerrinning Meeting Attendees

Meeting at Moodiarrup Hall 13/12/11

1.	Sasha Naughton, A/Senior Project Officer, Department of Regional Development and Lands
2.	Andrew Mann – Manager, Infrastructure Regional Investment, Dept of Regional Development & Lands
3.	Jim Davies, Principal Hydrologist, JDA Consultant Hydrologists
4.	Andrew Foddy, Environmental Hydrologist, JDA Consultant Hydrologists
5.	Martin Wells, Director, Land Assessment Pty Ltd
6.	Andrew Waters, Woodgis Environmental Assessment and Mngt
7.	Nick Cox, Program Manager, Drainage Evaluation, Department of Water
8.	Denam Bennetts, Senior Planning Officer, Department of Environment and Conservation
9.	Drew Griffiths, District Manager Wellington, Department of Environment and Conservation
10.	Greg Durall, District Manager Great Southern, Department of Environment and Conservation
11.	Felicity Bunning, Department of Water, Bunbury
12.	Wayne Tingey, Department of Water, Bunbury
13.	Ros Abbott, adjoining land owner/Representative on the Lake Towerrinning Strategic Planning Group
14.	Donald Cochrane (local leader behind the initial rediversion)
15.	Dr Richard George, Principal Research Scientist, DAFWA (involved in initial project)
16.	Don Bennett, Research Officer, DAFWA
17.	Representative, Wheatbelt NRM
18.	Michelle – Landcare Officer
19.	Ray Harrington - Shire President
20.	Cr Michael Meredith
21.	Ian and Theresa Peirce, owners of Lakeside Camping/Caravan Park
22.	Geoffrey, Bruce, Janette Whitaker (adjoining landowners)

Lake Towerrinning Community Consultation Workshop: 29 March 2012 Moodiarrup Sports Complex

	First Name	Last Name	Organization
1	Paul	Rosair	Director General, Department of Regional Development and Lands (Chair)
2	Sasha	Naughton	Senior Project Officer, Department of Regional Development and Lands
3	Joyce	Gadalon	Manager ODG, Department of Regional Development and Lands
4	Jim	Davies	Principal Hydrologist, JDA Consultant Hydrologists
5	Andrew	Foddy	Environmental Hydrologist, JDA Consultant Hydrologists
6	Gregorio	Serafini	Graduate Environmental Engineer, JDA Consultant Hydrologists
7	Martin	Wells	Director, Land Assessment Pty Ltd.
8	Andrew	Waters	Woodgis Environmental Assessment and Mngt.
9	Liz	Peterson	Director, Advanced Choice Economics
10	Richard	George	DAFWA
11	Ian	Peirce	Lakeside Camping
12	Tereasa	Peirce	Lakeside Camping
13	Nicole	Wastman	CEO, Shire of West Arthur
14	Ray	Harrington	Shire President, Chair lake committee
15	Roz	Abbot	Community Member
16	Wendy	Cochrane	Community Member
17	Chris	Cochrane	Community Member
19	Michelle	Gooding	NRMO, Shire of West Arthur

2. Lake Ewlyamartup Meeting Attendees

Meeting at Katanning Shire Office 13/12/11

1. Sasha Naughton, A/Senior Project Officer, Department of Regional Development and Lands
2. Jim Davies, Principal Hydrologist, JDA Consultant Hydrologists
3. Andrew Foddy, Environmental Hydrologist, JDA Consultant Hydrologists
4. Martin Wells, Director, Land Assessment Pty Ltd
5. Andrew Waters, Woodgis Environmental Assessment and Mngt
6. Nick Cox, Program Manager, Drainage Evaluation, Department of Water
7. Felicity Bunning, Department of Water, Bunbury
8. Wayne Tingey, Department of Water, Bunbury
9. Denam Bennetts, Senior Planning Officer, Department of Environment and Conservation
10. Greg Durall, District Manager Great Southern, Department of Environment and Conservation
11. Carl Beck A/CEO, Shire of Katanning
12. Jessica van Der Waag, Great Southern Development Commission
13. Russell Prichard, Regional Manager, Great Southern Development Commission
14. Marianne Perrie, District LandCare Officer
15. Mick Quartermaine Chair, Lake Ewlyamartup Working Group
16. Steve Blyth, Board Member, Katanning South West Catchment Council

Lake Ewlyamartup Community Consultation Workshop: 28 March 2012 Pioneer Room, Katanning Leisure Centre

	First Name	Last Name	Organization
1	Paul	Rosair	Director General, Department of Regional Development and Lands (Chair)
2	Sasha	Naughton	Senior Project Officer, Department of Regional Development and Lands
3	Joyce	Gadalon	Manager ODG, Department of Regional Developmet and Lands
4	Jim	Davies	Principal Hydrologist, JDA Consultant Hydrologists
5	Andrew	Foddy	Environmental Hydrologist, JDA Consultant Hydrologists
6	Gregorio	Serafini	Graduate Environmental Engineer, JDA Consultant Hydrologists
7	Martin	Wells	Director, Land Assessment Pty Ltd
8	Andrew	Waters	Woodgis Environmental Assessment and Mngt.
9	Liz	Peterson	Director, Advanced Choice Economics
10	Mark	Anderson	Community Member
11	Carl	Beck	Shire of Katanning
12	Geoff	Clay	Community Member
13	Greg	Garlick	Community Member
14	Neville	Garlick	Community Member
15	David	Garnett	Community Member
16	Denni	Garnett	Community Member
17	Bev	Kowald	Community Member
18	Paul	Livsey	Emerge Associates - Environmental Consultant - Hydrology
19	Bev	Lockley	Community Member
20	Ron	Lockley	Community Member
21	Ernie	Maples	Community Member
22	Linda	Maples	Community Member
23	Margot	McGuire	Community Member
24	Scott	Newbey	Community Member
25	Wayne	Newbey	Community Member

Lake Ewlyamartup Community Consultation Workshop: 28 March 2012 Pioneer Room, Katanning Leisure Centre (Cont.)

	Last Name	Organization	
26	Mal	Packard	Community Member
27	Marianne	Perrie	Katanning Landcare Centre
28	Russell	Pritchard	GSDC
29	Jill	Richardson	SWCCNRM
30	Sue	Rocchi	Community Member
31	David	Secomb	Community Member
32	Jessica	Van Der Waag	GSDC
33	Tracey	Haddleton	Community Member
34	Zac	Haddleton	Community Member
35	Bradley	Obst	Community Member
36	Dillian	Obst	Community Member
37	Darren	Blight	Community Member
38	Kye	Blight	Community Member
39	Jamie	Sawer	Community Member
40	Rick	Wise	Community Member
41	Kurt	Wise	Community Member
42	Klinton	Wise	Community Member
43	Stephon	Conning	Community Member
44	Graham	Treloar	Community Member

3. Lake Yealering Meeting Attendees

Meeting at Yealering Town Hall 14/12/11

1. Sasha Naughton, A/Senior Project Officer, Department of Regional Development and Lands
2. Jim Davies, Principal Hydrologist, JDA Consultant Hydrologists
3. Andrew Foddy, Environmental Hydrologist, JDA Consultant Hydrologists
4. Martin Wells, Director, Land Assessment Pty Ltd
5. Andrew Waters, Woodgis Environmental Assessment and Management
6. Ian Hills (Local Farmer)
7. Matt (Local Farmer)
8. Natalie Manton, Community Development Officer, Shire of Wickepin

Lake Yealering Community Consultation Workshop: 29 March 2012 Yealering Town Hall

	First Name	Last Name	Organization
1	Paul	Rosair	Director General, Department of Regional Development and Lands (Chair)
2	Sasha	Naughton	Senior Project Officer, Department of Regional Development and Lands
3	Joyce	Gadalon	Manager ODG, Department of Regional Development and Lands
4	Jim	Davies	Principal Hydrologist, JDA Consultant Hydrologists
5	Andrew	Foddy	Environmental Hydrologist, JDA Consultant Hydrologists
6	Gregorio	Serafini	Graduate Environmental Engineer, JDA Consultant Hydrologists
7	Martin	Wells	Director, Land Assessment Pty Ltd
8	Andrew	Waters	Woodgis Environmental Assessment and Mngt.
9	Liz	Peterson	Director, Advanced Choice Economics
10	Felicity	Astbury	Facey Group
11	Lindsay	Corke	Community Member
12	Denise	Corke	Community Member
13	Colin	Coxon	Community Member
14	Linda	Coxon	Community Member
15	Maurice	Dawes	Community Member
16	Clare	Dawes	Community Member
17	Ian	Hills	Lake Yealering/ Living Lakes Contact
18	Sara	Hills	Community Member
19	Natalie	Manton	CDO Wickepin Shire
20	Matthew	Pockran	Community Member
21	Sue	Richards	Community Member
22	Brian	Shipley	Community Member
23	Lois	Shipley	Community Member
24	Kym	Smith	Community Member

Lake Yealering Community Consultation Workshop: 29 March 2012 Yealering Town Hall (Cont)

	First Name	Last Name	Organization
25	Caroline	Sutton	Community Member
26	Greg	Warburton	Wheatbelt Natural Resource Management
27	Greg	White	Community Member
28	Peter	Stribline	Business Owner / Hotel & Shop
29	John	Sartori	Community Member
30	Luci	Sartori	Community Member
31	Chris	Walton	Community Member
32	Rachael	Hill	Community Member
33	Grant	Stainer	DAFWA

Lake Towerrinning Community Feedback

ENHANCEMENT NO.	Who	BRIEF DESCRIPTION OF FEEDBACK
ET1	Lake T Community Feedback	Option ET1 - Model is appropriate, results ok (16-20% runoff in winter) though assumption that transmission loss is 12% (16 - 4%) and salinity change is due to bed loss, seems too high/unlikely? Ie Given upstream catchment provides 2.03 GL? More likely water is also lost 'over bank' to ET. Recommendation – to increase culvert capacity - agreed, though its unlikely to make large difference though having added capacity. Versatility argument is sound and supported on the basis that the Structure needs to be repaired as its likely to become dysfunctional at the current rate of degradation. Sediment ingress needs to be dealt with. Table 3.8 should say supported on replacement / engineering grounds.
	RESPONSE	**Final Report does not support ET1.**
ET2	Lake T Community Feedback	Option ET2 - Shallow groundwater (saline) data exists and was provided. Aquifer would not discharge direct into shallow structure, but surface EC would increase as a result of improved lateral flow/drainage, if effective. Use of 2000 – 3000 mg/L range appropriate, 10,000 unlikely as annual mean (ie run 1000, 3000 and 10,000 mg/L?). JDA model needs to be refined to be clear it won't have a negative impact on LT.
	RESPONSE	**Report used 1000,5000,10000 mg/L salinity from Capercup Reserve. Value of 2000-3000mg/L is within that range.**
ET3	Lake T Community Feedback	Option ET3 – not required/practical
	RESPONSE	**Agreed.**
ET4	Lake T Community Feedback	Option ET4 – as above, not supported. Note EC units are incorrectly used, as above.
	RESPONSE	**Agreed. ET4 not supported by report. EC units corrected in final report.**
ET5	Lake T Community Feedback	Option ET5 – Agreed, useful to do this option. Also, while probably not documented in the way JDA may be used to, farmers files held by Don Cochrane reported they have maintained parts of the structure, and the rediversion. increasing flow (even if not by % noted) is agreed. Project could improve the 12 km and upgrade culverts and make it more efficient?
	RESPONSE	**Agreed**
ET6	Lake T Community Feedback	Option ET6 – supported in principal, though this has a history that has not been resolved regarding clearing, ownership and access to the key area/vegetation. Having the Plan may not change the issues that have prevented this to date. The Commissioner of Soil and Land Conservation has been involved. One recommendation may be that JDA recommends that the Shire buys this area to enable long term management.
	RESPONSE	**These issues are beyond the scope of the project.**
ET7	Lake T Community Feedback	Option ET7 – its not clear why this can't be assessed given the model exists. Modelling with boards always open or always shut would be feasible to provide end members for analysis. Its also not clear what reason, apart from management, it needs redesigning? Either way the boards need to be replaced with something more manageable and compliant.
	RESPONSE	**Report recommends winter 2012 monitoring of outlet and current board settings.**

ENHANCEMENT NO.	Who	BRIEF DESCRIPTION OF FEEDBACK
ET1	Lake T Community Feedback	Community comment: the wording or description of this enhancement option, led the community to believe that water would be travelling faster down the existing drain – increasing the possibility of erosion and more silt entering the spillway. Suggestion – investigate an enhancement which enables the Lake to reach peak capacity earlier in the season, so that in drier years flushing can still occur to reduce salt load and to ensure the Lake has the potential to reach peak volume irrespective of annual rainfall. Model ability of current structure to cope with increased flow. If the risk of environmental damage is low and risk of damage to structure is minimal, then this would be a very useful enhancement, as in years of drought or low winter rainfall it should be noted that dangerous levels of algae build up, including one species which has been known to cause skin irritations and has meant the Lake has had to be closed to the public.
	RESPONSE	Final Report shows ET1 Option will not significantly increase flow of water to the lake: whereas Option ET5 will do so.
ET2	Lake T Community Feedback	Community comment: agree that JDA monitor the Reserve , including the bores located on O'Connell/Chia's property, sections of the reserve to the NW corner that are currently seeping water and take into consideration the location of the Kojonup Fault and a study into paleochannels of the area. Also should note where groundwater is entering the Reserve from the North-West rather than just pooling at the old railway siding.
	RESPONSE	This comment supports Draft Report Recommendation for additional monitoring of Capercup Reserve shallow groundwater in winter 2012.
ET2	Lake T Community Feedback	Community comment: Disagree, public opinion is that intercepting groundwater & diverting to the existing Lake Towerrinning diversion structure prior to excessive groundwater entering the Reserve would have more benefit than waiting for this water to enter the reserve and then draining it away. Small drains have already been put in by DEC in the past which have failed to remediate or halt the spread of the salinity problem & decline in vegetative health. Suggestion If an interception drain is not feasible then perhaps another design, such as a syphon, would be? Would the resultant flow have negative impact on the Lake? From the Environmental reports undertaken as part of the feasibility study it would appear that this remnant has even higher value than that previously considered. It contains plant associations & fauna that no longer exist in other parts of the catchment and may enable local seed stock to be collected under licence for re-vegetation projects on similar soil types near the Lake.
	RESPONSE	Final Report states that the drain will need to extend into or around the Reserve.
ET3	Lake T Community Feedback	Community comment: Agree, there doesn't appear to be any benefit to dredging the Lake or creating an island.
	RESPONSE	This Comment is consistent with final report.
ET4	Lake T Community Feedback	Community comment: Agree, from other experiences in pumping a fresh water aquifer close to Lake Towerinning, the quality of groundwater may diminish considerably over time. However, as stated previously, there have been occasions when water levels have been too low to flush the Lake adequately, so if any enhancement can increase this early to mid-season flow, without the need of too much redesign of the existing structure, then these enhancements should be investigated.
	RESPONSE	Final report supports surface water option in preference to groundwater.

ENHANCEMENT NO.	Who	BRIEF DESCRIPTION OF FEEDBACK
ET5	Lake T Community Feedback	Community comment: Agree Original community concern at the public meeting was that the surface of the current rediversion drain may require maintenance, as over time, erosion has occurred or is likely to occur over the next 20 years. Community comment: Is it possible for the consultants to consider any maintenance and re-forming of the existing drain that may be required? As noted in the consultant's report, the potential and actual peak flows do not match due to leakage. As leakage can be translated to mean increased pooling, inundation, siltation and potential dry-land salinity adjacent to the diversion drain, the integrity of the structure itself would be at risk of damage over time with an increased silt & salt load then entering the Lake.
	RESPONSE	This comment supports Draft Report Recommendation for additional monitoring of the rediversion drain in winter 2012. The Final Report does not consider silt traps, because of maintenance difficulties plus the beneficial effect of shallow water for waterbirds in the Inlet Swamp. .
ET5	Lake T Community Feedback	Original community concern at the public meeting was that silt traps design or current management may not be adequate to reduce excessive silt entering the Lake. Community comment: Is it possible for JDA to check the design or current management of the silt traps? Perhaps is may be recommended that a monitoring & maintenance schedule be implemented, this could form part of a more formal management plan.
	RESPONSE	. Final Report shows long-section of the proposed drain, indicating adequate fall
ET6	Lake T Community Feedback	Two different alignments have been considered, namely north and south. The south alignment requires less clearing of vegetation than the north alignment. Public comment: Agree – the design which requires less clearing of vegetation would be the preferred option. Will the fall from the proposed enhancement option to the River enable water to get away from the outlet swamp?
ET7	Lake T Community Feedback	As a management measure, control boards could be installed within the structure (as at Lake Towerrinning itself) to allow the Outlet Swamp to contain water at most times. Such boards would be located on private property and under private control, unless otherwise negotiated. Public comment: the use of boards to control the level of water has been problematic in the original outlet, as they are dangerous to move at times of peak flow, requiring as they do someone to physically enter the water to remove them. It would be appreciated for the benefit of Duty of Care and OH&S if a less dangerous method was recommended in its stead.
	RESPONSE	Final Report includes option of controlled bores at outlet of Outlet Swamp. Table 3.10 notes the safety issue of the lake outlet control boards.
ET10	Lake T Community Feedback	JDA recommends winter 2012 datalogger water level monitoring of Outlet Swamps, to better understand the current water level variation. Public comment: Agree Additional concern – does the current culvert under Darkan South Road from the outlet swamp require replacing and will it be sufficient to the task of taking away extra water flow? The community has been informed that culverts made of metal have been removed & replaced with cement in other parts of Australia, as recommended by a coroner's inquest, due to their dangerous nature. Is this something we should be considering for
	RESPONSE	The condition of these culverts under Darkan South Rd will need to be further assessed at detailed design stage. The Report does not comment on safety issues of metal or concrete culverts, which is beyond the Report scope.

ENHANCEMENT NO.	Who	BRIEF DESCRIPTION OF FEEDBACK
ET7	Lake T Community Feedback	The current structure can sometimes be difficult to use. JDA recommends winter 2012 data should be collected on the heights and dates of placement and removal of the boards at the outlet structure. After monitoring data collected over winter 2012, revisit this enhancement option Public comment: Agree Original community concern at the public meeting was that the current method for removing the boards to manage winter flow, is dangerous and that after 19 years there must be a safer method available. See comment 9 above. Public comment: Appreciate JDA investigating an improvement to the actual outlet structure to make it safer to use.
	RESPONSE	Final Report states that from a lake water balance and salinity view point, current lake outlet operation is near optimal. Safety issues are beyond the scope of the work

Lake Towerrinning Community Feedback Coninuted

ENHANCEMENT NO.	Who	BRIEF DESCRIPTION OF FEEDBACK
-	Lake T Community Feedback	Is it only those with a 'yes' in the Table 3.8 that go forward. If so that doesn't deal with the need to 'future proof' the main structures (that have delivered the outcome) or support the local community who have managed them over the past 20 years. The gaol should be to improve the operability of the lake (to achieve a living lake) and aid local management. My recommendations for works may therefore be different to JDAs if the above is true. Enacting these also becomes a combination of upgrading works (eg ET1, 2 etc), dealing access/ownership (ET6) and setting up management plans, that use the JDA data and modelling (eg ET7).
-	RESPONSE	**Final Report adresses most of these issues, but some are beyond the scope of the project.**
-	Lake T Community Feedback	Upgrading the mechanism for the success of the project to date – rediversion - including the baseflow pipe and main culvert/s, its important and as reported, isn't recommended. In addition, dealing with sediment.
-	RESPONSE	**Final Report does support maintenance/rehabilitation of Rediversion structure and drain.**
-	Lake T Community Feedback	Rediversion works – clean and improve (waterway/culverts - future proof).
-	RESPONSE	**Agreed. Included in Final Report**
-	Lake T Community Feedback	Overflow upgrade – to install engineering that enables easy control, based on experience or from knowledge of model
-	RESPONSE	**See ET7**
-	Lake T Community Feedback	Capercup Reserve waterway – supported, based on limited impact on Lake Towerrinning, as above
-	RESPONSE	**Agreed**
-	Lake T Community Feedback	Back swamp managed – pending vegetation, ownership and access issues (to land, road, river) and management plan with Shire
-	RESPONSE	**Agreed**

Lake Ewlyamartup Community Feedback

ENHANCEMENT NO.	Who	BRIEF DESCRIPTION OF FEEDBACK
EE5	Lake Ewlyamartup Working Group (LEWG) 5/6/2012	The report suggests that Salinity (EC) for enhancement option EE5- LEWG Option 32 is lower than the EE6 – LEWG Option 41. How did you determine this result? Why is the deeper channel option (G41) higher in salinity?
	RESPONSE	**LEWG option G32 (EE5) is preferred to option G41(EE6) as explained in the report. See Figure 4.19b, 4.21d, 4.18**
EE5	LEWG 5/6/2012	EE6 – LEWG Option 41 was chosen as a preferred option by the LEWG because… • It is deeper than EE5 (G32) , common sense says that the deeper the channel is, the fresher it will get sooner • Channel needs to be in clay, if channel not deep enough the saline water will just seep through the sand walls and cause environmental stress on surrounding veg. • If we start with the lower level in G41, we can then build it up to the level in G32 if level proves to be too low, easier to build on to rather than to rebuild all together
	RESPONSE	**See Response Above**
EE5	LEWG 5/6/2012	What model was used and how does it differ from the model used by Wheatbelt Hydrology?
	RESPONSE	**Explained in Report (Section 4.6&4.7)**
EE5	LEWG 5/6/2012	Was the “under the road” outlet channel option looked at for the LEWG it was not economically feasible and Main Roads had indicated that they were not likely to change the relatively new bridge infrastructure.
	RESPONSE	**See Above**

Lake Yealering Community Feedback

ENHANCEMENT NO.	Who	BRIEF DESCRIPTION OF FEEDBACK
EY1	Lake Y Community Feedback	With a self-regulated water leveler in place EY1 can be put into place, giving prioritized fill to the main Lake and with the knowledge that once the lake is at a level, water can spill away or exit the lake, with out causing inundation in unwanted areas.
	RESPONSE	**Report supports EY2 being constructed before EY1..**
EY2	Lake Y Community Feedback	1. Before any increase in water levels can occur, we are of the opinion that the outlet EY2 should be addressed as a priority. 2. As an option to a gated structure could we consider a spill way to regulate water levels as a alternate solution (this could remain at existing 'Y' junction): 1. little maintenance required 2. no gate keeper required (a gatekeeper can be problematic) 3. A spill way could be set at a predetermined level which would allow water from the west and s-west side to flow into the lake until the main lake reaches a level and then spills down into the Avon. We fully appreciate that the main water fill for the lake comes from the east – s. east side but the west provides some fill and can help to maintain the water levels throughout the wetter months. On small rainfall events it is quite common for water to run in this channel, regularly bypassing the lake as it stands. 4. One advantage of a gated structure could be to divert first water flows for the season (poorer water quality, salinity??) down the river before diverting into the lake proper. 5. Is the position of the proposed structure (Gateway) between the Lake and the Wickepin/Corrigin Road? If so, could we consider placing just a spillway at the existing 'Y' junction where west side inflows meet lake outflows. (may have misread where this proposed gated stucture is to be placed)
	RESPONSE	**The report takes the view that it would be easier to obtain approvals from Main roads and West Rail for an outlet structure at EY2 rather than downstream at EY5. Report suggests EY1 & EY2 will produce reasonable result, with EY5 perhaps implemented later.**
EY2	Lake Y Community Feedback	The only suggestion I have is to have the flood gates for the outflow at the Y junction where the inflowing Avon meets the overflow. The general thought is that the water from the south is too salty but I taste test this water quite often as I cross the creek and apart from the initial flow and late in the season , the rest of winter it is nearly drinkable and I think for the lake to work to its potential we need to get as much water in it from wherever the source.
	RESPONSE	**See Response Above**
EY3	Lake Y Community Feedback	If we dredge the whole lake base, we have to find the extra water to also fill the dredged depth. This could only be an option if we can find surplus water beyond the 'x' depth. At this stage we haven't got enough water to make the existing lake at 'x' depth.
	RESPONSE	The final report includes the island which addresses this comment.

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Shire of Katanning

DELEGATIONS REGISTER
MARCH 2018

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A BACKGROUND TO DELEGATIONS AND AUTHORISATIONS

Delegations and authorisations are the means by which decision-making bodies can administer power to undertake certain statutory functions.

A delegation is the conferral of the ability to exercise a power/duty to a person/body from another that is vested with the responsibility to exercise that statutory function.

An authorisation is the designation of an officer or a body as an entity that is capable of exercising a specific statutory power.

When one exercises delegated authority they do so "on behalf" of the delegator, and in doing so, the person or body exercising delegated authority forms the relevant state of mind to make the decision "on behalf" of the delegator. An authorised person or body exercises a statutory function in their own right.

The Western Australian local government statutory regime also provides for the Council and CEO to "act through" other officers, agents and bodies to achieve statutory functions. "Acting through" is not the exercise of delegated authority, or an authorised power, and must be handled differently.

The Department of Local Government and Communities provides a guideline on delegation to local governments in Western Australia. (Local Government Guideline No. 17 – Delegations).

The Governance Structure

The Western Australian local government governance regime provides that the Council appoints a CEO and the CEO appoints employees. All local government employees are responsible to the CEO, who, in turn, is responsible to the Council.

Wherever possible, the Shire will endeavour to ensure authorisations and delegations conform to this governance structure. Delegations will be established from the Council to the CEO; the CEO can then delegate power to officers or authorise officers as the CEO sees fit.

Delegations and authorisations from the Council directly to officers, other than the CEO, will be avoided unless legislation specifically provides that this is the only manner in which the power can be provided.

Delegations

This section provides guidance on the statutory framework for delegated authority. It addresses the two statutory requirements for delegated authority – the power to delegate and the power being delegated. This section also addresses some common conditions on delegation that apply in the local government setting.

The Power to Delegate

The ability to delegate a statutory function, power or duty must be described in a piece of legislation, and is known as the power of delegation. The ability to delegate powers is the first statutory requirement for an effective delegation. The following powers of delegation are contained in legislation relevant to this register.

Legislation		Delegation From	Delegation To	Function	Restrictions
Local Government Act 1995	s5.16	Council	Committees	Powers and duties of Council under the *Local Government Act 1995*	s5.17
Local Government Act 1995	s5.42	Council	CEO	Powers and duties of the Council under the *Local Government Act 1995*	s5.43
Local Government Act 1995	s5.44	CEO	Any employee of the local government	Powers and duties of the CEO under the *Local Government Act 1995*	s5.44
Bush Fires Act 1954	s48	Council	CEO	Powers and duties of the Council under the *Bush Fires Act 1954*	s48
Cat Act 2011	s.44	Council	CEO	Powers and duties of the Council under the *Cat Act 2011*	s.45(6)
Local Planning Scheme No. 5	cl.11.3	Council	CEO	Powers under the Local Planning Scheme	s9.10
Planning and Development Act 2005	s16(3)	Commission	A local government, a committee established under the *Local Government Act 1995* or an employee of a local government	Functions of the Commission under the *Planning and Development Act 2005*	
Strata Titles Act 1985	s25 s27	Commission	A local government, a committee established under the *Local Government Act 1995* or an employee of a local government	Functions of the Commission under the *Planning and Development Act 2005*	

Legislation		Delegation From	Delegation To	Function	Restrictions
Dog Act 1976	s26	Council	CEO	The authority to determine applications on the keeping of three dogs under the *Dog Act 1976*	
Main Roads Act 1930	s33C	Council	CEO	All powers, duties and functions of local government under the *Main Roads Act 1930*	
Food Act 2008		Council	CEO	The authority to serve a prohibition order, register a food business and initiate proceedings under the *Food Act 2008.*	
Building Act 2011	s127	Council	CEO	The authority to approve or refuse to grant permits and issue building orders	
Liquor Control Act 1988	s39 s40	Council	CEO	The authority to approve or refuse to grant section 39 and section 40 certificates	

The Power Being Delegated

The second statutory requirement for an effective delegation is the existence of a power to be delegated. The power must be able to be exercised by the person or body wanting to delegate that power and it must be contained in legislation that has an associated power of delegation.

A range of different powers can be delegated. An important aspect of any delegation of power is certainty as to the power being delegated. The person or body delegating authority should clearly specify in the instrument of delegation the statutory power or duty being delegated. This will ensure that the person exercising delegated authority can be certain of the extent of authority conferred by the delegation. The statutory reference to the power being delegated should be included in the instrument of delegation.

Reviewing the above list, it is clear that there is a limited range of legislation under which powers can be delegated. There is no express provision for a local government to delegate its functions under any other legislation. However, this does not prohibit the local government from "acting through" its officers for the purpose of legislation and the manner in which this can be achieved is detailed below.

Standard Conditions of Delegation

Each power of delegation may be subject to its own conditions and these are noted in the above list. However, there are some broad conditions of delegation that are detailed as follows:

The *Interpretation Act 1984*

Sections 58 and 59 of the *Interpretation Act 1984* place restrictions upon the exercise of the power of delegation and effects of delegation; these sections apply to all delegations under written laws however they may be varied by the statute which provides the power of delegation.

58. Delegates, performance of functions by

Where under a written law the performance of a function by a person is dependent upon the opinion, belief, or state of mind of that person in relation to a matter and that function may be performed by the delegate upon the opinion, belief, or state of mind of the delegate in relation to that matter.

59. Power to delegate, construction of

(1) Where a written law confers power upon a person to delegate the exercise of any power or the performance of any duty conferred or imposed upon him under a written law –

- *(a) such a delegation shall not preclude a person so delegating from exercising or performing at any time a power or duty so delegated;*
- *(b) such a delegation may be made subject to such conditions, qualifications, limitations or exceptions as the person so delegating may specify;*
- *(c) if the delegation may be made only with the approval of some person, such delegation, and any amendment of the delegation, may be made subject to such conditions, qualifications, limitations or exceptions as the person whose approval is required may specify;*
- *(d) such a delegation may be made to a specified person or to persons of a specified class, or may be made to the holder or holders for the time being of a specified officer or class of office;*
- *(e) such a delegation may be amended or revoked by instrument in writing signed by the person so delegating;*
- *(f) in the case of a power conferred upon a person by reference to the term designating an office, such a delegation shall not cease to have effect by reason only of a change in the person lawfully acting in or performing the functions of that office.*

(2) The delegation of a power shall be deemed to include the delegation of any duty incidental thereto or connected therewith and the delegation of a duty shall be deemed to include the delegation of any power incidental thereto or connected therewith.

(3) Where under a written law an act or thing may or is required to be done to, by reference to or in relation to, a person and that person has under a written law delegated a relevant function conferred or imposed on him with respect to or in consequence of the doing of that act or thing, the act or thing shall be regarded as effectually done if done to, by reference to or in relation to the person to whom the function has been delegated.

The Concept of 'Acting Through'

[Extracted from DLGC Guideline No. 17 – Delegations]

In addition to covering delegations, the *Local Government Act 1995* introduces the concept of "acting through." In relation to delegations, section 5.45 of the Act states that nothing prevents a "local government from performing any of its functions by acting through a person other than the CEO" or "a CEO from performing any of his or her functions by acting through another person."

While the Act does not specifically define the meaning of the term "acting through, it cites a key difference between a delegation and "acting through" in that a delegate exercises the delegated decision-making function in his or her own right. The principal issue is that where a person has no discretion in carrying out a function, then that function may be undertaken through the "acting through" concept. Alternatively, where the decision allows for discretion on the part of the decision maker, then that function needs to be delegated for another person to have that authority.

For administrative purposes, a person may sign a letter in his or her own name on behalf of the CEO while, with delegated powers, the person would sign a letter in his or her own name, in accordance with the delegated authority.

An appropriate method for a council of a local government to make a decision which will be implemented by its officers, is for it to make a policy about particular functions that it performs. In that case there is no need for a delegation as it will be the role of the organisation to implement those policy decisions.

Register of Delegations

The *Local Government Act 1995* requires the Shire to maintain a register of the exercise of delegations. The register must include prescribed information detailing how delegated authority has been exercised in a range of circumstances. The requirement to record the prescribed information applies only to delegations made using the power of delegation under part of the *Local Government Act 1995* and does not extend to other legislation.

STANDARD CONDITIONS

Any person proposing to exercise a power under delegated authority shall comply with the following standard conditions of delegation:

1. Actual decisions relating to the matter delegated shall be made by the person nominated in the delegation. However, it is understood that other staff may carry out administrative and technical work relating to those decisions.

2. Compliance with all relevant legislative requirements, Local Laws, Council Policies, resolutions of Council and the Business Management System Procedures.

3. Delegated authority cannot be exercised where a Financial Interest or an Interest Affecting Impartiality is evident.

4. It is a statutory requirement to maintain a record of each decision made under delegated authority. Documents relating to delegated authority decisions shall, as a minimum, record:
   a. Date the decision was exercised;
   b. Name of the Officer/Committee exercising the decision;
   c. Description of how the person exercised the power or discharged the duty, including where appropriate, any directions to staff to carry out work associated with the decision unless those directions are included in Policies, Management Procedures or the Delegation Register;
   d. Notation of the people or class of people directly affected by the decision (other than Council or Committee members or employees of the Shire).

5. Wherever possible the requirements of point 4 above shall be incorporated into administrative documents such as memos, file notes, cheque vouchers, etc.

6. Instruction is provided for each delegation on record keeping requirements.

LOCAL GOVERNMENT ACT 1995
DELEGATIONS TO CEO

DA01 – APPOINTMENT OF AUTHORISED OFFICERS

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Government Act 1995***
Part 3, Division 3, Subdivision 2 s3.24 – Certain provisions about land
s9.10 Appointment of authorised officers

Cat Act 2011
s44 Delegation by local government

Dog Act 1976
s10AA Delegation of local government powers and duties

Food Act 2008
s122 Appointment of authorised officers

Building Act 2011
s96(3) Authorised persons

Litter Act 1979
s26 Authorised officers, appointment and jurisdiction of etc.

Planning and Development Act 2005
s228 Giving infringement notice

Control of Vehicles (Off-Road Areas) Act 1976
s5 Local government's functions

Health Act 2011
s26 Powers of local government (subject to s28 Appointments to be approved)

Bushfires Act 1954
s38 Local government may appoint bush fire control officer

General Local Law 1997

	Cemetery Local Law 1997
	Dogs Local Law 1997
	Extractive Industries Local Law 1997
	Katanning Airport Local Law 1997
	Removal of Refuse, Rubbish & Disused Materials Local Law 1998
	Health Local Law 1998
FUNCTION:	Appoint authorised officers in writing and issue certificates of authorisation to allow for the enforcement of the above Acts, associated Regulations and Local Laws.
CONDITIONS:	Must act in accordance with the Shire's "Standard Conditions Relating to Delegations". Authorised Officers for the *Food Act 2008* must hold office as an environmental health officer under the *Health Act 1911.* A power or duty under section 63, 64 or 65 of the *Cat Act 2011* cannot be delegated to an authorised person. The Shire is required, under s9.10(2) of the *Local Government Act 1995*, to issue each person so authorised a certificate and/or letter of authorisation. Authorised persons may be required to produce letter/certificate when exercising authorised functions.
RECORD KEEPING:	Record details of authorisations issued. Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.
REFERENCES:	Shire of Katanning Council Policy 3.5 – Statutory Appointments
COUNCIL AUTHORISATIONS:	Chief Executive Officer Executive Manager Infrastructure & Development Executive Manager Property & Assets Environmental Health Officer Shire Ranger
SUPPLEMENTARY CONDITION:	Above stated conditions apply.

POWER TO SUBDELEGATE: *Local Government Act 1995*:
s5.44 CEO may delegate powers and duties to other employees.

CEO DELEGATION TO: Not exercised – comprehensive list of authorised officers under Council Policy 3.5 – Statutory Appointments

DA02 – POWERS OF ENTRY

POWER / DUTY ASSIGNED TO:	Local Government
POWER TO DELEGATE:	*Local Government Act 1995* s5.42 Delegation of some powers or duties to CEO s5.43 Limitations on delegations to CEO
DELEGATION TO:	Chief Executive Officer
POWER / DUTY DELEGATED:	***Local Government Act 1995*** **Part 3, Division 3, Subdivision3 – Powers of entry**
FUNCTION:	To give effect to powers of entry as required in performing the functions of the *Local Government Act 1995.*
CONDITIONS:	Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".
RECORD KEEPING:	Record decisions to enter property. Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.
REFERENCES:	Shire of Katanning Council Policy 3.5 – Statutory Appointments
COUNCIL AUTHORISATIONS:	Chief Executive Officer Executive Manager Infrastructure & Development Executive Manager Property & Assets Environmental Health Officer Shire Ranger

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POWER TO SUBDELEGATE:	*Local Government Act 1995* s5.44 CEO may delegate powers and duties to other employees.
CEO DELEGATION TO:	Not exercised – comprehensive list of authorised officers under Council Policy 3.5

DA03 – ROAD CLOSURES – Temporary

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Government Act 1995***
s3.50 Closing certain thoroughfares to vehicles
s3.50 A Partial closure of thoroughfares for repairs or maintenance
s3.51 Affected owners to be notified of certain proposals
s3.52 Public access to be maintained and plans kept

FUNCTION: All duties and functions described in the delegated sections of the *Local Government Act 1995*.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

RECORD KEEPING: Record decision to undertake a closure. Record advice to owners/occupiers. Record agreements for maintenance of private structures in public thoroughfares /places.

Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: *Local Government Act 1995*
s5.44 CEO may delegate powers and duties to other employees.

CEO DELEGATION TO: Executive Manager Infrastructure & Development
Manager Operations

SUPPLEMENTARY CONDITIONS: Above stated conditions apply.

DA04 – TENDERS

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Government Act 1995***
s3.57 Tenders for providing goods or services

Local Government (Functions and General) Regulations 1996
Part 4 – regs. 11 to 24

FUNCTION: To call tenders and set weighted criteria as outlined in the relevant legislation and this delegation.

To authorise purchases and accept tenders in accordance with the conditions of this delegation.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

Authorise purchases that are exempt from tendering regulations as outlined in regulation 11.2, excluding 2(d), of the *Local Government (Functions and General) Regulations 1996,* where the purchase value is no more than $250,000 per annum.

Accept tenders where there is a Council budget provision approved for the following:

- Annual supplies of a routine operational nature within budget amount and where the tender is for no greater than 5-years and no more than $250,000 per annum;
- Replacement plant, equipment, furniture and maintenance within a net (changeover) cost of less than $250,000;
- New plant, equipment, furniture and construction where the tender is for less than an amount of $250,000 and within budget amount.
- Goods or Services where a budget provision exists and the purchase value is under $250,000.

The Chief Executive Officer may reject tenders of any amount.

Accept tenders relating to the disposal of impounded perishable and non-perishable goods in accordance with Section 3.47 of the *Local Government Act 1995*

Approve minor variations to the scope of work specified in a tender (up to a maximum of 10% of the total contract value) following the receipt of submissions but prior to entering into a contract

Where a tender is accepted with an option to extend the contract beyond the initial period, the Chief Executive Officer may exercise or decline that option.

To call, accept the short listing and if required reject all Expression of Interests.

RECORD KEEPING: Maintain Tender Register, recording details of decisions under this delegation and insert links to relevant evidentiary documents.

Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: *Local Government Act 1995*
s5.44 CEO may delegate powers and duties to other employees.

CEO DELEGATION TO: Executive Manager Finance & Administration
Executive Manager Infrastructure & Development
Executive Manager Projects & Community Building
Executive Manager Property & Assets

SUPPLEMENTARY CONDITIONS:

Can **ONLY** call Tenders or Expressions of Interest and set weighted criteria where there is a Council budget provision approved and the product or service being sought is not considered to be extraordinary.

Can **ONLY** approve minor variations to the scope of work specified in a tender (up to a maximum of 10% of the total contract value) following the receipt of submissions but prior to entering into a contract

Can **ONLY** call Tenders or Expression of Interests relevant to the activities of the respective Executive Manager's division.

DA05 – ACQUISITION AND DISPOSAL OF LAND

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some Powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Government Act 1995***
s3.58 (2) (3) Disposing of property

FUNCTION: Undertake the function of acquiring and disposal of land, including lease and purchase.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

Acquire and dispose of 'real property', which is specifically identified within the Budget with a value of up to $1,000,000.

Acquire and dispose of a leasehold interest in property for a cumulative cost over the life of the lease of up to $1,000,000.

Manage lease / licence clauses, including but not limited to terminations, renewal options, assignments, subletting, and the establishment of special conditions or variations to payment schedules.

Assignment of leases and licences is subject to appropriate Police Clearances and Credit Checks (where unsatisfactory refer to Council).

RECORD KEEPING: Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: *Local Government Act 1995*
s5.44 CEO may delegate powers and duties to other employees.

CEO DELEGATION TO: CEO has exercised the right not to sub-delegate this delegation.

DA06 – DISPOSAL OF ASSETS

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Government Act 1995***
s3.58 Disposing of property

Local Government (Functions and General) Regulations 1996 –
reg.30(3) Dispositions of property excluded from Act s3.58

FUNCTION: Dispose of assets surplus to the Shire's operational needs.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

Authorise the disposal of minor plant and assets with a depreciated value of not more than $25,000 without the requirement for Council approval.

Authorise the disposal of a plant item or asset with a depreciated value of no more than $90,000 in accordance with the requirements of s3.58.

RECORD KEEPING: Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: *Local Government Act 1995*
s5.44 CEO may delegate powers and duties to other employees.

CEO DELEGATION TO: Executive Manager Finance & Administration

SUPPLEMENTARY CONDITIONS: May dispose of surplus computer and related hardware with a depreciated value of up to $5,000, in accordance with procedures to be developed and approved by the CEO.

DA07 – APPOINT ACTING CHIEF EXECUTIVE OFFICER

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Government Act 1995***
s5.36(1)(a) Local government employees

FUNCTION: To provide for the appointment of one of the Shire's senior managers to perform the role of Acting Chief Executive Officer during absences of the Chief Executive Officer.

In making this delegation the Council has determined that the Shire's senior managers are suitably qualified to perform the role of Acting Chief Executive Officer.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

Appointment to the role of Acting Chief Executive Officer must be made in writing to the nominee for a defined period, which does not exceed 3 months to align with long service leave entitlements.

Senior managers will be appointed to the role of Acting Chief Executive Officer generally on a rotational basis at the discretion of the Chief Executive Officer however, dependent on availability and operational requirements.

The Shire's incumbent senior managers are:
- Executive Manager Finance & Administration
- Executive Manager Infrastructure & Development
- Executive Manager Projects & Community Building
- Executive Manager Property & Assets

RECORD KEEPING: Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems

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POWER TO SUBDELEGATE: *Local Government Act 1995*
s5.44 CEO may delegate powers and duties to other employees.

CEO DELEGATION TO:	CEO has exercised the right not to sub-delegate this delegation.

DA08 – MUNICIPAL FUND/PROCEDURES AND PAYMENTS

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Government Act 1995***
s6.7 Municipal fund

Local Government (Financial Management) Regulations 1996
reg.11 Payments, procedures for making etc.
reg.12 Payments from municipal fund or trust fund, restrictions on making

FUNCTION: Make payments from the Municipal Fund in accordance with procedures.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

RECORD KEEPING: Retain Cheque Vouchers, including electronic transfer records as evidence of decisions to make payments.

Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: *Local Government Act 1995*
s5.44 CEO may delegate powers and duties to other employees

CEO DELEGATION TO: Executive Manager Finance & Administration

SUPPLEMENTARY CONDITIONS: Above stated conditions apply.

CEO DELEGATION TO: Executive Manager Finance & Administration
Manager Finance
Executive Manager Infrastructure & Development
Executive Manager Property & Assets
Executive Manager Projects & Community Building

SUPPLEMENTARY

CONDITIONS:	Authorise payments from the Municipal Fund (i.e. sign cheques, initiate and authorise electronic payments)

DA09 – TRUST FUND / PROCEDURES AND PAYMENTS

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Government Act 1995***
s6.9(3) Trust fund

Local Government (Financial Management) Regulations 1996
reg.12 Payments from municipal or trust fund, restrictions on making

FUNCTION: Make payments from the Trust Fund in accordance with procedures.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

RECORD KEEPING: Minute details of Council's resolution to receive the Authorised Cheque Listing and retain Cheque Vouchers as evidence of decisions to make payments.

Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: *Local Government Act 1995*
s5.44 CEO may delegate powers and duties to other employees

CEO DELEGATION TO: Executive Manager Finance & Administration
Manager Finance
Executive Manager Infrastructure & Development
Executive Manager Projects & Community Building
Executive Manager Property & Assets

SUPPLEMENTARY CONDITIONS: Above stated conditions apply

DA10 – WAIVER OR CONCESSIONS - Granting

POWER / DUTY ASSIGNED TO:	Local Government
POWER TO DELEGATE:	*Local Government Act 1995* s5.42 Delegation of some powers or duties to CEO s5.43 Limitations on delegations to CEO
DELEGATION TO:	Chief Executive Officer
POWER / DUTY DELEGATED:	***Local Government Act 1995*** **s6.12(1)(b)(c) and (3) Power to defer, grant discounts, waive or write off debts**
FUNCTION:	Waive or grant concessions in relation to money owed to the Shire. Write off money owed to the Shire. Determine the conditions to be applied to waive, grant a concession or write off money owed to the Shire.
CONDITIONS:	Must act in accordance with the Shire's "Standard Conditions Relating to Delegations". Authorise a waiver, grant a concession or write off an amount of money owed to the Shire to a maximum value of $500 GST exclusive. Write offs to be reported to Council on a monthly basis with the Sundry Debtors Listing. Write offs exclude instances where a debtor has been incorrectly charged.
RECORD KEEPING:	Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE:	*Local Government Act 1995* s5.44 CEO may delegate powers and duties to other employees.
CEO DELEGATION TO:	CEO has exercised the right not to sub-delegate this delegation.

DA11 – INVESTMENTS

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Government Act 1995***
s6.14 Power to invest

Local Government (Financial Management) Regulations 1996
reg.19 Investments, control procedures for

FUNCTION: Money held in the municipal fund or the trust fund that is not, for the time being, required by the local government for any other purpose may be invested in accordance with Part III of the *Trustees Act 1962*.

Establish and document internal control procedures to ensure control over investments that enable the identification of the nature and location of all investments and the transactions related to each investment.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations" and in accordance with Council's Policy 3.4 Investment of Surplus Funds

RECORD KEEPING: Record details of documented procedures; the subsequent amendment of procedures and ECM-links to relevant evidentiary documents.

Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: *Local Government Act 1995*
s5.44 CEO may delegate powers and duties to other employees.

CEO DELEGATION TO: Executive Manager Finance & Administration
Manager Finance

SUPPLEMENTARY CONDITIONS: Establish and maintain procedures

DA12 – RECOVERY OF UNPAID RATES

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Government Act 1995***
s6.56(1) Rates or service charges recoverable in court
s6.60Local government may require lessee to pay rent
s6.64Actions to be taken
s6.69(2)(3) Right to pay rates, service charges and costs, and stay proceedings
s6.74(1) Power to have land re-vested in the Crown if rates in arrears 3 years
Schedule 6.2(1)[1] Provisions relating to lease of land where rates or service charges unpaid [Section 6.65]
Schedule 6.3(1)[4] and (4)[1] Provisions relating to sale or transfer of land where rates or service charges unpaid [Section 6.68(3)]

FUNCTION: Undertake recovery of overdue unpaid rates, as well as the costs of proceedings, if any, for that recovery, incurred in a court of competent jurisdiction.

As part of the legal recovery of rates and charges in court, documents such as summonses and warrants are required to be duly authorised.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

Legal representation is limited by the *Magistrates Court (Civil Proceedings) Act 2004.*

RECORD KEEPING: Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

REFERENCES: *Magistrates Court (Civil Proceedings) Act 2004* – Part 4

POWER TO SUBDELEGATE:	*Local Government Act 1995* s5.44 CEO may delegate powers and duties to other employees.
CEO DELEGATION TO:	Executive Manager Finance & Administration Manager Finance
SUPPLEMENTARY CONDITIONS:	Above stated conditions apply

DA13 – BANK ACCOUNTS

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Government Act 1995***
s6.6 Funds to be established

Local Government (Financial Management) Regulations 1996
reg.8 Separate bank etc. accounts required for some monies.

FUNCTION: Maintain separate accounts with a bank or other financial institution for money required to be held in:

- the municipal fund;
- the trust fund; and
- reserve accounts.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

RECORD KEEPING: Record details of accounts opened and maintained.

Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: *Local Government Act 1995*
s5.44 CEO may delegate powers and duties to other employees.

CEO DELEGATION TO: Executive Manager Finance & Administration
Manager Finance

SUPPLEMENTARY CONDITIONS: Above stated conditions apply

DA14 – EXTENSION FOR RATE EXEMPTION APPLICATION

POWER / DUTY ASSIGNED TO:	Local Government
POWER TO DELEGATE:	*Local Government Act 1995* s5.42 Delegation of some powers or duties to CEO s5.43 Limitations on delegations to CEO
DELEGATION TO:	Chief Executive Officer
POWER / DUTY DELEGATED:	***Local Government Act 1995*** **s6.76 Grounds of Objections**
FUNCTION:	Determine an application to extend the time for lodging an objection to the rate record where an objection is to be made relating to a rates exemption in accordance with *s6.26 Rateable Land* beyond 42 days from the date of service of the rate notice.
CONDITIONS:	Must act in accordance with the Shire's "Standard Conditions Relating to Delegations". Applications for an extension are to be made in writing. A recommendation on a rates exemption is to be referred to Council.
RECORD KEEPING:	Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE:	*Local Government Act 1995* s5.44 CEO may delegate powers and duties to other employees.
CEO DELEGATION TO:	Executive Manager Finance & Administration Manager Finance
SUPPLEMENTARY CONDITIONS:	Above stated conditions apply

DA15 – AUTHORISED OFFICERS – Variation of Meeting Date – Annual Electors Meeting

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Government Act 1995***
s5.27 Electors' general meetings

FUNCTION: Change the Annual Electors Meeting date should the need arise.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

RECORD KEEPING: Record details of authorisations issued.

Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems

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POWER TO SUBDELEGATE: *Local Government Act 1995*
s5.44 CEO may delegate powers and duties to other employees.

CEO DELEGATION TO: CEO has exercised the right not to sub-delegate this Delegation.

BUILDING ACT 2011

DA16 – BUILDING ACT 2011

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Building Act 2011*
s127 Delegation: special permit authorities and local governments

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Building Act 2011***
The following Permit Authority functions as required by the *Building Act 2011* and subsidiary Regulations
s20 Grant of building permit
s21 Grant of demolition permit
s22 Further grounds for not granting an application
s27 Conditions imposed by permit authority
s58 Grant of occupancy permit
s62 Conditions imposed by permit authority
s65 Extension of period of duration
s110 Building orders
s111 Notice of proposed building order other than building order (emergency)
s117 Revocation of building order

FUNCTION: The Authority to approve or refuse to grant permits and issue Building Orders:

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

Notify Council of all refusals to grant Permits and Building Orders issued.

RECORD KEEPING:	Any Permit granted or Building Order duly completed is sufficient record for the purposes of this Delegation. Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.
POWER TO SUBDELEGATE:	*Building Act 2011* s127 (6A) The CEO of a local government may delegate to any other local government employee.
CEO DELEGATION TO: **SUPPLEMENTARY CONDITIONS**:	Director Infrastructure & Development Above stated conditions apply with regards to: ▪ s110 Building orders ▪ s111 Notice of proposed building order other than building order (emergency) ▪ s117 Revocation of building order
CEO DELEGATION TO: **SUPPLEMENTARY CONDITIONS**:	Building Surveyor Above stated conditions apply with regards to: ▪ s20 Grant of building permit (Certified) ▪ s20 Grant of building permit (Uncertified; within level of Building Surveying Practitioner Registration) ▪ s21 Grant of demolition permit ▪ s22 Further grounds for not granting an application ▪ s27 Conditions imposed by permit authority ▪ s58 Grant of occupancy permit ▪ s62 Conditions imposed by permit authority ▪ s65 Extension of period of duration ▪ s110 Building orders ▪ s111 Notice of proposed building order other than building order (emergency) ▪ s117 Revocation of building order

DA17 – VERGE PERMITS

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Government (Uniform Local Provisions) Regulations 1996***
reg.6 Obstruction of public thoroughfare by things placed and left

FUNCTION: Consider and issue Verge Permits, with or without conditions in accordance with the requirements of reg.6.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

In issuing permits, licences and approvals ensure the Code of Conduct requirements for 'Quasi-Judicial Role' are applied.

RECORD KEEPING: As per Building / Demolition Permits, a Verge Permit duly completed is sufficient record for the purposes of this Delegation.

Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: *Local Government Act 1995*
s5.44 CEO may delegate powers and duties to other employees.

CEO DELEGATION TO: Executive Manager Infrastructure & Development
Building Surveyor

SUPPLEMENTARY CONDITIONS: Above stated conditions apply.

LOCAL PLANNING SCHEME No 5

DA18 – DEVELOPMENT APPLICATIONS

POWER / DUTY ASSIGNED TO: The Council

POWER TO DELEGATE: *Local Planning Scheme No. 5*
cl.11.3 Delegation of Functions

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Planning Scheme No. 5*, as amended:-**
Part 4 Zones and the Use of Land
Part 5 General Development Requirements
Part 6 – Special Control Areas
Clause 8.3 Unauthorised Existing Developments
Part 10 Procedure for Dealing with Applications
Clause 11.1 Powers of the Local Government

Planning and Development (Local Planning Schemes) Regulations 2015
Part 7 Requirement for development approval
Part 8 Applications for Development Approval
Part 9 Procedure for dealing with applications for development approval
Part 10 Enforcement and Administration

FUNCTION: All powers of the Council contained in the sections and parts of Local Planning Scheme No. 5, as amended and delegated above.

To determine applications for development under the Shire of Katanning's Local Planning Scheme No. 5.

To determine development applications, applications for the amalgamation of lots and all forms of subdivision and survey strata referred to the Council by the Western Australian Planning Commission

To endorse deposited plans after the conditions of subdivision/amalgamation approval for which the Council is responsible have been fulfilled.

To determine variations to the 'deemed to comply' provisions of the Residential Design Codes using the performance criteria

To determine applications for development requiring retrospective Planning Approval

To determine applications involving minor variations to an adopted Local Planning Policy
To determine applications involving minor variations to setback and lot coverage requirements of the Shire of Katanning Local Planning Scheme No. 5

CONDITIONS:

Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

This delegation must not be exercised by the delegated officer:

- Where project costs for new a development application exceeds $5 million.
- Where development is proposed on reserved land, owned or within the care and control of the Council.
- Where the development and/or subdivision proposals have a strategic impact and as a result involve issues in which Council has a direct interest.
- Where significant variations to the Scheme are evident.
- Where the decision requires the exercise of any of the powers of the Council under Local Planning Scheme No. 5 clauses:
  - 4.4.2 Interpretation of the Zoning Table
  - (Uses Not Listed)
  - 10.8 Approval Subject to Later Approval of Details
  - 10.6 Temporary Planning Approval

RECORD KEEPING:	Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE:	*Local Government Act 1995* s5.44 CEO may delegate powers and duties to other employees.
CEO DELEGATION TO:	Executive Manager Infrastructure & Development
SUPPLEMENTARY CONDITIONS:	Above stated conditions apply.

DA19 – DEVELOPMENT APPLICATIONS / MINOR VARIATIONS

POWER / DUTY ASSIGNED TO: The Council.

POWER TO DELEGATE: *Local Planning Scheme No.5*
cl.11.3 Delegation of Functions

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Planning Scheme No. 5*, as amended:-**
Part 4 Zones and the Use of Land
Part 5 General Development Requirements
Part 10 Procedure for Dealing with Applications
Clause 11.1 Powers of the Local Government

Planning and Development (Local Planning Schemes) Regulations 2015
Part 7 Requirement for development approval
Part 8 Applications for Development Approval
Part 9 Procedure for dealing with applications for development approval
Part 10 Enforcement and Administration

FUNCTION: To determine applications for development approval which involve minor variations to the "deemed to comply" provisions by using the performance criteria of the Residential Design Codes that require approval under Local Planning Scheme No.5

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

This delegation must not be exercised by the delegated officer:

- Where the development entails a variation to the Residential Design Codes that is considered by the Delegate to be significant;
- Where the development entails a variation to the Residential Design Codes that is considered by the Delegate to have the potential to negatively impact on the amenity of the locality;
- Where a formal objection has been lodged against the variation;

- Where the height of the development exceeds two storeys;
- Where development is proposed on reserved land within the care and control of the Council;
- Where development proposals are considered by the Delegate to have a strategic impact and as a result involve issues in which Council has a direct interest.
- Where significant variations to the Scheme are evident.
- Where the decision requires the exercise of any of the powers of the Council under clause:

- 4.4.2 Interpretation of the Zoning Table (Uses Not Listed)
- 10.8 Approval Subject to Later Approval of Details
- 10.6 Temporary Planning Approval

RECORD KEEPING: Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: *Local Planning Scheme No. 5* Clause 11.3.2

CEO DELEGATION TO: Executive Manager Finance & Administration
Executive Manager Infrastructure & Development
Contract Planner

SUPPLEMENTARY CONDITIONS: Above stated conditions apply.

DA20 – DEVELOPMENT APPLICATIONS - SHIRE DEVELOPMENTS ON RESERVED LAND

OWER / DUTY ASSIGNED TO: The Council

POWER TO DELEGATE: *Local Planning Scheme No.5*, as amended
cl. 11.3 Delegation of Functions

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Local Planning Scheme No.5*, as amended**
Part 4 Zones and the Use of Land
Part 5 General Development Requirements
Clause 8.3 Unauthorised Existing Developments
Part 10 Procedure for Dealing with Applications
Clause 11.1 Powers of the Local Government

Planning and Development (Local Planning Schemes) Regulations 2015
Part 7 Requirement for development approval
Part 8 Applications for Development Approval
Part 9 Procedure for dealing with applications for development approval
Part 10 Enforcement and Administration

FUNCTION: Streamline the processing of development application proposals for developments to be undertaken by the Shire.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

The delegation must not be exercised by the delegated officer unless:

- The Shire is listed as an applicant;
- The development is on land owned or under the care and control of the Shire of Katanning;
- The works have been approved on the current annual budget;
- The value of the development is less than $1,500,000.
- Where significant variations to the Scheme are evident; and,

- The decision does not require the exercise of any of the powers of the Council under Local Planning Scheme No. 5 clauses:
  - 4.4.2 Interpretation of the Zoning Table (Uses Not Listed)
  - 10.8 Approval Subject to Later Approval of Details
  - 10.6 Temporary Planning Approval

RECORD KEEPING: Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: *Local Planning Scheme No. 5*
Clause 11.3.2

CEO DELEGATION TO: Executive Manager Finance & Administration
Executive Manager Infrastructure & Development
Contract Planner

SUPPLEMENTARY CONDITIONS: Above stated conditions apply.

BUSH FIRES ACT 1954

DA21 – BUSH FIRES ACT – Powers and Functions

POWER / DUTY ASSIGNED TO:	Local Government
POWER TO DELEGATE:	*Bush Fires Act 1954* s48 Delegation by local governments
DELEGATION TO:	Chief Executive Officer.
POWER / DUTY DELEGATED:	***Bush Fires Act 1954***
FUNCTION:	All powers, duties and functions of the local government under the *Bush Fires Act 1954*.
CONDITIONS:	Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".
RECORD KEEPING:	Maintain records of activities and decisions made under this delegation. Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems

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POWER TO SUBDELEGATE:	CEO has exercised the right not to sub-delegate this delegation.

MAIN ROADS ACT 1930

DA22 – MAIN ROADS – Control of Advertisements

POWER / DUTY ASSIGNED TO:	Local Government
POWER TO DELEGATE:	*Main Roads Act 1930* s33C Commissioner may delegate powers etc. under regulations to local government
DELEGATION TO:	Chief Executive Officer.
POWER / DUTY DELEGATED:	***Main Roads Act 1930***
FUNCTION:	All powers, duties and functions of the local government under the *Main Roads Act 1930.*
CONDITIONS:	Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".
RECORD KEEPING:	Maintain records of activities and decisions made under this delegation. Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems
POWER TO SUBDELEGATE:	CEO has exercised the right not to sub-delegate this delegation.

FOOD ACT 2008

DA23 – PROHIBITION ORDERS

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Food Act 2008*
s118 Functions of enforcement agencies and delegation
s119 Conditions on performance of functions by enforcement agencies
s120 Performance of functions by enforcement agencies and authorised officers

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Food Act 2008***
s65 Prohibition order
s66 Certificate of clearance to be given in certain circumstances
s67 Request for re-inspection

FUNCTION: This delegation provides authority to:-

1. Serve a prohibition order on the proprietor of a food business in accordance with s65 of the *Food Act 2008;*

2. Give a certificate of clearance, where inspection demonstrates compliance with a prohibition order and any improvement notices;

3. Give written notice to proprietor of a food business on whom a prohibition order has been served of the decision not to give a certificate of clearance after an inspection.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

RECORD KEEPING: Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: CEO has exercised the right not to sub-delegate this delegation.

DA24 – REGISTRATION OF FOOD BUSINESS

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Food Act 2008*
s118 Functions of enforcement agencies and delegation
s119 Conditions on performance of functions by enforcement agencies
s120 Performance of functions by enforcement agencies and authorised officers

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Food Act 2008***
s110 Registration of food business
s112 Variation of conditions or cancellation of registration of food businesses.

FUNCTION: The delegation provides the authority to:-

1. Register a food business in respect of any premises for the purposes of Part 9 of the *Food Act 2008* and issue a certificate of registration;
2. After considering an application, determine to grant (with or without conditions) or refuse the application;
3. Vary the conditions or cancel the registration of a food business in respect of any premises under Part 9 of the *Food Act 2008.*

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

RECORD KEEPING: Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: CEO has exercised the right not to sub-delegate this delegation.

DA25 – FOOD ACT 2008 - PROSECUTIONS

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Food Act 2008*
s118 Functions of enforcement agencies and delegation
s119 Conditions on performance of functions by enforcement agencies
s120 Performance of functions by enforcement agencies and authorised officers

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Food Act 2008***
s125 Institution of proceedings

FUNCTION: The authority to institute proceedings for an offence under the *Food Act 2008*.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

RECORD KEEPING: Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: CEO has exercised the right not to sub-delegate this delegation.

LIQUOR CONTROL ACT 1988

DA26 – LIQUOR LICENSING – SECTION 39 CERTIFICATES

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Liquor Control Act 1988***
s39 Certificate of local government as to whether premises comply with laws

FUNCTION: The authority to approve or refuse to grant section 39 Liquor Licensing Certificates.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

Delegation provides authority to confirm premises comply with the requirements of the: *Health Act 1911, Food Act 2008* and any written law applying to the sewerage or drainage of those premises.

RECORD KEEPING: Record details of certificates issued.

Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: *Local Government Act 1995*
s5.44 CEO may delegate powers and duties to other employees

CEO DELEGATION TO: CEO has exercised the right not to sub-delegate this delegation.

DA27 – LIQUOR LICENSING – SECTION 40 CERTIFICATES

POWER / DUTY ASSIGNED TO: Local Government

POWER TO DELEGATE: *Local Government Act 1995*
s5.42 Delegation of some Powers or duties to CEO
s5.43 Limitations on delegations to CEO

DELEGATION TO: Chief Executive Officer

POWER / DUTY DELEGATED: ***Liquor Control Act 1988***
s40 Certificate of planning authority as to whether use of premises complies with planning laws

FUNCTION: The authority to approve or refuse to grant section 40 Liquor Licensing Certificates.

CONDITIONS: Must act in accordance with the Shire's "Standard Conditions Relating to Delegations".

Delegation provides authority to confirm premises comply with the requirements of the *Planning and Development Act 2005* and Local Planning Scheme No. 15.

RECORD KEEPING: Record details of certificates issued.

Ensure that evidentiary documents that meet the requirements of *Local Government (Administration) Regulations 1996 reg.19 Delegates to keep certain records (Act s5.46(3)),* are retained in the Shire's record keeping systems.

POWER TO SUBDELEGATE: *Local Government Act 1995*
s5.44 CEO may delegate powers and duties to other employees.

CEO DELEGATION TO: CEO has exercised the right not to sub-delegate this delegation.

2.11 Debt Recovery – Proposed NEW Policy

Policy Owner: Finance
Person Responsible: Manager of Finance
Date of Approval:
Amended:

Objective: To outline clear and appropriate debt recovery procedures which will be undertaken by the Shire of Katanning and to ensure effective control over all invoiced debts owed to Council whilst being sympathetic to those ratepayers and debtors suffering genuine financial hardship.

Policy: This policy sets the parameters for Rates and Sundry Debtors Charges, Write Offs and the Recovery Process

Rates – Outstanding Amounts

1.1 Amounts outstanding after the due date for payment will be followed up within 14 days of the due date with a Final Notice.

1.2 14 days after the Final Notice is issued, a Shire of Katanning reminder letter will be issued giving 7 days to arrange payment.

1.3 Following this 7 day period, Councils Debt Collection agency will be instructed to send a Notice of Intention to Issue a General Procedure Claim demanding payment and warning that legal action may commence if payment or a suitable arrangement is not made within 7 days.

1.4 After this 7 day period has lapsed:

i. Contact is to be made by telephone, where possible, in order to seek payment or a special arrangement. If this action is unsuccessful, accounts may then be forwarded to the Shire's Debt Collection agency for legal action to commence.
ii. Legal action will commence with the issuing of Court proceedings (General Procedure Claim) in accordance with S6.56 of the Local Government Act 1995.

1.5 Ratepayers who are unable to pay rates and charges by the due date either because of reasons beyond their control or because payment would cause undue hardship, may apply to enter into an agreement to make periodic payments subject to the following:

i. The Chief Executive Officer is to endorse the arrangement.
ii. Special arrangements will be for regular instalments with the debt to be finalised by 30 June of the financial year where possible.

Sundry Debtors

2.1 Sundry debtor accounts become overdue if not paid within 30 days of issuing of the account.

2.2 On becoming overdue, a statement is to be issued requesting immediate payment

2.3 14 days after the statement is issued, contact is to be made by telephone, where possible, in order to seek payment and to advise that the provision of credit facilities will cease in seven days.

2.4 After this 7 day period has lapsed, the Shire may stop the provision of credit facilities to debtors. Recovery action through the courts may also be taken unless the debtor enters into and complies with an overdue payment agreement. Any such agreement will not exceed 6 months unless exceptional circumstances exist.

2.5 The Chief Executive Officer may determine other suitable treatment options to deal with sundry debtors in the case of demonstrated hardship or other situations.

Write-off of small amounts

To assist with the maintenance of the Council rate record and Sundry Debtors and to ensure employee resources are effectively utilised, any penalty interest amount outstanding at the end of the financial year of less than $50.00 may be written off at the discretion of the Chief Executive Officer. This write off is only to occur where all other property rates, rubbish charges, levies and sundry debts have been paid in full.

This is a new policy which is the result of a combination of old policies
3.1 Rates Recovery
3.3 Accounts Receivable

2.3 Application of Early Rate Payment Discount

Policy Owner: Finance
Person Responsible: Executive Manager of Finance & Administration
Date of Approval:
Amended:

Objectives: To allow any early payment incentive to ratepayers who choose to mail their payment and thus not disadvantage those who reside outside of the Katanning District.

Policy Statement: To provide clarity on when "early payment" discount will be applied;

Guidelines:

1) If a rates payment is mailed on, or before, the day prior to the due date and the envelope postmark clearly shows the date of postage the discount for early payment will be allowed, regardless of when the payment is received by Council.

2) Envelopes are to be kept identifying the date of postage.

3) Rate payments received by electronic fund transfer must reach Council bank account on or before the due date. Payments received after the due date will not be eligible for the early rate payment incentive.

2.10 Lease of/License to Occupy Community Assets

Policy Owner: Finance
Person Responsible: Executive Manager of Projects & Community Building
Date of Approval:
Amended:

Objective:

1) Create a framework to assess lease proposals.
2) Provide consistency and equity in the distribution of lease agreements.
3) Create a reasonable financial recovery from Councils assets
4) Provide a rationale for fee calculations.
5) Enable minimum lease fees to be known by all groups seeking to enter in to an agreement with Council.
6) Improve Councils asset management practices.

Policy Statement:

To provide a format whereby applications for the lease of, or license to occupy, a council asset can be systematically assessed and performance managed in conjunction with the requirements of the *Local Government Act 1995 sec 3.58.*

Guidelines:

1) All lease proposals will be forwarded to Council for consideration and endorsement.
2) Fee calculations will commence at the Shire's minimum rate value.
3) The lease will take in to account an organisation's historical use of land and buildings recognising capital contributions and community service provided.
4) Tenure periods will be recommended to a maximum of 10 years and be reflective of capital contributions made.
5) Asset performance management will be introduced to protect and promote Council's assets.

Nature and Types of Leases

1. Community

This classification will be utilised where groups and organisations have achieved incorporated status via the Ministry of Fair Trading and are wishing to negotiate a lease on or license to occupy, Council owned land and/or buildings.

Council recognise that not-for-profit groups are generally;

- Providing a benefit to the community; and
- Not in a position to pay commercial lease rates.

Council when determining an appropriate lease agreement or license of occupy, will take the following considerations into account:

- The original purpose of the lease/ license to occupy.
- Previous audited financial statements.
- Ability to generate income to meet the minimum lease/license fee benchmark.
- Previous capital contribution including any improvements made.
- Community service (i.e. emergency, charitable institutions or other government agencies).

2. Commercial

Groups that cannot achieve incorporated status via the Ministry of Fair Trading will be regarded as commercial entities. As such an approved valuer will determine the rental rate for usage of either land and/or buildings. Properties included within the commercial category to be leased only by calling of public tender in accordance with the provisions of the Local Government Act 1995.

3. Unimproved Land Lease

Should an exclusive land lease be forwarded to Council for consideration, the recommended annual fee will be based on the minimum land rates as determined by Council.

Fee Calculations and Charges

- The determination of the annual lease fee/ license fee will be dependent on the nature of the organisation applying and the proposed use of the land or building.
- The lease fee for Community and Land Leases is calculated as the Shires minimum rate value as determined by Council plus the Gross Rental Value of the building reduced proportionately by the applicants capital contribution as represented by the following formula

Lease Fee = Shire Minimum Rate + (Gross Rental Value - % of capital contribution, including grants)

- Lessees will be responsible for all operational costs of the facility.
- Maintenance standards and responsibilities will be attached as a schedule to the lease documentation.
- Maintenance costs will be the responsibility of the Lessee with the exception of liability for structural defects or agreed repairs to be performed by Council.

Tenure Periods

The maximum lease obtainable from the Shire of Katanning is 10 years. Options of extensions will not be reciprocal, the Shire will consider offering the option at re-negotiation time, taking into account asset management performance and other relevant issues.

The tenure period of a Community lease will be recommended proportional to the capital contribution made by the lease applicant as follows:

Up to 3 years	= 0-10% of capital contribution
Up to 5 years	= 11–50% of capital contribution
Up to 10 years	= 51% and above capital contribution

Commercial and land leases are subject to negotiation.

Asset/ Licenses Performance Management
Leases will be performance managed by regular site inspections to the facility to ascertain that the maintenance program is being upheld in accordance with the lease agreement/ license to occupy with the lessor and lessee.

Exclusions
This policy is not applicable to Shire facilities including staff housing.

1.3 Records Management - AMENDED

Policy Owner: Administration
Person Responsible: Records Officer
Date of Approval:
Amended:

Objective:

To ensure complete and accurate records are maintained of the decisions and activities carried out by, or on behalf of, the Shire of Katanning and to ensure compliance with the State Records Act 2000.

Policy Statement:

The Shire of Katanning is committed to making and keeping full and accurate records of its business transactions and official activities. Records can be, but are not limited to, any record of information in any medium including letters, files, emails, word processed documents, databases, photographs and social media messages.

Records created and received by Shire personnel, elected members and contractors, irrespective of format, are to be managed in accordance with the Shire's Record Keeping Plan and Records Management Procedure Manual. Records will not be destroyed except by reference to the State Records Office's General Disposal Authority for Local Government Records.

The Shire is responsible for the security and protection of all records created or captured as part of the Shire's day to day operations. All Shire staff and contractors have a responsibility to apply appropriate security and protection measures to all records created or received when carrying out the Shire's business.

It is the responsibility of all staff to ensure that the business, operational and administrative activities of the Shire are appropriately documented and that records are created and maintained in fulfilment of legislative requirements.

Access to Shire records by staff and contractors will be in accordance with designated access and security classifications. Access to the Shire's records by the general public will be in accordance with the *Freedom of Information Act 1992* and the Shire's policy on Freedom of Information. Access to the Shire's records by elected members will be through the CEO in accordance with the *Local Government Act 1995*.

Records will only be destroyed or otherwise disposed of by reference to the *General Disposal Authority for Local Government Records* issued by the State Records Office, and following authorisation from the Chief Executive Officer. Records identified as a State Archive should be transferred to the State Records Office in accordance with the

requirements of the *General Disposal Authority for Local Government Records*.

All significant records, irrespective of format, are to be registered, classified and captured into the Shire's official record keeping systems. All correspondence should be attached to a corporate file.

Records created or received by elected members of the Shire, in the performance of their functions and roles as specified in the *Local Government Act 1995*, are government records and will be managed in accordance with the Shire's Records Keeping Plan and the *State Records Act 2000*. This policy applies to any record documenting decisions which are made outside normal Shire or Committee meetings.

Local government records fall into one of two categories:

Local government records of continuing value

Local government records of continuing value are those records created or received containing information of:

a) administrative value to the Shire, including records which:
   i. provide an interpretation of the Shire's policy or the rationale behind it;
   ii. document progress and coordination of responses to issues;
   iii. document formal communications and/or transactions, such as a Minute report or submission between elected members and another party; and
   iv. document elected members' decisions, directives, reasons and actions
b) legal value to the Shire including records which document compliance with statutory requirements or court orders which stipulate the retention of records;
c) evidential value such as information about the legal rights and obligations of the Shire of Katanning including elected members, ratepayers, organisations and the general community; and
d) historical value to the Shire of Katanning and to the State.

Records of no continuing value (Ephemeral)

These records do not need to be incorporated into the Shire's recordkeeping system and can be destroyed when reference to them ceases, but only in accordance with the General Disposal Authority for Local Government Records (GDA LG). Elected members should contact the Chief Executive Officer for advice prior to destroying any records.

2.4 Material Variance

Policy Owner: Finance
Person Responsible: Manager of Finance
Date of Approval:
Amended:

Objective: To ensure compliance with Australian Accounting Standard 5 Materiality

Policy Statement: Determining a material variance amount to be reported in the Statement of Financial Activity

Guidelines: In the preparation and presentation of financial reports, Council is required to adopt a percentage and/or value in accordance with Australian Accounting Standard 5 Materiality, to be used in the statement of financial activity for reporting material variances. Materiality is defined as 'information is material if its omission, misstatement or non-disclosure has the potential to adversely affect:

1) Decisions about the allocation of scarce resources made by users of the financial report; or

2) The discharge of accountability by the management or governing body of the entity',

Any variance +/- 10% or $10,000, whichever is the greater, will be disclosed in the monthly statement of financial activity.

2.5 Purchasing Policy

Policy No	2.5		
Policy Name	Purchasing Policy		
Responsible Directorate	Finance & Administration		
Responsible Officer	Procurement and Executive Support Officer		
Council Adoption	Date:		Resolution No.
Reviewed/Modified	Date:	27 September 2016	Resolution No.
		24 November 2015	
		23 September 2015	
		26 February 2015	
		22 October 2014	
		24 July 2013	
		25 July 2012	
Reivew Date	XX XX 2020		
Legislation	Local Government Act 1995 Local Government (Functions & General) Regulations 1996		
Related Policies	Buy Local – Regional Price Preference		
Related Organisational Directives			

Objectives:

The objectives of this Policy are to ensure that all purchasing activities:

- demonstrate that best value for money is attained for the Shire of Katanning;
- are compliant with relevant legislation, including the Act and Regulations;
- are recorded in compliance with the *State Records Act 2000* and associated records management practices and procedures of the Shire of Katanning;
- mitigate probity risk, by establishing consistent and demonstrated processes that promotes openness, transparency, fairness and equity to all potential suppliers;
- ensure that sustainable benefits, such as environmental, social and local economic factors are considered in the overall value for money assessment; and
- are conducted in a consistent and efficient manner across the Shire of Katanning and that ethical decision making is demonstrated.

Policy Statement:

The Shire of Katanning is committed to delivering best practice in the purchasing of goods, services and works that align with the principles of transparency, probity and good governance and complies with the Local Government Act 1995 (the "Act") and Part 4 of the Local Government (Functions and General) Regulations 1996, (the "**Regulations**"). Procurement processes and practices to be complied with are defined

within this Policy and the Shire of Katanning's prescribed procurement procedures.

Ethics & Integrity: **Code of Conduct**

All officers and employees of the Shire of Katanning undertaking purchasing activities must have regard to the Code of Conduct requirements and shall observe the highest standards of ethics and integrity. All officers and employees of the Shire of Katanning must act in an honest and professional manner at all times which supports the standing of the Shire of Katanning.

Purchasing Principles: The following principles, standards and behaviours must be observed and enforced through all stages of the purchasing process to ensure the fair and equitable treatment of all parties:

- full accountability shall be taken by the authorised purchasing officer for all purchasing decisions and the efficient, effective and proper expenditure of public monies based on achieving value for money;
- all purchasing practices shall comply with relevant legislation, regulations, and requirements consistent with the Shire of Katanning's policies and Code of Conduct;
- purchasing is to be undertaken on a competitive basis where all suppliers are treated impartially, honestly and consistently;
- all processes, evaluations and decisions shall be transparent, free from bias and fully documented in accordance with applicable policies, audit requirements and relevant legislation;
- any actual or perceived conflicts of interest are to be identified, disclosed and appropriately managed; and
- any information provided to the Shire of Katanning by a supplier shall be treated as commercial-in-confidence and should not be released unless authorised by the supplier or relevant legislation.

Value for Money: **Policy**

Value for money is determined by the consideration of price, risk and qualitative factors assessing the most advantageous outcome achievable for the Shire of Katanning.

As such, purchasing decisions must consider qualitative and risk factors and not be based purely on the lowest price.

Application: An assessment of the best value for money outcome for any purchasing process should consider:

- all relevant Total Costs of Ownership (TCO) and benefits including transaction costs associated with acquisition, delivery, distribution, as well as other costs such as but not limited to holding costs, consumables, deployment, maintenance and disposal;

- the technical merits of the goods or services being offered in terms of compliance with specifications, contractual terms and conditions and any relevant methods of assuring quality, including but not limited to an assessment of levels and currency of compliances, value adds offered, warranties, guarantees, repair and replacement policies, ease of inspection, ease of after sales service, ease of communications etc.
- financial viability and capacity to supply without risk of default (competency of the prospective suppliers in terms of managerial and technical capabilities and compliance history);
- a strong element of competition in the allocation of orders or the awarding of contracts. This is achieved by obtaining a sufficient number of competitive quotations wherever practicable;
- the safety requirements associated with both the product design and specification offered by suppliers and the evaluation of risk when considering purchasing goods and services from suppliers;
- purchasing of goods and services from suppliers that demonstrate sustainable benefits and good corporate social responsibility; and
- providing opportunities **to support and stimulate** local businesses within the Shire of Katanning and wider Defined Area to be given the opportunity to quote for providing goods and services wherever possible as per the Buy Locally- Regional Price Preference.

Purchasing Requirements: **Legislative / Regulatory Requirements**

The requirements that must be complied with by the Shire of Katanning, including purchasing thresholds and processes, are prescribed within the Regulations, this Policy and associated purchasing procedures in effect at the Shire of Katanning.

Policy

Purchasing that is $150,000 or below in total value (excluding GST) must be in accordance with the purchasing requirements under the relevant threshold as defined in this policy under Purchasing Thresholds.

Purchasing that exceeds $150,000 in total value (excluding GST) must be put to public Tender when it is determined that a regulatory Tender exemption, as stated under "Tender Exemptions" of this Policy is not deemed to be suitable.

Purchasing Value Definition

Determining Purchasing Value is to be based on the following considerations:

1. Cost exclusive of Goods and Services Tax (GST);
2. The actual or expected value of a contract over the full contract period, including all options to extend; or the extent to which it could be reasonably expected that the Shire of Katanning will continue to purchase a particular category of goods, services or

works and what total value is or could be reasonably expected to be purchased. A best practice suggestion is that if a purchasing threshold is reached within three years for a particular category of goods, services or works, then the purchasing requirement under the relevant threshold (including the tender threshold) must apply.

3. Must incorporate any variation to the scope of the purchase and be limited to a 10% tolerance of the original expected purchasing value.

Purchasing from Existing Contracts

Where the Shire of Katanning has existing contracts in place, it must ensure that goods and services required are purchased under these contracts to the extent that the scope of the contract allows. When planning the purchase, the Shire of Katanning must consult its Contracts Register in the first instance before seeking to obtain any further quotes or tenders.

Purchasing Thresholds

The table below prescribes the purchasing process that the Shire of Katanning must follow, based on the purchase value:

Purchase Value Threshold	Purchasing Requirement
Up to $5,000	Purchase directly from a supplier using a Purchase Order or Corporate Credit Card issued by the Shire of Katanning, obtaining at least one (1) verbal or written quotation from a suitable supplier, either from: • an existing panel of pre-qualified suppliers administered by the Shire of Katanning; or • a pre-qualified supplier on the WALGA Preferred Supply Program or State Government Common Use Arrangement (CUA); or • from the open market.

Over $5,000 and up to $50,000	Obtain at least three (3) written quotations from suppliers following a brief outlining the specified requirement, either from: • an existing panel of pre-qualified suppliers administered by the Shire of Katanning ; or • a pre-qualified supplier on the WALGA Preferred Supply Program or State Government CUA; or • from the open market.
Over $50,000 to $150 000	Obtain at least three (3) written quotations from suppliers by formal invitation under a Request for Quotation, containing price and detailed specification of goods and services required. The procurement decision is to be based on pre- determined evaluation of criterion that assesses all value for money considerations in accordance with the definition stated within this Policy. Quotations within this threshold may be obtained from: • an existing panel of pre-qualified suppliers administered by the Shire of Katanning ; or • a pre-qualified supplier on the WALGA Preferred Supply Program or State Government CUA; or • from the open market. Requests for quotation from a pre-qualified panel of suppliers (whether administered by the Shire of Katanning, through the WALGA preferred supply program or State Government CUA) are not required to be invited using a Request for Quotation form, however at least three written quotes are still required to be obtained.
$150,000 and above	Conduct a public Request for Tender process in accordance with Part 4 of the *Local Government (Functions and General) Regulations 1996,* this policy and the Shire of Katanning tender procedures. The procurement decision is to be based on pre-determined evaluation a criterion that assesses all value for money considerations in accordance with the definition stated within this Policy. or Obtain at least three (3) quotations directly from suppliers on a WALGA Preferred Supplier Panel using VendorPanel eQuotes. If there are more than three (3) preferred suppliers on the supplier panel, quotations must be sought from each preferred supplier, as considered appropriate by the officer.

Forms and Quotations

Verbal

Where a verbal quotation is required under this policy then both the request for quotation and submission of quotation, may occur verbally or in writing.

Written

Where a written quotation is required under this policy then both the request for quotation and the submission of a quotation must occur in writing.

Quotations

Both a verbal and written request for quotation must include:

- Details of goods and services required;
- The time when goods and services are required; and
- A date by which the quotation must be submitted.

Tendering Exemptions

An exemption to publicly invite tenders may apply in the following instances:

- the purchase is obtained from a pre-qualified supplier under the WALGA Preferred Supply Program or State Government Common Use Arrangement.
- the purchase is from a Regional Local Government or another Local Government;
- the purchase is acquired from a person registered on the WA Aboriginal Business Directory, as published by the Small Business Development Corporation, where the consideration under contract is worth $250,000 or less and represents value for money;
- the purchase is acquired from an Australian Disability Enterprise and represents value for money;
- the purchase is from a pre-qualified supplier under a Panel established by the Shire of Katanning ; or
- any of the other exclusions under Regulation 11 of the Regulations apply.

Inviting Tenders Under the Tender Threshold

Where considered appropriate and beneficial, the Shire of Katanning may consider publicly advertising Tenders in lieu of undertaking a Request for Quotation for purchases under the tender threshold. This decision should only be made after considering the benefits of this approach in comparison with the costs, risks, and timeliness and compliance requirements and also whether the purchasing requirement can be met through the WALGA Preferred Supply Program or State Government CUA.

If a decision is made to undertake a public Tender for contracts expected to be $150,000 or less in value, the Shire of Katanning's tendering procedures must be followed in full.

Sole Source of Supply

Where the purchasing requirement is over the value of $5,000 and of a unique nature that can only be supplied from one supplier, the purchase is permitted without undertaking a tender or quotation process. This is only permitted in circumstances where the Shire of Katanning is satisfied and can evidence that there is only one source of supply for those goods, services or works. The Shire of Katanning must use its best endeavours to determine if the sole source of supply is genuine by exploring if there are any alternative sources of supply. Once determined, the justification must be endorsed by the Chief Executive Officer, prior to a contract being entered into.

From time to time, the Shire of Katanning may publicly invite an expression of interest to effectively determine that only one sole source of supply still genuinely exists.

Anti-Avoidance

The Shire of Katanning shall not enter into two or more contracts or create multiple purchase order transactions of a similar nature for the purpose of "splitting" the value of the purchase or contract to take the value of the consideration of the purchase below a particular purchasing threshold, particularly in relation to Tenders and to avoid the need to call a public Tender.

Emergency Purchases

An emergency purchase is defined as an unanticipated and unbudgeted purchase which is required in response to an emergency situation as provided for in the *Local Government Act 1995*. In such instances, quotes and tenders are not required to be obtained prior to the purchase being undertaken.

An emergency purchase does not relate to purchases not planned for due to time constraints. Every effort must be made to anticipate purchases required by the Shire of Katanning in advance and to allow sufficient time to obtain quotes and tenders, whichever may apply.

Records Management: Records of all purchasing activity must be retained in compliance with the *State Records Act 2000 (WA)* the Shire of Katanning's Records Management Policy and associated procurement procedures.

For the quotation process, this includes:

- Quotation documentation
- File notes for verbal quotes
- Internal documentation
- Purchase orders or requisitions
- Any other relevant correspondence.

For the tendering process, this includes:

- Advertising
- Tender documentation
- Evaluation documentation
- Enquiry and response documentation; and
- Notification and award documentation

Where a verbal quotation is required under this policy then the following information must be noted and stored in the Shire's records management system:

- Details of goods and services required;
- The name of any supplier who was requested to provide a quotation and the date on which it was requested; and
- The name of any supplier who submitted the quotation, the amount of the quotation and the date on which it was received.

Where a written quotation is required under this policy then the written request for quotation, the amount of the quotation and the date on which it was received.

Sustainable Procurement and Corporate Social Responsibility:

The Shire of Katanning is committed to providing a preference to suppliers that demonstrate sustainable business practices and high levels of corporate social responsibility (CSR). Where appropriate, the Shire of Katanning shall endeavour to provide an advantage to suppliers demonstrating that they minimise environmental and negative social impacts and embrace CSR. Sustainable and CSR considerations must be balanced against value for money outcomes.

Buy Local Policy:

A regional price preference may be afforded to locally based businesses for the purposes of assessment. Provisions are detailed within the Shire of Katanning's Regional Price Preference Policy.

Purchasing From Disability Enterprises:

Pursuant to Part 4 of the Local Government (Functions and General) Regulations 1996, the Shire of Katanning is not required to publicly invite tenders if the goods or services are to be supplied from an Australian Disability Enterprise, as registered on www.ade.org.au. This is contingent on the demonstration of value for money.

Where possible, Australian Disability Enterprises are to be invited to quote for supplying goods and services under the tender threshold. A qualitative weighting may be afforded in the evaluation of quotes and tenders to provide advantages to Australian Disability Enterprises.

Purchasing from Aboriginal Businesses:

Pursuant to Part 4 of the *Local Government (Functions and General) Regulations 1996*, the Shire of Katanning is not required to publicly invite tenders if the goods or services are to be supplied from a person registered on the Aboriginal Business Directory published by the Small Business Development Corporation on www.abdwa.com.au, where the

expected consideration under contract is worth $250,000 or less. This is contingent on the demonstration of value for money.

Where possible, Aboriginal businesses are to be invited to quote for supplying goods and services under the tender threshold. A qualitative weighting may be afforded in the evaluation of quotes and tenders to provide advantages to Aboriginal owned businesses or businesses that demonstrate a high level of aboriginal employment.

Panel of Pre-Qualified Suppliers:

Policy Objectives

In accordance with Regulation 24AC of the *Local Government (Functions and General) Regulations 1996*, a Panel of Pre-qualified Suppliers ("Panel") may be created where most of the following factors apply:

- the Shire of Katanning determines that a range of similar goods and services are required to be purchased on a continuing and regular basis;
- there are numerous potential suppliers in the local and regional procurement- related market sector(s) that satisfy the test of 'value for money';
- the purchasing activity under the intended Panel is assessed as being of a low to medium risk;
- the Panel will streamline and will improve procurement processes; and
- the Shire of Katanning has the capability to establish, manage the risks and achieve the benefits expected of the proposed Panel.

The Shire of Katanning will endeavour to ensure that Panels will not be created unless most of the above factors are firmly and quantifiably established.

Establishing a Panel

Should the Shire of Katanning determine that a Panel is beneficial to be created, it must do so in accordance with Part 4, Division 3 the Local Government (Functions and General) Regulations 1996.

Panels may be established for one supply requirement, or a number of similar supply requirements under defined categories within the Panel.

Panels may be established for a minimum of two (2) years and for a maximum length of time deemed appropriate by the Shire of Katanning.

Evaluation criteria must be determined and communicated in the application process by which applications will be assessed and accepted.

Where a Panel is to be established, the Shire of Katanning must appoint at least three(3) suppliers to each category, on the basis that best value for money is demonstrated. Where less than three (3) suppliers are appointed to each category within the Panel, the category is not to be established.

In each invitation to apply to become a pre-qualified supplier (through a procurement process advertised through a state-wide notice), the Shire of Katanning must state the expected number of suppliers it intends to put on the panel.

Should a Panel member leave the Panel, they may be replaced by the next ranked Panel member determined in the value for money assessment should the supplier agree to do so, with this intention to be disclosed in the detailed information set out under Regulation 24AD(5)(d) and (e) when establishing the Panel.

Distributing Work amongst Panel Members:

To satisfy Regulation 24AD(5) of the Regulations, when establishing a Panel of pre- qualified suppliers, the detailed information associated with each invitation to apply to join the Panel must either prescribe whether the Shire intends to:

i. obtain quotations from each pre-qualified supplier on the Panel with respect to all purchases, in accordance with Clause 11.4; or
ii. purchase goods and services exclusively from any pre-qualified supplier appointed to that Panel, and under what circumstances; or
iii. develop a ranking system for selection to the Panel, with work awarded in accordance with Clause 11.3(b).

In considering the distribution of work among Panel members, the detailed information must also prescribe whether:

a) each Panel member will have the opportunity to bid for each item of work under the Panel, with pre-determined evaluation criteria forming part of the invitation to quote to assess the suitability of the supplier for particular items of work. Contracts under the pre-qualified panel will be awarded on the basis of value for money in every instance; or
b) work will be awarded on a ranked basis, which is to be stipulated in the detailed information set out under Regulation 24AD(5)(f) when establishing the Panel. The Shire/Town/City is to invite the highest ranked Panel member, who is to give written notice as to whether to accept the offer for the work to be undertaken. Should the offer be declined, an invitation to the next ranked Panel member is to be made and so forth until a Panel member accepts a Contract. Should the list of Panel members invited be exhausted with no Panel member accepting the offer to provide goods/services under the Panel, the Shire of Katanning may then invite suppliers that are not pre-qualified under the Panel, in accordance with the Purchasing Thresholds stated in section 5.5 of this Policy. When a ranking system is established, the Panel must not operate for a period exceeding 12 months.

In every instance, a contract must not be formed with a pre-qualified supplier for an item of work beyond 12 months, which includes options to extend thecontract.

Purchasing from the Panel

The invitation to apply to be considered to join a panel of pre-qualified suppliers must state whether quotations are either to be invited to every member (within each category, if applicable) of the Panel for each purchasing requirement, whether a ranking system is to be established, or otherwise.

Each quotation process, including the invitation to quote, communications with panel members, quotations received, evaluation of quotes and notification of award communications must all be made through eQuotes, or any other electronic quotation facility.

Each quotation process, including the invitation to quote, communications with panel members, quotations received, evaluation of quotes and notification of award communications must all be captured on the Shire of Katanning's electronic records system. A separate file is to be maintained for each quotation process made under each Panel that captures all communications between the Shire of Katanning and Panel members.

Recordkeeping

Records of all communications with Panel members, with respect to the quotation process and all subsequent purchases made through the Panel, must be kept.

For the creation of a Panel, this includes:

- The procurement initiation document such as a procurement business case which justifies the need for a Panel to be created;
- Procurement planning and approval documentation which describes how the procurement process is to be undertaken to create and manage the Panel;
- Request for applications documentation;
- Copy of public advertisement inviting applications;
- Copies of applications received;
- Evaluation documentation, including clarifications sought;
- Negotiation documents such as negotiation plans and negotiation logs;
- Approval of award documentation;
- All correspondence to applicants notifying of the establishment and composition of the Panel such as award letters;
- Contract Management Plans which describes how the contract will be managed; and
- Copies of any framework agreements entered into with pre-qualified suppliers.

The Shire of Katanning is also to retain itemised records of all requests for quotation, including quotations received from pre-qualified suppliers and contracts awarded to Panel members. A unique reference number shall be applied to all records relating to each quotation process, which is to also be quoted on each purchase order issued under the Contract.

Adoption

Information with regards to the Panel offerings, including details of suppliers appointed to the Panel, must be kept up to date, consistent and made available for access by all officers and employees of the Shire of Katanning.

2.6 Asset Capitalisation Threshold

Policy Owner: Finance
Person Responsible: Manager of Finance
Date of Approval:
Amended:

Objectives

To assist with budget preparation and financial reporting of all Assets held within the Shire of Katanning

Policy Statement

The following capitalisation threshold for each classification of property, plant equipment and infrastructure asset shall apply

Guidelines

All asset purchases will be in accordance with the following Capitalisation threshold and Asset Classes;

Asset Class	Capitalisation Threshold	Depreciation
Property, Plant & Equipment		
Buildings	$5,000	2%
Land – ALL	N/A	
Furniture & Fittings	$5,000	10%
Paintings & Sculptures	All	1%
Equipment	$5,000	10-33.3%
Plant	$5,000	10-20%
Motor Vehicles	All	25%
Infrastructure		
Roads	$10,000	2.5-5%
Footpaths	$10,000	2%
Drainage	$10,000	2%
Bridges	$10,000	2%
Parks & Ovals	$10,000	5%
Other Infrastructure	$10,000	2-5%

2) A register will be maintained for all Portable Equipment and Desirable items that fall below the Asset Capitalisation threshold. That the register is to be reviewed on an annual basis.

2.7 Buy Locally – Regional Price Preference

Policy Owner: Finance
Person Responsible: Procurement and Executive Support Officer
Date of Approval:
Amended:

Objectives:

To support local business within the Defined Area by giving preferential consideration to regional suppliers in the procurement of goods and services.

Policy Statement:

The Shire of Katanning will encourage local industry to do business with Council through the adoption of a Buy Locally – Regional Price Preference Policy to be used in conjunction with standard quotation or tender considerations.

The region (Defined Areas) for the purpose of the Buy Locally-Regional Price Preference Policy is

Area 1: The area falling within the boundaries of the Local Government Authority of Katanning – up to 10% where the contract is for goods and services up to a maximum price reduction of $50,000; or up to 5% where the contract is for construction (building) services, up to a maximum price reduction of $50,000;

Area 2: The areas falling within the boundaries of the Local Government Authorities of Kent, Gnowangerup, Broomehill Tambellup, Kojonup, Woodanilling, Wagin and Dumbleyung - – up to 2.5% where the contract is for goods and services up to a maximum price reduction of $50,000; or up to 2.5% where the contract is for construction (building) services, up to a maximum price reduction of $50,000;

Guidelines:

Regional Price Preference

- A price preference will apply to eligible suppliers who are defined as based in, operate from or source goods or services from within the Defined Area in relation to all tenders and quotations invited by the Shire for the supply of goods, services and construction (building) services, unless the tender/quotation document specifically states prior to advertising of the tender/quotation that this policy does not apply.
- The regional price preference enables tenders and quotations to be evaluated as if the proposed price were reduced in accordance with permitted price preference as specified below in this policy.
- This policy will operate in conjunction with the purchasing considerations and procedures for tenders and quotations as outlined

in the Shire's 'Purchasing Policy' when evaluating and awarding contracts.

Qualifying Criteria

A supplier of goods or services who submits a tender/quotation is regarded as being an eligible supplier if:

(a) that supplier has been operating a business continuously out of premises in the Defined Area for at least six months before the time after which further tenders/quotations cannot be submitted. This is further defined as follows and the supplier will be required to meet all of these criteria:

i. the supplier to have a physical business premises (in the form of an office, depot, shop, outlet, headquarters or other premises where goods or services are being supplied from), located in the Defined Area. This does not exclude suppliers whose registered business is located outside the Defined Area but undertake the business from premises located in the Defined Area;

ii. the physical location of the business premises in the Defined Area has been operating on an ongoing basis for more than six months prior to the closing date for the tender;

iii. a business having permanent staff that are based at the business premises located in the Defined Area;

iv. management or delivery of the majority of the tendered outcomes will be carried out from the business premises located in the Defined Area; and

v. the business being registered or licensed in Western Australia; or

(b) some or all of the goods or services are to be supplied from Defined Area sources. Goods and/or services that form a part of a tender/quotation submitted may be wholly supplied from Defined Area sources; or partly supplied, and partly supplied from outside the Defined Area. Only those goods or services identified in the tender/quotation as being from Defined Area sources may be included in the discounted calculations that form a part of the assessments of a tender/quotation when the regional price preference policy is in operation.

In order for the policy to apply, the supplier is required to provide to the Shire written evidence within the tender/quotation submission which demonstrates compliance with the above criteria.

Suppliers who claim that they will use goods, materials or services supplied from regional sources in the delivery of the contract outcomes will be required, as part of the contract conditions, to demonstrate that they have used them.

Roles and Responsibilities

As much as practicable, the Shire of Katanning will:

- where appropriate, consider buying practices, procedures and specifications that do not unfairly disadvantage local businesses;
- consider indirect benefits that have flow on benefits for local suppliers (i.e. servicing and support);
- explore the capability of local businesses to meet requirements and ensure that Requests for Quotation and Tenders are designed to accommodate the capabilities of local businesses;
- avoid bias in the design and specifications for Requests for Quotation and Tenders – all Requests must be structured to encourage local businesses to bid;
- use a competitive market for their local purchasing requirements to encourage economic growth and local business partnerships where it is practical and reasonable to do so;
- ensure that the application of a local price preference is clearly identified within the quotation or tender documents to which the preference is to be applied; and
- provide adequate and consistent information to potential suppliers.

2.8 Corporate Credit Card Policy

Policy Owner: Finance
Person Responsible: Procurement and Executive Support Officer
Date of Approval:
Amended:

Objectives

The objective of this policy is to:

- provide a clear framework to enable the use of corporate credit cards
- provide staff issued with a Corporate Credit Card clear and concise guidelines
- outlining its use reduce the risk of fraud and misuse of the corporate credit card.

The application of this policy is to be in conjunction with the Shire of Katanning Code of Conduct and Purchasing Policy.

Policy Statement:

The Shire of Katanning is committed to delivering best practice in the approval, issuing and use of Corporate Credit Cards with the principles of transparency, probity and good governance and complying with the Local Government Act 1995 (the "Act") and Regulation 11 (1) (a) of the Local Government (Financial Management) Regulations 1996, (the "Regulations"). Procurement processes and practices to be complied with are defined within this Policy and the Shire of Katanning prescribed procurement procedures.

Ethics & Integrity:

Code of Conduct
All officers and employees of the Shire of Katanning undertaking purchasing activities must have regard for the Code of Conduct requirements and shall observe the highest standards of ethics and integrity. All officers and employees of the Shire of Katanning must act in an honest and professional manner at all times which supports the standing of the Shire of Katanning.

Purchasing Principles: The following principles, standards and behaviours must be observed and enforced by the cardholder through all stages of the purchasing process to ensure the fair and equitable treatment of all parties:

- full accountability, by the cardholder, shall be taken for all purchasing decisions and the efficient, effective and proper expenditure of public monies based on achieving value for money;
- all purchasing practices shall comply with relevant legislation, regulations, and requirements consistent with the Shire of Katanning policies and Code of Conduct;

- purchasing is to be undertaken on a competitive basis where all potential supplier are treated impartially, honestly and consistently;
- all processes, evaluations and decisions shall be transparent, free from bias and fully documented in accordance with applicable policies, audit requirements and relevant legislation;
- any actual or perceived conflicts of interest are to be identified, disclosed and appropriately managed; and
- any information provided to the Shire of Katanning by a supplier shall be treated as commercial-in-confidence and should not be released unless authorised by the supplier or relevant legislation.

Usage

Shire of Katanning Corporate Credit Cards shall be used only:

- for Council business activities,
- for the purchase of goods and services in accordance with Council's Purchasing Policy.

Shire of Katanning Corporate Credit Cards do not have a cash advance facility.

Eligibility and application procedures for new Corporate Credit Cards:

Issue of a corporate credit card can only be approved by the Chief Executive Officer, or in the case the card is for the Chief Executive Officer, approval is provided by the Shire President. Once approved the application must be signed by the cardholder and two
(2) signatories to Council's bank accounts.

Corporate credit cards will only be issued when it is established that the anticipated usage of the card is warranted.

A credit limit of $10,000 is to be applied to the Chief Executive Officer's corporate credit card.

A maximum credit limit of $5,000 is to be applied to corporate credit cards approved for other employees.

The cardholder shall acknowledge and accept conditions of use of the Shire of Katanning Corporate Credit Card. Attachment 1a: Corporate Credit Cardholder Agreement.

Corporate Credit Card reconciliation procedures:

Transactions are to be recorded on the Credit Card Receipt Form and presented to the Creditors Officer within 7 days of the transaction.

Transactions will be supported by a GST invoice stating the type of goods/services purchased, amount of goods/services purchased and the price paid for the goods/services. The receipt shall meet the requirements of the Goods and Services Tax Act 1999 to enable an input tax credit to be claimed where available/appropriate.

Transactions shall be accompanied by a succinct explanation of why the expense was incurred.

Transactions shall be accompanied by an account/job number for costing purposes.

If no supporting documentation is available the cardholder will provide a declaration detailing the nature of the expense and must state on that declaration 'all expenditure is of a business nature'. Attachment 1b: *Missing Receipt/Invoice Declaration*
Approval of this expense is referred to the Chief Executive Officer.

Should a lack of detail be a regular occurrence for a particular cardholder, the cardholder may be refused access to a credit card in the future. Use of a declaration is for exceptional cases rather than the norm.

Should approval of expenses be denied by the Chief Executive Officer, recovery of the expense shall be met by the cardholder.

Review of Corporate Credit Card use:

The Creditors Officer shall review the monthly expenditure undertaken by each staff member.

All receipts and documentation will be reviewed and any expenses that do not appear to represent fair and reasonable business expenses shall be referred to the Chief Executive Officer by the Manager Finance for a decision.

The CEO shall review the monthly expenditure on the staff credit card reconciliations monthly and will be required to authorise and sign the statements. The Shire President shall review the monthly expenditure of the Chief Executive Officer and will be required to authorise and sign the statement.

External scrutiny of the credit card expenditure will also be undertaken as part of the external audit process of Council's finances.

Review of Credit Card Limits:

Credit limits are reviewed annually for all cardholders. If there is a request for a variation to the monthly limit, a business case will need to be provided to the Chief Executive Officer for consideration.

Procedures for lost, stolen and damaged cards:

The loss or theft of a credit card must be immediately reported by the cardholder to the card provider regardless of the time or day discovered. The cardholder must also formally advise the Manager Finance of the loss or theft on the next working day.

Advice of a damaged card is to be provided to the Manager Finance who will organise a replacement card.

Destruction of Corporate Credit Cards:

In the event of an employee ceasing employment with the Shire of Katanning or an employee being moved to a position that does not require a corporate credit card the card is to be:

- surrendered to the employees supervisor immediately on ceasing of employment or change in job role;
- handed as soon as practicable to the Manager Finance,
- destroyed, the Manager Finance is to make the arrangements for the credit card to be destroyed and to ensure that the employees' status on the Corporate Credit Card Register is to reflect that the card has been surrendered and destroyed. The register needs to have the date the card was destroyed and by whom. All the steps in the process are to be documented and on completion it is to be recorded and processed with the Records Officer.

Consequences: This policy represents the formal policy and expected standards of the Shire. It is imperative that staff with purchasing authority and in possession of a Corporate Credit Card retain appropriate documentation to substantiate their expenditure. Elected Members and Employees are reminded of their obligations under the Shire's Code of Conduct to give full effect to the lawful policies, decisions and practices of the Shire.

ROLES AND RESPONSIBILITIES

Corporate Credit Cardholders responsibilities:

- Ensure corporate credit cards are maintained in a secure manner and guarded against improper use. Credit card details are not to be

released to anyone. Credit card purchases are to be made by the Cardholder.

- Corporate credit cards are to be used only for Shire of Katanning official activities, there is no approval given for any private use.
- All documentation regarding a corporate credit card transaction is to be retained by the cardholder and produced as part of the reconciliation procedure.
- Credit limits are not to be exceeded.
- The use of the credit card shall not be tied to any type of reward system that provides cardholders with any personal benefit or reward.
- Purchases on the corporate credit card are to be made in accordance with the Shire of Katanning Purchasing Policy.
- Monthly reconciliations of the credit card purchases are to be completed within seven (7) days of the date of the corporate credit card statement being issued by Financial Services with all reconciliation dockets attached to equal the balance of credit used.
- Corporate credit cards are to be returned to the Manager Finance on or before the employee's termination date with a full acquittal of expenses.
- Corporate credit cards are to be handed in to the Manager Finance for the duration of extended leave, considered to be of two weeks or more, to be kept in the Shire safe.
- All cardholder responsibilities as outlined by the card provider.

Attachment 1a

Shire of Katanning
Heart of the Great Southern

Corporate Credit Cardholder Agreement

I _____ (name) acknowledge and accept the conditions listed b e l o w which govern the use of the Shire of Katanning Corporate Credit Card:

Conditions of Use

- Ensure corporate credit cards are maintained in a secure manner and guarded against improper use.
- Corporate credit cards are to be used only for Shire of Katanning official activities, there is no approval given for any private use.
- All documentation regarding a corporate credit card transaction is to be retained by, or provided to, the cardholder and produced as part of the reconciliation procedure.
- Credit limits are not to be exceeded.
- The use of the credit card shall not be tied to any type of reward system that provides cardholders with any personal benefit or reward.
- Observe all cardholder responsibilities as outlined by the card provider.
- Purchases on the corporate credit card are to be made in accordance with Shire of Katanning Purchasing Policy.
- Transactions will be supported by a GST invoice stating the type of goods purchased, amount of goods purchased and the price paid for the goods. The receipt shall meet the requirements of the *Goods and Services Tax Act 1999* to enable an input tax credit to be claimed where available/appropriate.
- Transactions shall be accompanied by a succinct explanation of why the expense was incurred.
- Transactions shall be accompanied by a job number for costing purposes.
- If no supporting documentation is available the cardholder will provide the declaration detailing the nature of the expense and must state on that declaration 'all expenditure is of a business nature'
- Approval of this expense is referred to the Chief Executive Officer for a decision. Regular failure to provide documented records may result in the card being forfeited.
- Should approval of expenses be denied by the Chief Executive Officer, reimbursement of the expense shall be met by the cardholder.
- Lost or stolen cards shall be reported immediately to the card provider and a written account of the circumstances shall be provided to the Manager finance on the next working day.
- Corporate Credit Cards are to be returned to the Manager Finance on or before the employee's termination date with a full acquittal of expenses.
- Corporate Credit Cards are to be returned to the Manager Finance before an employee begins an extended period of leave being of 2 weeks or more.

Failure to comply with any of these requirements could result in the card being withdrawn from the employee. In the event of loss or theft through negligence or failure to comply with the Shire of Katanning Corporate Credit Card Policy any liability arising from the use of the card may be passed to the cardholder.

The use of a Shire of Katanning Corporate Credit Card is subject to the provisions of the Code of Conduct of Shire of Katanning. Any serious transgression of the above listed responsibilities or the Code of Conduct may result in an appropriate referral under the *Corruption and Crime Commission Act 2003* and/or termination of employment.

Signature of Card Holder:_____ Date:_____

Signature of CEO:_____ Date:_____

Attachment 1b

Shire of Katanning
Missing Receipt/Invoice Declaration

Name (please print):

_____

I certify that I made the purchase shown below and all expenditure was of a business nature but do not have a receipt for the following reason:

_____

Supplier Name		
Address/Location		
Date of Purchase		
Detailed Description of Purchase	GL Code/Job No/Plant No	Item Amount
Total Purchase Amount		

This document is in lieu of an invoice or receipt for this transaction. I certify that all items listed above were purchased and received for Shire of Katanning business. I understand that a Missing Receipt/Invoice Declaration should be required only on rare occasions and may not be used on a routine basis.

Employee Signature: _____ Date: _____

6.1 Graffiti Removal and Prevention

Policy Owner: Community Services and Facilities
Person Responsible: Executive Manager of Projects and Community Building
Date of Approval:
Amended:

Objectives:

1) To adopt a strategy of rapid removal of graffiti from Council property and to encourage constituents similarly.
2) To assist property owners to rectify the effects of graffiti and encourage them to deal with graffiti damage promptly.
3) To encourage the general public to become involved in repairing graffiti damage, even when their own personal property is unaffected.
4) To develop community programs to dissuade youth from becoming involved with graffiti and steer those already involved in graffiti into alternative activities.
5) To balance enforcement strategies with education programs, informing the public of the seriousness of graffiti as an offence and instilling a sense of community pride, which will make people see graffiti as a negative influence on society.
6) To support the use of legitimate outlets for the artistic and creative energies of youth giving them an alternative to resorting to illegal graffiti.
7) To develop strategies that ensure land owners and developers design their buildings and surroundings to discourage graffiti and make its removal easier.

Policy Statement:

A policy which provides strategies and responsibility for the removal of graffiti from Local Government property, the encouragement of private property owners to remove graffiti from their premises and the prevention of graffiti within Katanning.

Guidelines:

1) All instances of reports of graffiti are to be directed to the Director of Corporate and Community Services who will:

   a. adopt rapid removal within 24 hours for all of the Local Government assets as the desired approach;

   b. provide a mechanism for accepting and actioning graffiti reports from the Local Government's employees and others in the community who make them to the Local Government;

   c. adopt the use of anti-graffiti products from approved product lists; and

   d. provide assistance to the general public to repair graffiti damage by way of advice on removal and prevention of graffiti.

2) Council will promote preventative strategies including:

   a. providing a range of constructive alternatives for young people, based on consultation and feedback from the target group;

   b. providing and funding opportunities for urban art projects;

   c. supporting links with community policing strategies (e.g. Neighbourhood Watch) and the community;

   d. working closely with police on local graffiti matters; and

   e. providing opportunities for young people sentenced for graffiti offences to carry out community service with Local Government supervision.

3) Council will ensure that the principles of reducing opportunities for illegal graffiti are incorporated into building design and planning approval by:

   a. instigating requirements that ensure walls, particularly those with a natural surface abutting public space, have a plan for target hardening prior to approval e.g. a graffiti coating, planting vines;

   b. ensuring that design briefs for all new Council buildings employ the principles of reducing opportunities for wilful damage and graffiti;

   c. considering methods to ensure that approval of building designs is dependent on a plan to minimise the availability of areas that would be vulnerable to graffiti; and

   d. encouraging landowners to install effective lighting and other security devices to deter illegal graffiti.

8.9 Municipal Inventory Heritage Policy

Policy Owner: Town Planning and Building
Person Responsible: Executive Manager Infrastructure and Development
Date of Approval:
Amended:

Objectives: To encourage property owners of heritage listed properties to conserve, record and document developments, alterations and demolition of properties listed in Council's Municipal Inventory.

Policy Statement: To provide guidelines to property owners on the impact of development to properties listed in Council's Municipal Inventory.

Guidelines:

CATEGORY	LEVEL OF SIGNIFICANCE	POLICY
Category 1 Conservation Essential	Possible state or national significance Highest level of protection appropriate	• Council *will* require a HERITAGE IMPACT STATEMENT to be prepared addressing how the proposed development will affect the cultural heritage significance of the place. • As per section 78 of the *Heritage Act of Western Australia*, Council *will* seek advice from the Heritage Council of Western Australia for places entered in the Register of Heritage Places. • Council *will* seek advice from the Australian Heritage Council for places entered in the National List. • Council *may* require that the history and significance of the site be recognised through INTERPRETATION.
Category 2 Conservation Recommended	Of very considerable significance to the Shire of Katanning High level of protection appropriate	• Council *may* require a HERITAGE IMPACT STATEMENT to be prepared addressing how the proposed development will affect the cultural heritage significance of the place. • Council *will* require an ARCHIVAL RECORD prior to the commencement of any major changes or demolition. • Council will seek advice from the Regional Heritage Advisor. • Council *may* require that the history and significance of the site be recognised through INTERPRETATION.

Category 3 Retain and conserve if possible	Significant as an individual building within the Shire	• Council *will* require a JUSTIFICATION FOR DEMOLITION to accompany the development application. • *In certain instances*, a HERITAGE IMPACT STATEMENT may be required. • Council *may* require an ARCHIVAL RECORD prior to the commencement of any major changes or demolition.
Category 4 Recognise through interpretation	Historic Site	• Council *may* require that the history and significance of the site be recognised through INTERPRETATION.
Category 5 Conservation desirable	Contributes to local character Significant but not essential to history of area	• Council *may* require an ARCHIVAL RECORD prior to the commencement of any major changes or demolition. • Council *will consider if* any replacement buildings respect the existing character of the street or area.

6.2 Allocation of Units at Amherst Village

Policy Owner: Community Services and Facilities
Person Responsible: Executive Manager of Finance and Administration
Date of Approval:
Amended:

Objective: To ensure all Licence to Occupy Agreements for vacant units at the Amherst Village are allocated utilising a clear, fair and transparent system.

Policy Statement: To provide guidelines to Council Staff on how the Licence to Occupy Agreements for vacant units at the **Amherst Independent Living Village** are to be allocated.

Guidelines: The Shire of Katanning will maintain a list of residents who have expressed an interest in purchasing a Licence to Occupy Agreement for vacant units at Amherst Village.

When a unit becomes vacant Administration will write to all applicants on the "Expression of Interest" list to inform them of the vacancy and offer them the opportunity to submit an offer amount for the Licence to Occupy Agreement.

Applicants are to be given a minimum of 21 days to submit an offer.

All offers will be retained un-opened until the closing date at which time they will be opened by a Senior Staff member and recorded in the inward mail system.

Offers will then be rated based on the amount offered with offers by Katanning Residents (resident for more than 5 years) weighted by 5% over offers from applicants residing outside the Katanning Shire. Only unconditional offers will be considered. In the event of the offer of a Katanning resident being accepted as a result of the 5% weighting being applied, the vacating resident will receive one half of any profit (above initial capital deposit) calculated on the highest offer received.

Applicants who have been residents of Katanning for five or more years will be given priority where the offered amounts are equal after applying the weighting system above. This will include long term residents of Katanning who have moved away (for no more than five years) and are now looking to retire in Katanning for family/personal reasons.
The successful applicant will be required to provide a 10% deposit and a doctor's certificate proving their ability to live independently within 7 days. The remaining funds are to be paid within a further 35 days. (Total of 42 days following receipt of the deposit)

Successful applicants may be permitted to move into the unit under a short term lease once the deposit has been paid (prior to remaining funds being paid) and the doctor's certificate provided. The applicant will in addition to the normal weekly maintenance fee, pay rent set at the rate of $200 GST exclusive per week until the balance due is paid.

Regional Development Australia
WHEATBELT WA

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Briefing Note:

Collaboration for Regional Impact

Pilot 1: Harlem Children's Zone

1 THE SITUATION

Families living in regional or rural areas of Australia can face challenges that may be less commonly experienced by families in major cities; for example, in accessing services and good quality infrastructure. The concern is whether these challenges result in poorer lifetime outcomes for rural and regional children, and if so, what can be done about it.

A key area of interest is education outcomes (both for their own sake, and their correlation with positive lifetime outcomes for income, health and wellbeing).

Regional Development Australia Wheatbelt Inc WA (RDA Wheatbelt) recently completed a submission to the Federal Government's Independent Review into Regional, Rural and Remote Education[1]. The nearly 300 responses of parents and teachers to our regional survey indicated a plethora of challenges for the regions regional, rural and remote schools.

A 2012 report by Save the Children[2] *Developing Children's Zones for England* notes that "*Children and young people in England have very unequal chances of doing well in education and then going on to do well in their adult lives. These chances depend to a large extent on how rich or poor the child's family is, however, many other factors are involved, including where the child lives. Despite efforts through the years to tackle the inequalities between places, the fact remains that there are many areas in England that are marked by high levels of poverty, worklessness and ill-health. Children who live in these areas do worse, on average, than their peers elsewhere*. "

[1] http://rdawheatbelt.com.au/publications)

[2] Dyson, A., Kerr, K., Raffo, C. and Wigelsworth, M. (2012) Developing Children's Zones for England. (p.1) Centre for Equity in Education, The University of Manchester.

This English report is supported by an Australian study completed in 2013. The report[3] '*The Tyrannies of distance and disadvantage – Factors related to children's development in regional and disadvantaged areas of Australia',* examined whether children living regional areas experienced a 'tyranny of distance' or a 'tyranny of disadvantage'. In other words, are the gaps in children's development that are evident in regional areas the result of remoteness or of disadvantage. This study suggested;

"there are enduring differences in child cognitive outcomes by whether children live in major city areas compared to regional areas, even after a broad range of factors are taken into account, indicating there is a tyranny of distance for cognitive outcomes".

In relation to emotional and behavioral problems the study suggested that the biggest link was one of disadvantage;

"*children living in disadvantaged areas experience greater emotional or behavioral problems, even when all other factors are taken into account"*.

If we look in more detail at two target locations within the Wheatbelt and Great Southern, Moora and Katanning, in the early phase of life (0-8) the *2015 Australian Early Development Census* community profiles show both communities have a higher than average proportion of children developmentally vulnerable:

Percentage of children developmentally vulnerable in 2015

Geography	Physical	Social	Emotional	Language	Communication	Vuln 1	Vuln 2
Australia	9.7	9.9	8.4	6.5	8.5	22.0	11.1
WA	9.9	8.4	8.5	6.6	8.0	21.3	10.5
Moora	12.9	6.5	6.5	16.1	6.5	25.8	12.9
Katanning	17.1	19.7	15.8	15.8	18.4	36.8	19.7

(source: www.aedc.gov.au/resources/2015-aedc-results accessed 5/1/18)

Katanning shows almost double the WA average for children with 2 or more vulnerabilities**.**

The disadvantage continues through schooling with the most recently available NAPLAN results for years 7 and 9 at these two locations showing significant shortfalls against the National average:

	Moora		**Katanning**	
	Year 7	Year 9	Year 7	Year 9
Subject				
Reading	499	546	489	546
Writing	476	511	478	509
Spelling	502	515	501	557
Grammar & Puct	500	536	495	531
Numeracy	511	571	497	552

Source: www.myschool.edu.au Yr 7 and Yr 9 NAPLAN results 2016 accessed 5/1/18

Code: Substantially above Australian Schools Average
Above Australian Schools Average
Close to Australian Schools Average

[3] Edwards, B., and Baxter, J. (2013) The tyrannies of distance and disadvantage – Factors related to children's development in regional and disadvantaged areas of Australia. *Research Report No. 25*, Melbourne, Australian Institute of Family Studies

Below Australian Schools Average
Substantially Below Australian Schools Average

Student attendance rates are extremely poor:

Student Attendance Rate				
	Moora Term 1 and 2	Katanning term 1 and 2	Moora term 3	Katanning term 3
All students	83%	83%	83%	78%
Indigenous Students	60%	69%	59%	56%
Non-Indigenous students	90%	88%	90%	86%
Student Attendance level (proportion of students attending 90% of more of the time)				
All students	60%	55%	52%	39%
Indigenous students	27%	31%	27%	15%
Non Indigenous students	70%	65%	60%	50%

Source: www.myschool.edu.au for the 2017 reporting year, for years 1-10 accessed 5/1/18

This pattern of poor regional educational outcomes continues through to the end of year 12. SCSA 2016 tables (which only include schools with a year 12 cohort of 20 or over) showing the percentage of year 12 students who successfully graduated year 12 with a WACE in 2016 reveal Katanning High School achieved the lowest graduation rate of all schools within the Great Southern and Wheatbelt (out of 13 eligible schools).

Against a State average graduation rate of 91.92% Katanning achieved only 69.80%. Six of the 13 schools achieved over 90% graduation with all but two schools achieving over 83%. North Albany High School was the other poor performer at 77.60% (it exists in a low socio-economic area of Albany). The myschool website[4] indicates a graduation rate of 63.8% for Katanning for 2016 and 57.7% for Moora. Both High schools have Index of Community Socio-Educational Advantage scores of less than 1000 (indicating disadvantage), with relatively high Indigenous cohorts of over 20%.

Katanning has 23% of its student cohort with English as a second language. Both have a high proportion of students in the most disadvantaged quartile:

School	**ICSEA Value**	**Bottom quarter**	**Middle quarters**		**Top Quarter**
Moora Distribution	913	48	31	17	4
Katanning Distribution	887	62	25	11	2
Australian Distribution	1000	25	25	25	25

Source: https://myschool.edu.au/SchoolProfile/Index/111370/CentralMidlandsSeniorHighSchool/48155/2016 and https://myschool.edu.au/SchoolProfile/Index/111352/KatanningSeniorHighSchool/48136/2016

This educational data is aligned with data measuring other aspects of disadvantage, for example *Lessons of Location: Potentially Preventable Hospitalisation Hotspots in Western Australia* report[5] released in

[4] www.myschool.edu.au accessed 5/1/18

[5] http://ww2.health.wa.gov.au/~/media/Files/Corporate/Reports%20and%20publications/Lessons-of-Location/Lessons-of-Location-2017.pdf

November 2017, identified areas in WA where health inequalities are prevalent and, without intervention, likely to continue. Moora and Katanning are two of the nine locations identified in the Wheatbelt and Great Southern as health hotspots (defined as a location that receives inpatient hospitalisations for preventable diseases at more than 1.5 times the state average).

Further, Katanning in particular experiences higher social disadvantage across a range of measures such as Long Term unemployed (1 in 14 compared to the state average of 1 in 33), Households without a car (1 in 11 compared to 1 in 16), People with a healthcare card (1 in 10 compared to 1 in 16), Children in jobless families (1 in 4 compared to a state average of 1 in 10)[6].

2 THE COMPLICATION

The School Curriculum and Standards Authority[7] (SCSA) notes that *"many factors affect student achievement, some of which are outside the control of schools. These include differences in ability, cultural and language background, educational background of parents and economic differences"* (p.7).

SCSA maintains "*that researchers into school effectiveness agree that schools account for only about nine per cent of the variance between students. Students' personal backgrounds account for most of the variance in academic performance."* (p.7).

That's not to say that schools are not critically important, but focusing on the school alone is unlikely to change the dynamic. To date education in regional areas has been considered very much the responsibility of schools. RDA Wheatbelt believes that a more collaborative "it takes a village" approach may be needed to encourage innovative approaches to improving educational outcomes in an environment where our schools have very limited resources. A positive side benefit of this approach where it has occurred elsewhere in the world is an enhanced civic society and an improvement in the quality of life not just for students but for the whole community.

Collaborations are difficult however, and require commitment from a range of organisations each with a different master, funding imperative and agenda. To create a collaboration that focuses on changing the outcomes for young people not at a single stage, but at all stages of the process, requires long term commitment covering birth to adulthood. Whilst there have been many instances of local co-operation in many areas of the Wheatbelt and Great Southern including in areas such as early childhood and youth, they have been 'ad hoc' and dependent on short term funding streams. Inevitably efforts have been short lived. This is even for programs that have won National awards for their impact such as RDA Wheatbelt's Youth Connections program.

To create the required 'buy in' for a long-term project significant work is required at the 'pre-intervention' stage to create shared meaning and commitment, measurement systems, funding streams and leadership.

[6] Curtin University School of Public Health (2016) Health System & Health Economics, Population Health Needs Assessment Country WA Primary Health Network (p.27) WA Primary Health Alliance.
[7] https://www.scsa.wa.edu.au/publications/reports/statistical-reports/school-comparison-statistics

3 THE RESOLUTION

Community collaborations focused on improving outcomes for young people exist throughout the world and RDA Wheatbelt is interested in exploring models such as the Harlem Children's Zone (HCZ) model that works on influencing outcomes by providing extensive community support mechanisms including mentors, out of school clubs for academic support and a range of other out of school options, starting at pregnancy and continuing through College.

"It seeks to create a 'pipeline' of support for children by linking high-quality schools and early years provision with personal, social and health support for them and their families, and with community development initiatives. It is doubly holistic in working with children over time and across all the contexts in which they learn and develop." [8]

A rigorous Harvard University study[9] of the academic achievements of students at the HCZ schools - results reported as a "miracle" by the New York Times – found that the program produced enormous gains in the outcomes for children.

We have a theory that when school resources are tight and our influence to change the 'system' minimal, communities can still have a big impact on the educational and other outcomes for their children by banding together to create a collective impact. This is particularly so when other support mechanisms such as mental health resources, are not readily available within schools. To be effective, there needs to be support for the community via community funding mechanisms and engagement of all stakeholders towards a common goal.

The HCZ believe that if the effort is sustained, it *"may be possible to create a 'tipping point' so that the area as a whole supports children to do well*. "[10]

RDA Wheatbelt proposes that several steps are needed:

1. Commission UWA Centre for Social Impact to review two pilot sites of Moora (Wheatbelt) and Katanning (Great Southern) to map:
    a. How disadvantage 'works' in these areas.
    b. What are the existing support structures at play both formal and informal.
    c. Who are the key partners that would be needed for a collaborative effort and any gaps that exist where key services are not presently available to the town where partners will need to be sourced externally.
    d. Map these local dynamics against the HCZ model to derive a 'working model' for pilot across all the contexts in which children learn and develop.

[8] Dyson, A., Kerr, K., Raffo, C. and Wigelsworth, M. (2012) Developing Children's Zones for England. (p.1) Centre for Equity in Education, The University of Manchester.
[9] Dobbie, W. and Fryer, R, G. (2009) "Are High-Quality Schools Enough to Close the Achievement Gap? Evidence from a Bold Social Experiment in Harlem," Harvard University.
[10] Dyson, A., Kerr, K., Raffo, C. and Wigelsworth, M. (2012) Developing Children's Zones for England. (p.1) Centre for Equity in Education, The University of Manchester.

2. Hold workshops within the two towns with community and potential partners identified in 1c above that seeks to:
    a. Shift the focus from targeting particular outcomes for particular groups of children to enabling all children and young people to do well across a range of outcomes. Encourage parties to think radically about how all the sources of support for children can be configured strategically using the working model as a guide.
    b. Create a working party 'lead team' in each town to be supported by the Collaboration for Regional Impact backbone, or alternatively by RDAs Wheatbelt and Great Southern to take this work forward.

3. Implementation
    a. Identify within the working model how much represents collaboration and co-operation with existing structures (both informal and formal) and what is 'new' that will require additional funding.
    b. Continue to engage with community and other stakeholders to refine and agree.
    c. Develop implementation plan including funding strategies.
    d. Develop evaluation strategies to support the working model.
    e. Implement.

This is a simple outline to indicate the intent, with detailed project planning required once the 'lead teams' are established. If there is no local buy-in, then no 'lead team' will eventuate and the project will not proceed. Collaboration and effective community facilitation will be key.

4 More Information?

If further information is required on any aspect of this concept paper, including detail on the Harlem Children's Zone, please don't hesitate to contact RDA Wheatbelt.

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10.3.1

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Briefing Note:

Collaboration for Regional Impact

Pilot 2: Youth Unemployment

THE APPROACH TO DETERMINING THE SITUATION, THE COMPLICATION AND THE ULTIMATE RESOLUTION

Youth (aged 15-24) Unemployment is identified as key 'wicked problem' for the Great Southern and Wheatbelt regions. Employment data for the Wheatbelt Region at an SA 4 level (which combines both the Wheatbelt and the Great Southern into a single data set) shows that the rate of unemployment for the 15-24 years population at 13%, is over double that of the 25 years and over population (5%). This rate of youth unemployment is further exacerbated by the high level of Aboriginal youth unemployment which at 32% is almost three times greater than the non-Aboriginal youth unemployment rate (11%) and adds a full 2% to the overall youth unemployment rate in the region.

The National and Global research on youth unemployment has been considered with the pilot designed initially to ascertain whether the risk factors experienced by our own unemployed youth are consistent with the national research, or are perhaps simply due to a lack of employment options.

This pilot is focused on cross matching linked data sets for the key regional centres below, in order to establish an evidence based understanding of the key risk factors that are at play. It will also undertake a spatial analysis of 'first employer' options within these key regional centres (overlaid to the linked data) in order to inform whether the high levels of unemployment are a result of disadvantage or simply a lack of suitable first employers.

This is a key issue in understanding what might be an intelligent evidence based intervention to impact on youth unemployment, especially long-term youth unemployment.

This Pilot is at its early phase of development. The Department of Employment (Federal) has been working since November 2017 to review what data it holds on hand to support an analysis.

The data requested, on either a time series basis, or at selected points in time (including if possible the date of the last two census so that it can be cross checked against broader population profiles) includes:

1. Data to cover the following key communities:
    a. Shire of Northam
    b. Shire of Moora
    c. Shire of Narrogin
    d. Shire of Merrdein
    e. Shire of Jurien Bay
    f. Shire of Katanning
    g. City of Albany
2. Unemployed youth by number, age and gender
3. Unemployed youth with one or more of the following risk factors (including multiples)
    a. Age
    b. Gender
    c. Low literacy achievement
    d. Low numeracy achievement
    e. Labour market experience
    f. Completed year 12
    g. Post school qualifications
    h. Overseas born

The data is sought in order to establish whether there are common risk factors experienced by the unemployed youth cohort, and whether these risk factors are common across the sub-regional centres.

In order to remove any particular macro influence, we are seeking to look at this sort of data over either time series, or at certain points in time (including the last two census dates) to enable a broader context to be applied. An analysis of this data will help direct the way we think about a resolution of this problem.

THE WORKING THEORY

The theory we are working towards is that the cohort of unemployed youth will demonstrate a higher number of risk factors than the general population, but will ALSO have reduced first employer opportunities.

The working theory intervention is the establishment of social enterprise within a location that provides consistent experience in the workforce at an early age, whilst providing mechanisms to support the alleviation of risk factors (for example, tutoring support on literacy and numeracy in the context of an employment experience).

MORE INFORMATION?

If further information is required on any aspect of this concept paper, please don't hesitate to contact RDA Wheatbelt.

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Regional Development Australia
WHEATBELT WA

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Briefing Note:

Collaboration for Regional Impact

Pilot 3: Aboriginal Economic Participation

THE SITUATION

The economic profile of the Indigenous population in the Wheatbelt is characterised by low employment, low labour force participation, very little business development, low personal incomes and high levels of income support. Additional to these issues are the associated issues of literacy and numeracy levels, low year 12 attainments and low levels of non-school qualifications.

Emeritus Professor D'Arcy Holman in his highly regarded report on WA Indigenous Health Programs has noted that the very significant disadvantage being experienced by Indigenous West Australian's is unlikely to be remedied without "huge improvements in education, employment and wealth". Wealth creation and employment pathways are a necessary component of addressing disadvantage.

The Wheatbelt community has been experiencing significant structural change over many years brought about by improvements in technology within the agricultural sector. This has removed an entire layer of semi-skilled occupations from the economy that have in the past provided employment for Aboriginal people and allowed the communities to be both productive in work and to be able to stay on country.

The absence of traditional employment pathways, coupled with low education outcomes and a continuing desire among Aboriginal communities to stay on country has resulted in very high levels of unemployment (more than 50% youth unemployment) and an increasing sense of hopelessness being reported within what is an expanding Aboriginal population in the region.

Aboriginal employment in the wheatbelt sub regions of Avon, Central Midlands and Wheatbelt South presents as a prominent issue on two levels. These are unemployment rates and labour force participation.

The overall unemployment rate for Aboriginal people across the three sub regions was excessively high when viewed as a standalone statistic but could be described as abysmal when compared to the non-Aboriginal unemployment rate[1] (Table 7). An overall Aboriginal unemployment rate of 26.5% compared

[1] RDAW analysis of Wheatbelt Aboriginal employment statistics derived from ABS Census Statistics (2011).

to a non-Aboriginal rate of 3.7% suggests that the COAG target of closing the gap 2018 would be difficult to achieve without adding the further reported increase in the gap of almost 14% in 2015[2].

Table 1 Avon, Central Midland and Wheatbelt South combined employment statistics 2011

	Aboriginal			*Non- Aboriginal*		
	Males	*Females*	*Persons*	*Males*	*Females*	*Persons*
% Unemployment(b)	28.9	23.8	26.5	3.7	3.6	3.7
% Labour force participation(c)	50.6	38.8	44.2	91.1	75.4	83.4
% Employment to population(d)	36.0	29.6	32.5	87.7	72.6	80.3

In summary the unemployment rates and participation rates of Aboriginal males in the Wheatbelt regions in association with the low levels of weekly personal and household income and the acknowledged growing gaps suggests the need to examine what is influencing these outcomes at a micro (personal/family) and community level and if a different approach is required.

THE COMPLICATION

The proposal put forward by Regional Development Australia Wheatbelt Inc WA (RDA Wheatbelt). looks to provide resources that will inspire, facilitate and activate the Noongar community to develop self-employment options as well as social enterprises that provide skills, employment pathways, income and most important a sense of purpose and hope. It is intended that over time this would feed back into educational pathways and provide a link for young people to both develop their own skills and be confident that these could be employed on country.

A market analysis to determine whether resources existing within the community to provide support for the activation of indigenous assets to create employment pathways, income and self-employment options has been undertaken. In addition, the market analysis looked at what general enterprise development services existed across the region that could be accessed by the Noongar people.

The market analysis showed that no services currently exist within the Wheatbelt to encourage and facilitate new enterprise development within the Noongar community. Small business support services are offered by Indigenous Business Australia (IBA) and RSM Bird Cameron (under the SBDC contract) and these services appear to be identical to each other, focusing on assisting small business people who have already taken the first step along the journey. Neither service provides assistance to individuals or communities to identify opportunities for small business, and encourage and support the taking of the first steps. This is gap that is important to address if the community is to be supported in creating sustainable outcomes.

[2] Department of Aboriginal Affairs WA. 2015. "Progress Against Closing the Gap: WA 2015", http://www.daa.wa.gov.au/accountable-government/closing-the-gap/

RDA Wheatbelt believes that additional action specific to the needs and situation of Indigenous people in the Wheatbelt should be undertaken to support the objectives of the broader initiatives to advance economic outcomes for Indigenous people.

RDA Wheatbelt contends that if the current approach is maintained there is a risk that a high proportion of Aboriginal people in the Wheatbelt will continue to remain in a position of economic disadvantage. This has very significant ramifications for towns such as Moora where the Population Projections suggest that the proportion of the population that identifies as Indigenous is estimated to increase from 12.27% in 2011 to around 29% in 2026 (less than 10 years). Given the projected estimates of significant increases of the Aboriginal population in the region over the next 20 years, failure to adequately respond now could lead to more serious economic and social consequences in the future.

THE RESOLUTION

In consultation with the Noongar Chamber of Commerce and Industry, RDA Wheatbelt have articulated a target intervention designed to build capacity within the Noongar Nation through the application of a different approach to the delivery of economic development support to Indigenous people in the Wheatbelt.

This project and approach entails the establishment of an Aboriginal organisation, staffed with Aboriginal people who have a cultural connection with communities, who would facilitate the delivery of economic development support and undertake mentoring and fostering of business development and employment. This would include working with families to map existing cultural and physical assets, an assessment of commercialisation potential for these assets, and then working with the families on governance models, business frameworks and plans (including connecting with IBA, Indigenous Land Council and Department of Prime Minister and the Cabinet for capital support).

If this delivery model was successful, it is hoped that from these economic beginnings would be added education programs and employment pathways which in turn feed into Aboriginal enterprises. It is envisaged that a holistic approach to family economic independence will see a rise in health outcomes, reduced risks in early childhood development and improvements in a whole range of economic, social and health outcomes.

The Collaboration for Regional Impact's role in this project may be to connect parties to provide for initial establishment and mentoring, governance, assistance in developing government and non-government partnerships, and initial administrative, strategic and research support until such time as sufficient capacity has been developed within the Indigenous organisation that it can stand alone.

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12 November, 2017

Collaboration for Regional Impact

BACKGROUND

RDA Wheatbelt has designed a medium to long term project to:

1. Properly identify the issues that matter to the people living in the region
2. Align existing resources from State and Federal bodies, and the NFP and commercial sectors, towards an agreed framework for impact, including 'what's working and what's not'
3. Harness the social impact investment and corporate market to provide addition financial support towards the implementation of chosen interventions
4. Measure outcomes to meet the requirements of the social impact investment market

RDA Wheatbelt is seeking to establish a backbone organisation through an independent NFP (to be able to apply for funding in its own right) to achieve the above and seeks an Expression of Interest from 10 key identified stakeholders (plus independent chair) with regard to willingness to:

A. Provide financial support to match the level of support provided by RDA Wheatbelt ($60,000 per annum with a 3 year commitment). This will provide the seed funding for the Backbone organisation.
B. Engage as a Foundation Committee member on the NFP Committee (Board) to provide expertise and a point of connection to the broader social impact investment and corporate investment market.

SUMMARY OF PROJECT

This project aligns with Sustainable Development *Goal 17: Revitalise the global partnership for sustainable development* under the United Nations Economic and Social Council's 2030 Agenda. It is also focused on many of the core requirements of regional economic development identified though COAG:

Strengthen Human Capital
Increase infrastructure
Improve access to markets
Leverage regional comparative advantage

Improve Productivity
Improve business competitiveness

However, it ***seeks to change the conversation*** around regional economic development towards one that focuses on human wellbeing – a critically important ingredient of sustainable economic development. This might mean that instead of focusing on attracting new industry to the region, it may well focus on education, health, youth unemployment pathways etc.

It may also focus on other key collaborative projects with regional impact – for example, the current Wheatbelt projects *Secondary Freight Route* (a collaboration between RDAW and all 42 local governments) and *Aboriginal Enterprise Development* (a collaboration between RDAW, the Noongar Chamber of Commerce and Industry, the Noongar landholder cooperative and 3 local governments in the Wheatbelt) – may well fit within the CRFI framework and be able to be managed through this framework (with the consent of the CRFI Committee).

The key is that the **community want it, its collaborative, and has regional impact.**

See article from the Harvard Business Review that talks to what we are seeking to implement. Please pay special note to the references to Backbone support, which is what we are seeking to establish through this project.

The EcoSystem of Shared Value.pdf

Within the Collaboration for Regional Impact model sourcing of capital to finance impact investments comes through mechanisms such as social impact bonds. "It is estimated the Australian social impact investment market could ready $32 billion in a decade" Impact- Australia 2013. Already large, high performing social impact pooled investment funds have started to emerge overseas, some with portfolios more than US$100 million. This project combines investment attraction through BOTH social impact market, and the collaboration market. The Centre for Social Impact at UWA advise this has not been done in any other region (world leading was their phrase!).

Social Impact Bonds are now in NSW, VIC, SA, QLD (all since 2016)

However, there are problems with the issuing of Social Impact Bonds in WA due to lack of Privacy Legislation, however the current Government has indicated that Privacy Legislation is expected to be introduced to WA Parliament as a priority.

Social Impact Bonds have financed solutions across a whole host of issues including (but not limited to):

I. Summer school for disadvantaged students (like Camp Kulin)
II. Social housing
III. Aged care service delivery
IV. Juvenile justice
V. Adult justice
VI. Early childhood intervention

Collective Impact efforts have financed progress on issues (amongst others) such as

I. Education
II. Juvenile justice
III. Substance abuse
IV. Childhood obesity
V. Job creation
VI. Pollution

Collective impact (Together SA example) and social impact (NEWPIN example) often focus on same type of problems, but less players in a straight social impact investment (so a bit easier). Both require a long-term focus. Funds can be secured for up to 20 years for a single project.


Newpin example.pdf


Case Study Together SA.docx

We are advised that an International G8 Taskforce on Social Impact Investment is working to grow the market globally. An Australian Advisory Board reporting into that Taskforce recently launched a plan to grow the market in Australia, which involves three working groups to focus on implementing different streams of work. There may be an opportunity to work closely with these working groups, as well as leverage the work being done at the Centre for Social Impact, UWA.

The work done in NSW confirms the Harvard findings that social services providers need assistance to enable their participation in a social impact investment market. This assistance included building organization capacity in areas such as outcomes measurement, and financial and contract negotiation.

Lotterywest advise they have had 5 approaches for funding support for backbone support around Collective Impact projects within WA but none, apart from ours, in the regions. They are open to discussions for the provision of assistance to this project so long as key stakeholders are secured and a long-term funding model designed. We envisage that an application to Lotterywest to fund the initial building of capacity within the NFP would occur as soon as foundation stakeholders are secured.

Draft Funding Model


draft funding model V1.docx

Calculated at $1/person/shire/quarter which if all Shires/City commit would raise $488,000 per annum. Funds raised from NFPS, RDAs and other Government Departments would be in addition to this. Discussions have commenced with City of Albany and Shire of Northam as the key Local Governments in each region, together accounting for 41% of the combined regional populations. An early part of the

project would be to progressively brief and secure shires throughout the region as part of the long term funding model (with a target of securing all commitments within two years).

Discussions are also occurring with Minister MacTiernan's office and the Department of the Prime Minster and Cabinet as to possible engagement with these two 'lead' agencies as Foundation members with a view to securing support and engagement from all tiers of Government. Department of the Prime Minister and Cabinet have already committed as a Foundation Committee member and are processing the request for matched funds. Minister MacTiernan's office are in the process of seeking advice from the Regional Development Commissions and expect to advise their response in January.

Target Foundation Committee Structure

1. Shire of Northam
2. City of Albany
3. RDA Great Southern
4. RDA Wheatbelt
5. Department of the Prime Minister and Cabinet
6. Department of Regional Development

Six Core members all financially contributing to the running of the organisation with a stake in each of the targeted regions, plus the following 'expert' member organisations (if they will agree):

7. Center for Social Impact (UWA)
8. Social Ventures Australia
9. Commonland (a Belgian social impact investor organisation currently invested in the Wheatbelt with strong international social impact linkages)
10. Bankwest Foundation (a key link understanding social impact investment through the work undertaken through the Social Impact Series research, and in connecting to the domestic philanthropic market). Bankwest Foundation have committed as a Foundation Committee member and are progressing the request for matched funding.
11. Corporate Sector.

We see this project as a game changer for regional areas within Western Australia. It has the potential to provide greater control to regions in resolving their key critical issues, especially those relating to wellbeing. It also provides a mechanism for the population to engaged as part of a true collaboration, identifying and also investing in the issues that matter to them.

However, we also believe that to be effective and long lasting, a collaboration focused on social impact investing in all its forms, requires the existence of a backbone support organisation. It is this backbone support that we are seeking to establish as a necessary pre-curser to success.

Sophie Justins

From: Juliet Grist - RDA Wheatbelt <juliet.grist@rdawheatbelt.com.au>
Sent: Monday, 19 March 2018 3:53 PM
To: Denise Gallanagh-Wood
Subject: FW: Collaboration for Regional Impact
Attachments: katanning CFRI.pdf.pptx; briefing note CFRI.docx; Briefing Note CFRI - Pilot 1 Harlem Children's Zone - January 2018.pdf; Briefing Note CFRI - Pilot 2 Youth Unemployment.pdf; Briefing Note CFRI - Pilot 3 Aboriginal Economic Participation - January 2018.pdf

Hi Denise, thanks for your message today. Please see attachments and comments below sent to Julian on 14 March.

Kind regards, Juliet

From: Juliet Grist - RDA Wheatbelt
Sent: Wednesday, March 14, 2018 3:01 PM
To: 'Liz Guidera' <lizguidera@iinet.net.au>; 'Julian Murphy' <ceo@katanning.wa.gov.au>
Subject: Collaboration for Regional Impact

Dear Liz and Julian,

I very much appreciated the opportunity to brief Councillors on the CFRI project last night – thank you! I have attached the soft copies of the slides from last night, plus the CFRI briefing paper and the briefing papers for the three pilots. I am delighted to advise that we have today received confirmation of $1,072,500 inc GST to fund Pilot 3 – Aboriginal Enterprise Development. This pilot is occurring within the Wheatbelt region however now it is funded we have opportunity to 'bolt on' other delivery programs to it within this space.

Best regards,

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Regional Development Australia
WHEATBELT WA

Collaboration for Regional Impact

Shire of Katanning

An Australian Government Initiative

10.3.1

Collaboration for Regional Impact

(working title)

- Project looking to support systems change
- Targeted at whole of region (Wheatbelt and ?)
- Focussed on human wellbeing
  - ‘wicked’ problems
  - Multi-stakeholder
  - Transformational impact

Mechanism is a ‘backbone support’ structure

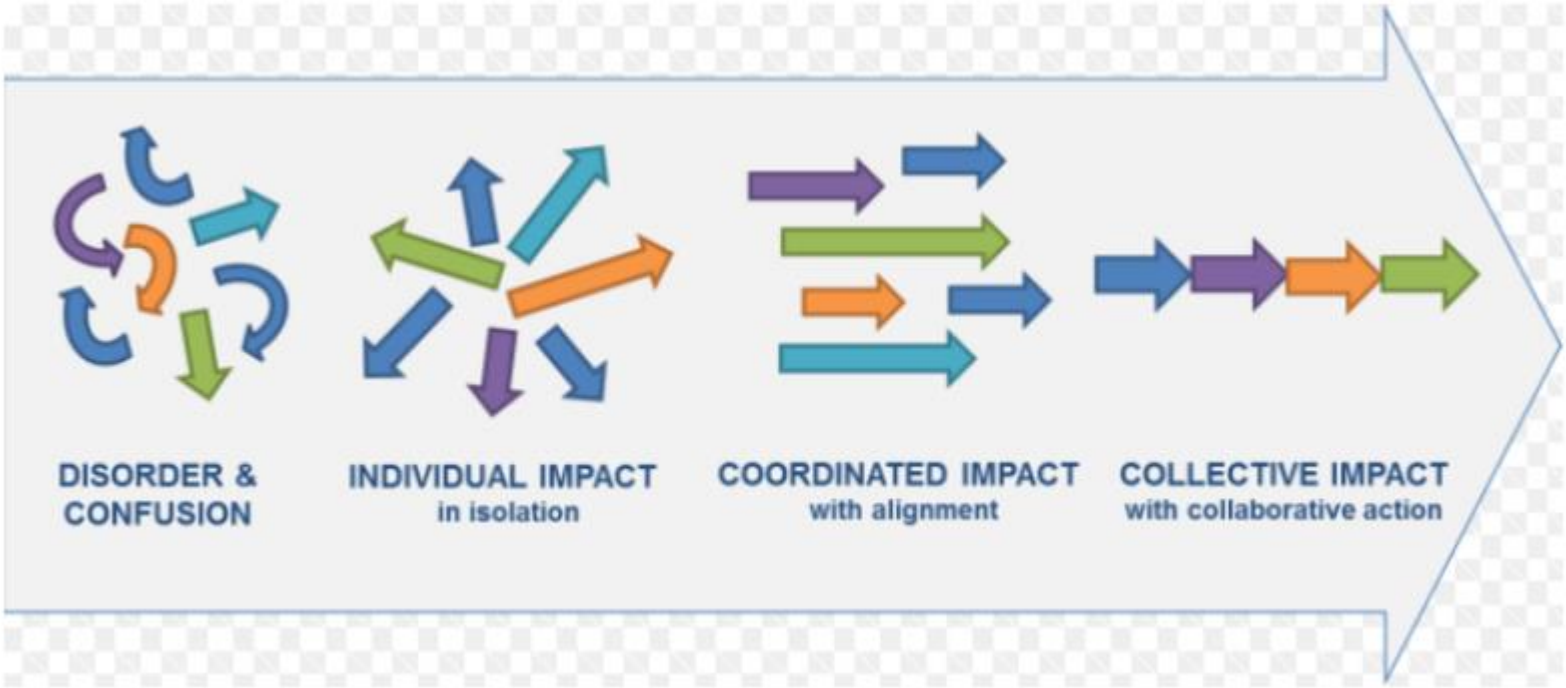
Why?

With the collective impact approach, cross-sector leaders come together and strategically organize all of the relevant groups in a community to accomplish a population-wide outcome.

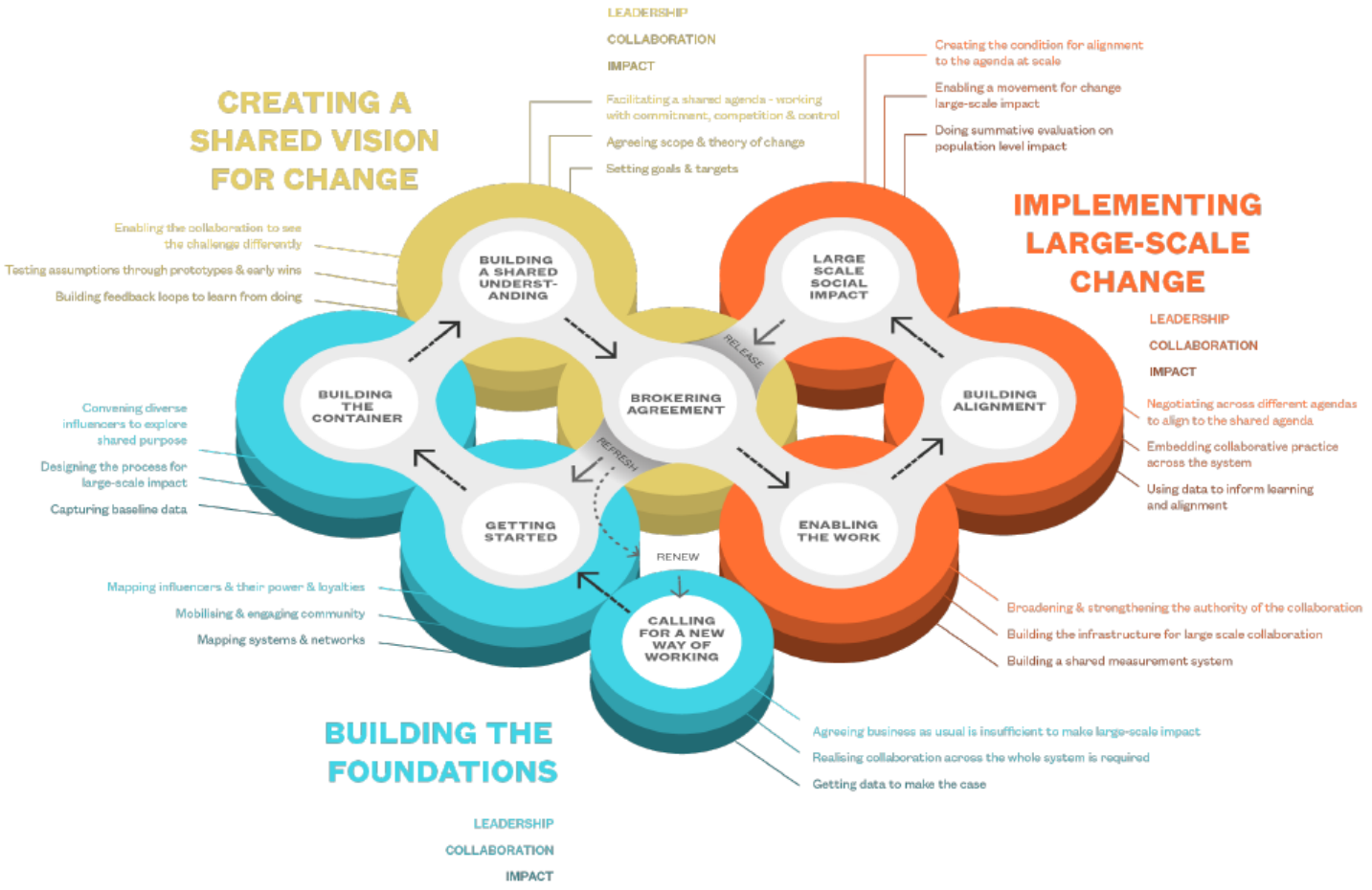
Collective impact is defined as “the commitment of a group of cross-sector actors to a common agenda for solving a complex social problem”.

10.3.1

Systems level change



Collaboration Change Cycle



10.3.1

"The expectation that collaboration can occur without a supporting infrastructure is one of the most frequent reasons why it fails. The backbone organization requires a dedicated staff separate from the participating organisations who can plan, manage, and support the initiative through ongoing facilitation, technology and communications support, data collection and reporting, and handling the myriad logistical and administrative details needed for the initiative to function smoothly."

Roles of a Backbone

1. **Guiding vision and strategy**
2. **Supporting aligned activities**
3. **Establishing shared measurement practices**
4. **Cultivating community engagement and ownership**
5. **Advancing policy**
6. **Mobilising resources**

Guide Vision and Strategy

- Build a common understanding of the problem
- Serve as a thought leader / standard bearer for the initiative
- Ensure common agenda is updated as needed as strategy unfolds

Advance Policy

- Advocate for an aligned policy agenda
- Stay on top of policy developments that impact the effort

Mobilise Resources

- Mobilise and align public and private resources to support initiative's goals (and the backbone itself)
- In our case this includes activating the social impact investment market

10.3.1

Build Community Engagement

- Create a sense of urgency and articulate a call to action
- Support community member engagement activities
- Produce and manage communications (e.g., news releases, reports)

10.3.1

Support Aligned Activities

- Partners' continuous communication and collaboration (e.g., run taskforce meetings)
- Recruit and convene partners and key external stakeholders
- Seek out opportunities for alignment with other efforts
- Ensure taskforces are being data driven

10.3.1

Establish Shared Measurement Practices

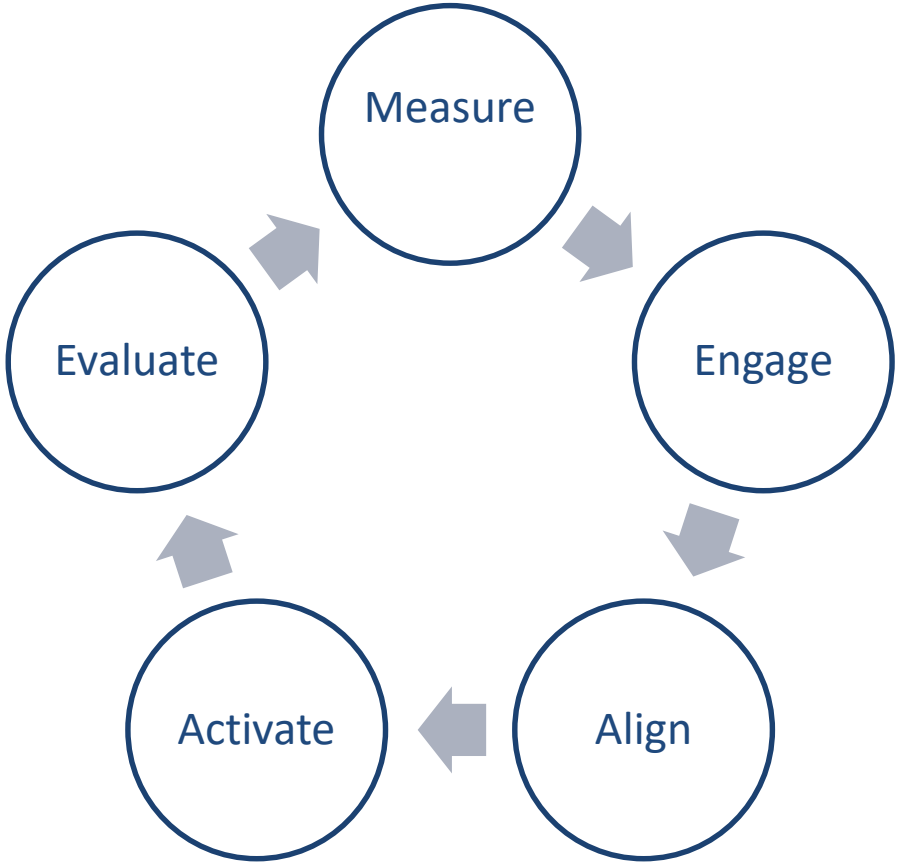
- Collect, analyse, interpret, and report data
- Catalyse or develop shared measurement systems
- Provide technical assistance for building partners' data capacity

Cost?

Initial annual budgets for backbone operations typically range from $400,000 to $600,000 for the first few years.

Although budgets vary depending on available resources and staffing needs, more established and sufficiently resourced backbones tend to operate on annual budgets in the $500,000-$750,000 range.

Or in summary



10.3.1

Developmental Evaluation

Pilot Projects

- Regional Education
- Youth Unemployment
- Aboriginal Economic Participation

Foundation Membership Structure

- User pays model (strictly observed)
- All tiers of Government underwriting the backbone structure
- Local Government key funder reflecting the ‘close to community’ nature of the project
- “Board” includes specialist members
- Who’s in?
- Who’s out?
- Forward funding pathway
- Underlying project funded independently through targeted stakeholder engagement

Timing?

- March 31 deadline for Foundation Stakeholders (Board membership) financial contribution confirmation
- Project pathway to be developed in consultation with the new Board but anticipated priorities:
  - New entity establishment
  - Dedicated project manager
  - Formal Business case development
  - Lotterywest application for funding gap
  - Continued development and resource securement for the three test pilots

Questions?

Juliet Grist

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Shire of Katanning

KATANNING SUPERTOWN HERITAGE CENTRE PROJECT ADVISORY GROUP

TERMS OF REFERENCE

OBJECTIVES OF THE COMMITTEE

The Katanning Supertown Heritage Centre Project Advisory Group (PAG) is a strategic group responsible for providing high level advice to the Project Control Group to guide the development of the Katanning Supertown Heritage Centre Project. Representatives of the PAG will also perform a key liaison role between the Project Control Group, local community stakeholders and other project stakeholder representatives.

The project is managed by the Shire of Katanning, the approving authority is the Katanning Shire Council.

The Shire of Katanning will form a Project Management Operations ~~Control~~ Group [PMOG] comprising of the ~~Shire President,~~ Chief Executive Officer, Executive Manager Projects and Community Building, ~~and the~~ Executive Manager Property & Assets, and Executive Manager Infrastructure Development to oversee the project and provide a gateway for reporting back to Council and PAG.

In addition to the PAG, the PMOG~~Project Control Group~~ will set up and manage working groups and project supports to advise and inform the Project Team with regard to scoping, brief development and design.

ROLE OF THE COMMITTEE

The core function of the Project Advisory Group is to review and advise on the development of the project.

MEMBERSHIP

The PAG membership will comprise of:

- Shire of Katanning President (Chair) [Cr Liz Guidera]
- Shire of Katanning Elected Member [Cr John Goodheart]
- Shire of Katanning CEO
- Shire of Katanning Executive Manager Projects and Community Building
- Shire of Katanning Executive Manager Property and Assets.
- Great Southern Development Commission CEO
- ~~Great Southern Development Commission Board Representative [Mr Cameron Taylor]~~
- Landcorp (non-voting member)

- 2 Community Member Representatives -[Ms Lisa Blacklow; Mr Cameron Taylor ; Doug Cherry~~Mr Devon Gilmour~~]

The Chair will be the President of the Shire of Katanning, unless delegated to another PAG member.~~.~~

The ~~Great Southern Development Commission and the~~ Shire of Katanning shall provide secretarial and administrative support to the committee.

MEETINGS

The PAG will meet on a monthly basis, frequency of meetings will be reviewed as the project is rolled out.

Additional meetings shall be convened at the discretion of the Chair.

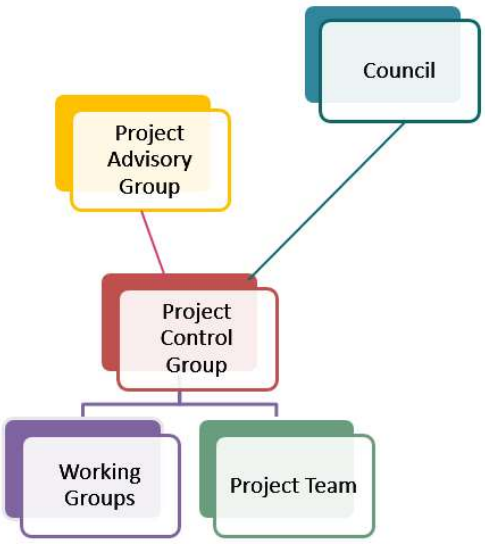
Members can request re-imbursement of reasonable out of pocket expenses to attend PAG meetings which will be approved at the discretion of the CEO. Rates of reimbursement will be consistent with provisions of the Local Government Act.

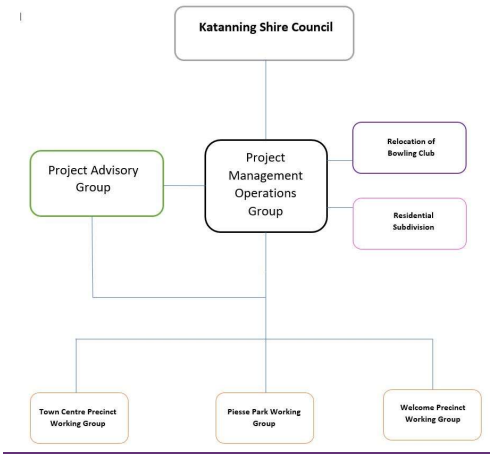
MEDIA

All media contact shall be through the Chair of the PAG. Members of the PAG should not express opinions on behalf of the PAG without first coordinating comments through the PAG Chair.

REPORTING & RELATIONSHIP

The PAG reports to the Shire of Katanning, Katanning Supertown Heritage Centre Project Control Group, which reports directly to the Shire President and Council, and ultimately to the Department of Regional Development and other funding providers.





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Date Last Reviewed:

14/12/16 - Draft

9/01/17 – Adopted

23/05/17 – Revised

23/10/17 – Revised

21/03/18 Revised Draft

Shire of Katanning
Heart of the Great Southern

KSHCP – Katanning SuperTown Heritage Centre Project

A HOUSING AND COMMUNITY DEVELOPMENT PLAN FOR COMMUNITY GROWTH

Project Management Plan Rev 4

15/3/2018

Heart of the Great Southern

TABLE OF CONTENTS

KSHCP – A HOUSING & COMMUNITY DEVELOPMENT PROJECT FOR COMMUNITY GROWTH

1. INTRODUCTION

1.1.PROJECT CHARTER

Katanning received funding for the Katanning SuperTown Heritage Centre Project (KSHCP) through the Department of Regional Development and Lotterywest (FAA June 2016).

The project is outlined in the document: Katanning SuperTown Heritage Centre Project: Welcome Precinct & the Piesse Lake Development, Business Case (2014-15) prepared by the Shire of Katanning. Outcomes from the Katanning Heritage Centre Project are aligned with transformational projects identified in the Great Southern Regional Blueprint. The development of the Piesse Lake Precinct and revitalisation of the Katanning All Ages Playground are specifically noted in the Blueprint. The Business Case also draws from The Katanning SuperTown Growth and Implementation Plan and the Shire Strategic Plan which recommend activation and development of the Piesse Lake medium density residential areas and the creation of a visually attractive entrance experience to Katanning.

A review of the project objectives led to a change in working title of the project by the Project Advisory Group to: KSHCP – A Housing & Community Development Project for Community Growth. It was felt that this title better reflected the objectives of the project and that the original title, where reference to “Heritage Centre” was a bit confusing. (For brevity in this document the project title will be referred to as ‘KSHCP’)

Subsequently the State Government requested the return of $3m of the original grant funding. In response to this request the project budget has been amended and with that the scope modified to accommodate the $3m requested savings. The variation to confirm this is currently being drafted.

1.2. PROJECT OBJECTIVES

The following objectives are identified in the Business Case with notes added:

ECONOMIC DEVELOPMENT & DIVERSIFICATION OF KATANNING

- Construction Phase: Employment, training and apprenticeships, local suppliers.
- Increase visitor numbers as a result of improved tourism services.
- Increase direct spending by guiding tourists to town.
- Attract private investment on top of Government investment.
- Retention factors due to increased amenity and experiential recreational areas.

ENHANCE KATANNING TOWN AMENITY

- Improved recreational facilities in strategic precincts.
- Botanical Gardens.

- Green space.
- Iconic tourism precinct.
- Complement existing tourism infrastructure in the Great Southern.
- Complement coordinated regional marketing (Hidden Treasures, Regional Botanical Gardens network).
- Enhancement of public image.

IMPROVE COMMUNITY PRIDE & OWNERSHIP

- Increased opportunities for volunteerism and participation;
    - Friends of Piesse Lake Botanic Garden.
    - Visitor Centre and Welcome Precinct.
    - Katanning Action Network 'Adopt a Spot'.
    - Rotary museum maintenance and curatorial.
- Celebrating Katanning's Heritage through interpretation elements and museum displays.
    - European settlement
    - Noongar family group meeting place
    - Strong multicultural and diverse community
- Strengthened community partnerships
    - Colocation
    - Sharing of resources

POPULATION ATTRACTION & RETENTION

- Develop residential land bank to enable future quick response to population growth.
- Provide current residential options that have high amenity to attract skilled and professional workers.
- Improved amenity and liveability resulting from well planned and experiential recreational infrastructure and facilities.

ENVIRONMENTAL & EDUCATIONAL ENHANCEMENT

- Opportunities for primary and high schools to utilise the Botanic Garden for outdoor learning and extension activities (eg Adopt a Spot, bush rangers, cultural awareness and citizen science).
- Broader environmental awareness for visitors to the Botanic Gardens on local flora and vegetation systems.
- Cultural and heritage education through interpretation elements at both recreational areas.
- Opportunities to host tertiary students undertaking research in the region.

ACTIVATION AND DEVELOPMENT OF THE PIESSE LAKE PRECINCT

- Botanic Garden
- Green Space

- Recreational Facilities
- Walk trails
- Interpretive trails and elements
- Amphitheatre; cultural, theatre, music events
- Adjacent residential development

CREATE ATTRACTIVE ENTRANCE EXPERIENCE TO TOWN

- Improve All Ages playground and other recreational facilities
- Improve ease of entering Welcome Precinct
- Provide tourist experience and information
- *Enhance pathways/ road experience into town*

ENHANCE VISITOR EXPERIENCE

- Improved town amenities
- Tourism experiences
- Events (enhanced facilities)
- Improve RV services

CREATE 'CONCIERGE' FACILITY FOR WIDER REGION

- Promote regional tourism through new Visitor Centre
- Utilise technologies (eg. Augmented Reality (AR)), tourism trails to promote regional tourism.

ENHANCE RECREATION FACILITIES

- All Ages Playground
- Broader use play equipment
- Recreational parks
- Trails
- Facilities

PROVIDE ADAPTIVE HOUSING

- Provide residential land for alternative building models
- Encourage developer participation

LOCAL CONTENT

- Maximise local content through appropriate project tender packages
- Provide community projects that the community can participate in (eg Interpretive elements, art in the park)

ABORIGINAL PARTICIPATION

- Involve community, including the aboriginal community in interpretive elements
- Cultural elements and trails
- Skills acquired through the botanic garden volunteer capacity building project will be able to be utilised by the Katanning Aboriginal Corporation to develop the Noongar Cultural Park

TRAINEESHIPS & APPRENTICESHIP PARTICIPATION

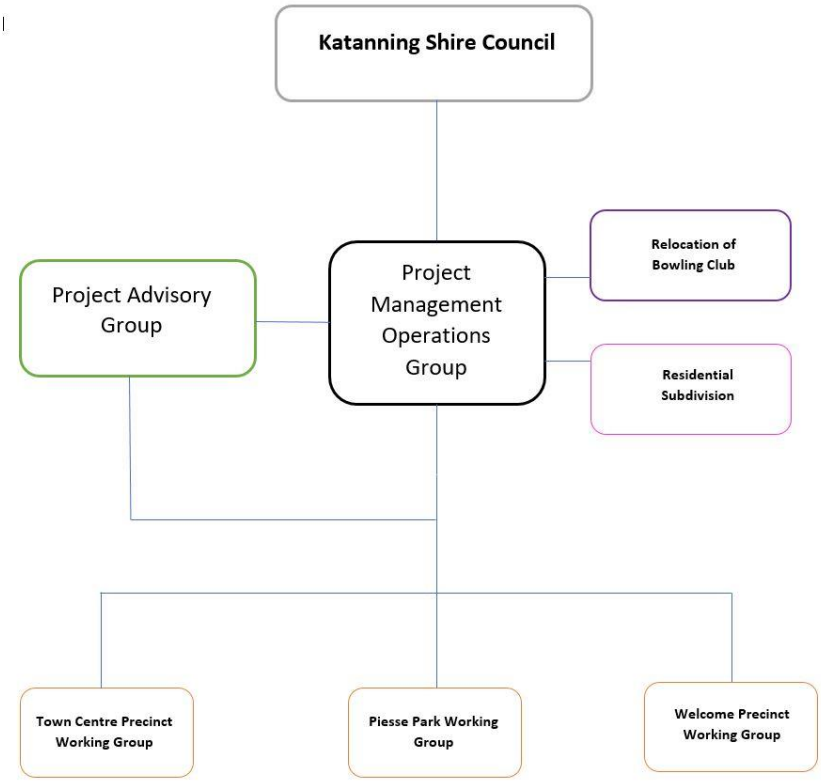
- Include appropriate conditions in tender documentation
- Refer to Regional Workforce Plan (GSDC) and Katanning Workforce Plan (Dept Education and Training).

2. PROJECT ORGANISATION

2.1PROJECT MANAGEMENT STRATEGY

The KSHCP is being managed by the Shire of Katanning. The Shire's appointed Project Manager is the Executive Manager of Property & Assets (EMPA) and will be the project manager for the project, including sub-projects, unless otherwise nominated in the Project Management Plan. The EMPA together with the Executive Manager of Projects and Community Building (EMPCB), Executive Manager Infrastructure and Development (EMID) & the CEO form the Project Management Operations Group (PMOG) to oversee the operational aspects of carrying out this project.

PROJECT ORGANISATION CHART



The Project Management Plan (this document) is a working document and will be revised as the need arises. This is the forth revision of this document (Rev 15/3/2018). The Project Manager is responsible for developing the Project Management Plan and updating and issuing the plan regularly.

Projects will be developed by working groups as outlined in 2.4 below. High level advice and guidance will be provided by the Project Advisory Group. A chart outlining the relationships between these groups and the membership of the groups is attached.

2.2 PROJECT ADVISORY GROUP (PAG)

The Project Advisory Group (PAG) consisting of Councillors, high level stakeholders and community representation will provide high level advice and guidance to the project through the Project Management Operations Group. The PAG will advise the CEO of project preferences through making recommendations when required. The CEO can act on these recommendations and/or put them to Council as required.

The PAG will operate as per the terms of reference approved by Council.

2.3 PROJECT MANAGEMENT OPERATIONS GROUP

The Shire Project Management Operations Group is an operational group and will consist of the CEO, Executive Manager Projects and Community Building, Executive Manager Infrastructure and Development and the Executive Manager Property & Assets. The PMOG will make operational decisions regarding project resourcing, scope, funding and implementation. The PMOG is tasked with delivering the project to the specified timelines and budgets. Where necessary the PMOG can refer decisions to the PAG for a recommendation or to Council for a decision as required and/or as outlined in the Project Management Plan.

2.4 WORKING GROUPS (WG)

Working groups have been created to help develop the scope as necessary to align with and enhance the project objectives. The working groups formed include:

- Welcome Precinct Working Group
- Piesse Park Working Group
- Town Centre Working Group

In addition a working group will be formed for the Bowls Relocation project. This working group will consist of the stakeholders from the Katanning Country Club and the Katanning Bowls Club.

The working groups will be the main consultative process during the scoping and design phases of the projects. Working groups will work with the lead consultants as appropriate and make recommendations to PMOG as is required to enable each stage of the project to be developed to completion.

The working groups will meet regularly as is required to workshop stages of the project to bring each stage to a successful conclusion. The working groups are chaired by the project manager.

Minutes of working group meetings or workshops will be kept with recommendations clearly identified. Minutes will be circulated to PAG members and Councillors.

2.5 PROJECT TEAM

The Project Team consists of the Project Manager, Executive Manager Projects & Community Building, Shire staff assigned to the project, and design and expert consultants appointed to the project.

2.6 STAKEHOLDERS

This list below is the list of stakeholders as identified in the Business Plan.

- Friends of Piesse Lake
- Katanning Landcare Centre
- Katanning Action Network
- Katanning Tourist, Information and Visitor Centre
- Great Southern Development Commission
- Great Southern Institute of Technology
- Katanning Rotary Club
- Kings Park Botanic Gardens
- Regional Botanic Gardens Network – Steering Committee
- Katanning Aboriginal Corporation
- Tourism WA
- Landcorp
- Katanning Miniature Railway
- Hidden Treasures of the Great Southern
- Katanning Senior High School
- Katanning Primary School
- Katanning Playgroup
- Katanning Apex
- Katanning Bowling Club
- Katanning Country Club

The following stakeholders have also been identified:

- Katanning Regional Business Association
- Dome

- Badgebup Aboriginal Corporation
- Katanning Historical Society

3 SCOPE & MASTERPLAN

3.1 REVISED SCOPE

Following the request from the State Government to find $3m in project savings the scope has been modified as follows:

WELCOME PRECINCT

1. WELCOME PRECINCT MASTER PLAN

2. REDEVELOPMENT OF ALL AGES PLAYGROUND AND PARK

- All Ages Playground
- Recreation facilities
- BBQs/ Shelter
- Toilets/ Changing Places
- Skate/ Street Park extended
- Cultural Park/ Stage or platform
- Paths and trails
- Signage/ Tourism Direction
- Note: The Miniature Rail and BMX track are located in this precinct and may require minor adjustments to accommodate new pathways and facilities.

EXTENSION OF SEWER SYSTEM

3. ANDOVER ST: DELETED

- This component has been deleted from the project

TOWN CENTRE PRECINCT

4. AUSTRAL TERRACE: (HAMES SHARLEY MASTERPLAN)

- RV parking short stay – Relocate from the Welcome Precinct to the old caravan park Aberdeen Street.
- RV dump point – Relocate from the Welcome Precinct to the old caravan park Aberdeen Street.
- Enhance parking Austral Terrace South particularly for RVs.

- Improve Austral Terrace/ Clive Street round-a-bout to allow larger vehicles to negotiate the roundabout.
- Street greening strategies
- Improve pathways. Lighting and security Austral Terrace
- Improve railway crossing if possible

*5. TOURIST VISITORS CENTRE (*CONCIERGE TOWN CONCEPT*)*

- Develop a regional tourism strategy (project funding for a new building deleted)
- Enter into a JV with Dome Coffees to provide tourism information facilities
- Augmented Reality/ Signage
- Tourism trail

6. CULTURAL PRECINCT

- New machinery museum – local building re-use (private development as project funding deleted)
- Improve pathways, connectivity, lighting and security
- Heritage trail
- Signage

PIESSE LAKE PRECINCT

7. PIESSE LAKE MASTER PLAN

8. PIESSE PARK

- Botanic Garden
- Nature Playground
- Amphitheatre
- Fredrick Street – construct new road
- Walk trails/ boardwalks/ paths/ lighting
- Entry features
- Toilets and facilities
- Interpretive elements
- Green space
- Signs
- Parking area
- Proximity Parking
- Event parking

9. RELOCATE BOWLING CLUB

- Relocating the bowling club releases land for future development
- The Katanning Bowling Club will be re-located to the Katanning Country Club. This strategy builds on an existing club and seeks to make the whole a more sustainable club.

10. PIESSE LAKE RESIDENTIAL LAND DEVELOPMENT

- The Piesse Lake Residential Land Development will create a new medium density high amenity residential land of 32 lots (min).

PROJECT ENHANCEMENT & INTEGRATION

11. KATANNING STORIES, SIGNAGE, CLOUD TECHNOLOGIES (AR), PUBLIC ART

- Katanning Stories will be utilised to develop the various trails (eg heritage, indigenous, botanic).
- Public Art: The Shire of Katanning will seek to utilise public art features in both the Augmented Reality world and the traditional world to enhance the park features and tell local stories.
- Signage. The KSHCP will incorporate the existing signage protocols and design (eg Round-a-bout, Saleyards) to develop a hierarchy of signage to use for way finding and the like.
- It is proposed to utilise Augmented Reality technology, and other technologies, to exhibit heritage, tourism, cultural and botanical information in a cost effective and exciting new mediums. The AR technology, through its' virtual reality nature, can be used to integrate elements through the landscape, create trails through town, link concepts together as well as portray places and events throughout the region thus enhancing many of the project objectives.

3.2 MASTER PLANNING

The KSHCP Master Plan was developed as part of the scope of the KSHCP and adopted by Council at the OCM 31/10/2018. Hames Sharley were commissioned to undertake the master planning process commencing in April 2017 and having the first draft complete by 30/6/2017.

The Master Plan covers the following precincts:

a) Welcome Precinct
b) Town Centre Precinct
c) Piesse Lake Precinct

The master plan was developed following the programme outlined below.

SCOPING STUDY; MASTER-PLANNING RFQ

Gerard Healy & Associates conducted a workshop with Shire Staff & Councillors to develop a brief statement for the project as a whole. This brief statement was used to develop the scope statement for the Master-Planning RFQ. This workshop was held on 31/1/2017.

MASTER PLAN DEVELOPMENT

Hames Sharley conducted a series of workshops and consultation sessions including:

1. 26/4/2017: PCG Introductory Workshop
2. 27/4/2017: PAG Workshop
3. 9/5/2017: Council Workshop
4. 26/5/2017: Focus Groups (4 x Workshops)
5. 27/5/2017: Drop-in (Daily Grind) and Focus Group #5 Workshop
6. 8/6/2017: Community Presentation and Workshop
7. 9/6/2017: PCG
8. 9/6/2017: PAG Workshop
9. 27/6/2017: PCG/ PAG and Council Workshop (Presentation of draft Master Plan) (3 sessions)

Further sessions to discuss and approve the Master Plan where held as follows:

10. PAG Meeting 13/7/2017 (discuss Master Plan and budget revision)
11. Council Forum 12/9/17 (Discuss Master Plan and recommendation to put to OC 26/9/17)
12. OC Meeting 26/9/17 (Master Plan not adopted Council requested further public consultation)
13. Public Town Hall meeting held October 2017
14. OC Meeting 31/10/17 (Master Plan adopted)

SUB PROJECTS

Following the Master Planning process the following Sub-Projects were identified:

1. Welcome Precinct/ All Ages Playground and Park
2. Changing Places (incorporated into the Welcome Precinct)
3. Town Centre (Austral Terrace North & South, Aberdeen Street including RV Dump & RV Park)
4. Piesse Lake Park
5. Piesse Lake Residential Development
6. Relocation of the Bowling Club
7. Signage (integrated across all sub- projects)
8. Katanning Stories / Information Trails/ Public Art/ Augmented Reality

Section 3.1 Revised Scope has been updated to include these sub-projects

A scope document will be developed for each sub-project that collectively achieves the outline scope defined in this document and as developed through the master planning process.

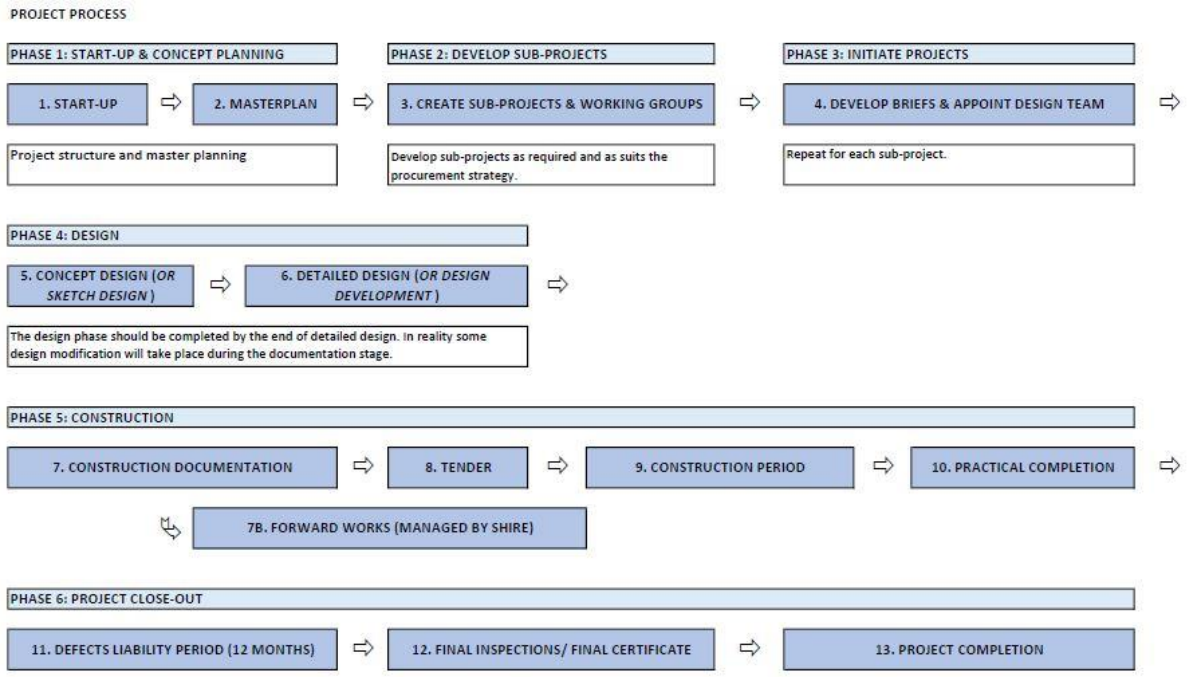
The strategy to deliver each sub-project will be developed to best utilise existing resources and to suit the nature of each sub-project. The general structure of projects is outlined in Section 4.

OPERATIONAL PLANS

So far no new operational plans have been developed for any of the project components. It is recognised that the management of the Piesse Lake Park, and especially the botanic gardens, will require additional resources and expertise.

4 PROJECT STRUCTURE

4.1 PROJECT PROCESS



The project process adopted is to, in the main, follow a traditional design – tender – lump sum contract procurement process. Professional designers will be engaged to design the sub-projects and prepare construction documentation. Request for Quotes (RFQs) or Request for Tenders (RFTs) will be held by the Shire of Katanning as required to appoint designers and contractors (Refer to 11.1 *Design Strategy*).

4.2 PROJECT PHASES

The KSHCP project will be divided into PHASES. This process is managed by the Project Management Operations Group.

1. PHASE 1: Project Start Up & Concept Planning
    a. Start Up
    b. Master Plan

2. PHASE 2: Develop Sub-Projects (Refer to 4.3)

3. PHASE 3: Initiation of Individual Sub-Projects (multiple sub-projects will be initiated)
    a. Develop briefs and appoint the design team

4. PHASE 4: Sub-Project Design (for each Sub-Project)

   a. Concept Design
   b. Detailed Design

5. PHASE 5: Sub-Project Construction
   a. Construction documentation
   b. Tender
   c. Construction Period
   d. Practical Completion

6. PHASE 6: Project Close Out
   a. Defects Liability Period
   b. Final Inspections and Final Certificates
   c. Project Acquittal

4.2 SUB PROJECTS

SUB-PROJECT LIST:

Each Sub-Project will follow the general process outlined in 4.1 and 4.2 above.

1. Welcome Precinct/ All Ages Playground and Park including Changing Places
2. Town Centre (Austral Terrace North & South, Aberdeen Street including RV Dump & RV Park)
3. Piesse Lake Park
4. Piesse Lake Residential Development
5. Relocation of the Bowling Club
6. Signage (integrated across all sub- projects)
7. Katanning Stories / Information Trails/ Public Art/ Augmented Reality

The Town Centre sub-project will be comprised of a number of smaller projects. The full scope of these projects will be developed by the Town Centre Working Group.

A signage strategy will be developed in the first instance as a precursor to procuring the signs required for the individual sub-projects.

The development strategy for developing Katanning stories, information trails etc. has yet to be developed. It is envisaged that a separate working group or groups may be required to achieve the different objectives. These aspects of the project will be discussed at the relevant sub-project working groups to help formulate a strategy to achieve these aims.

4.3 COUNCIL APPROVALS

The design of sub-projects (except the relocation of bowls to the Katanning Country Club) will be presented to Council for approval at the following design stages:

- Concept Design stage
- Detailed Design stage.

Tenders will be presented to Council for acceptance.

The concept design and detailed design of the changes Katanning Country Club to accommodate bowls will be approved by the Katanning Country Club Management Committee.

5 COSTCONTROL

Current Cost Plan: Refer to KHCP Cost Plan Revision F

6 PROGRAM

Current Version: KHCP Programme V08

7 FUNDING

Royalties for Regions Funding Assistance Grant

The original funding of $15.72m has been reduced to $13.72m (variation to be confirmed).

Clause 4.3 Project Time frame

The current milestone delivery date for these obligations is 15/2/2019 with the project completion date being 15/8/2019. These dates are being reviewed in the variation.

Project Management Plan & Revised Project Timeline

Under Clause 3.2 of Schedule 4 of the agreement the Shire of Katanning is to submit a project management plan to the satisfaction of the Department of Primary Industries and Regional Development, including a revised project timeline as part of the obligations to obtain Progress Payment no 1. The initial project management plan was submitted to the department in early 2017. This revised version, once adopted by Council, will be submitted to DPIRD with a revised timeline.

Lotterywest Grant Application 421008438 $2m

Funding being provided by Lotterywest is for:

- Towards the construction of the community elements of the Welcome Precinct (All Ages Playground/ Skate Park/ Street Park and other associated costs.
- Towards the Piesse Lake Development (Nature Playground, Botanic Garden, boardwalks, interpretive works/ signage/ Amphitheatre)

The Shire of Katanning contribution is a minimum of $630k.

8 RESOURCES PLAN

To deliver this project the Shire of Katanning will further develop the Shire's project management team to provide project management as per this plan. This will be managed by the Shire Executive.

9 RISK MANAGEMENT

Risk Management will be undertaken by the Project Management Operations Group who will identify and monitor risks as they arise. Refer also to Section 2.13 of the Business Case Risk Analysis.

10 PROCUREMENT STRATEGY

11.1 OVERVIEW

General:

The overall procurement strategy will be managed by the Shire of Katanning. The Shire has appointed the Executive Manager of Property & Assets as the overall Project Manager (or Program Manager). The Shire will commit resources from both Shire funds and the project budget to employ an additional project manager and one project administrator as required. Funds will also be used to commission project managers where this is deemed the most appropriate project management strategy for the sub-project.

Procurement Strategy (Local Content):

The adopted procurement strategy is to create sub-project packages applicable to the scope of works, and of an appropriate size to enable local and regional contractors to competitively quote for the works packages. It is recognised that the scale of some of the works packages may be beyond local contractors and will be better suited to the medium/ larger sized regional contractors. In these instances, a two-stage tender process will be conducted to select a suitable panel of contractors to price the works. The members of the panel will be advertised locally so that local sub-contractors can contact contractors to submit trade and supply prices. The Shire of Katanning Local Regional Price Preference Policy will apply to all quotes and tenders.

Fast Tracking:

In response to the combined demand of community, Council and PAG members to expedite this project at least with-in the approved time frame, and more quickly if possible, a fast-tracking strategy has been adopted by the Project Management Team during the Design Phase. This strategy employs the use of overlapping stages so that the administrative components of one stage can overlap the development component of

the previous stage. This means that Requests for Quotes or Tender for detailed design and documentation can be conducted based on initial scope and concept documentation before the final concept is approved by Council. The RFQ or RFT typically takes 5 to 8 weeks so this time can be saved by overlapping without any risk to the project. Any changes made during the concept plan approval process can be fed back into the project before the detailed design/ construction documentation actually commences.

This process was implemented for the appointment of the designer to conduct the concept design and detailed design of Piesse Park and also for the detailed design, construction documentation and contract administration of the Welcome Precinct.

Design Strategy:

Professional consultants will be commissioned for the appropriate sub-projects to undertake all design work, consultant design coordination, contract documentation, conduct tenders and contract administration. Typically, this will consist of an architect or landscape architect (lead consultant) and professional services consultants. In some case a project manager may be engaged as the lead consultant. The project management team will conduct the RFQs or RFTs to engage lead consultants. The lead consultants (architect/ landscape architect/ project manager) will conduct RFQ's to obtain quotes for the service consultants as appropriate. The results of these RFQ's will be forwarded to the project management team, with a recommendation, for approval. All RFQs or RFTs will be conducted according to the Shire of Katanning's Procurement Policy.

Lead Consultants and Service Consultants will be directly engaged by the Shire of Katanning. All consultants will be engaged under AS 4122 – 2010 General Conditions of Contract for Consultants.

The lead consultants will co-ordinate the work of services consultants. The project management team will maintain overall responsibility for ensuring the design team adheres to the briefs and that sub- projects are developed to satisfy project objectives.

The Master-planning consultant will be retained to advise on sub-project integrity with-in the context of the over-all master-plan during the design stage of each sub-project.

Construction Strategy:

Sub-projects will be constructed by either calling for tenders for contractors to build the works or the Shire of Katanning acting as a Construction Manager and calling for sub-contractor quotes and utilising other Shire resources where applicable.

Where tenders are required for works packages it is proposed to conduct a two stage tender calling for Expressions of Interest then inviting Acceptable Tenderers to submit quotes. This strategy will be employed where time permits.

This process will benefit local and regional development by:

- Creating a known list of building contractors who will be asked to tender on the works packages

- Including the willingness, and past history, of contractors to engage local contractors and sub-contractors as one of the selection criteria for the panel
- Promoting to the local and regional industry the list of panel contractors so that local and regional sub-contractors and contractors can develop business relationships with the panel contractors.
- Applying the Shire of Katanning “Buy Local” policy to all Request for Quotations held.

Cost Control:

Cost control will involve the commissioning of a Quantity Surveyor (QS) by the Shire of Katanning to provide quantity surveying services for the project as a whole or in parts. The QS will deliver cost plans at the Concept (Indicative Cost), Sketch Design (Preliminary Cost), Design Development (Limit of Cost) and Pre-tender stages.

Contract Administration:

Lead Consultants will be responsible for contract administration of contracts during the Construction Stage where nominated for each sub-project. Where no lead consultant is engaged on a sub-project contract administration will be undertaken by the Project Team.

SHIRE OF KATANNING

ANNUAL ELECTORS MEETING

Minutes of the Annual Electors Meeting of the Shire of Katanning held on Monday 12 March 2018 in the Pioneer Room, commencing at 7.30pm.

1. DECLARATION OF OPENING

The Shire President declared the meeting open at 7.34pm.

2. ATTENDANCE AND APOLOGIES

PRESENT

Presiding Member: Cr Liz Guidera - Shire President

Council Members:
Cr John Goodheart - Deputy Shire President
Cr Owen Boxall
Cr Danny McGrath
Cr Alep Mydie
Cr Martin Van Koldenhoven
Cr Serena Sandwell
Cr Kristy D'Aprile
Cr Ernie Menghini

Council Officers:
Julian Murphy, Chief Executive Officer
Lisa Hannagan, Executive Manager Finance & Administration
Paul Webb, Executive Manager Infrastructure & Development
Andrus Budrikis, Executive Manager Property & Assets
Sam Davis, Executive Manager Projects & Community Building
Libby French, Finance Manager
Sophie Justins, Executive Assistant to CEO

Electors:
Teresa Flugge
Peggy Sambell
Jim Sambell
Bernadette Bradley
Sue Eastcott
Bill Bembridge
Ernie Maples

Karen Hall
Ainslie Evans
Julie Bucknell
Norman Flugge
Sjanna Sandlova
Colin Lockhart
Tania Wolfe
Matt Collis
Julie Stock
Derek Stock
Julie Stade
Linda Maples
Alan Voice
Lisa Blacklow
Ziagul Sultani
Moh Aeson

Leave of Absence:

Apologies: Melvin Hettner

3. CONFIRMATION OF MINUTES OF PREVIOUS MEETING

3.1 Annual Electors Meeting – 20 April 2017
(SEE ATTACHED MINUTES)

MOVED: TERESA FLUGGE **SECONDED: ZIAGUL SULTANI**

OC1/18 That the minutes of the Annual Electors Meeting held on Thursday 20 April 2017 be confirmed as a true record of proceedings.

Voting Requirement: Simple Majority

CARRIED

4. ANNUAL REPORT 2016/17

MOVED: NORMAN FLUGGE **SECONDED: MATTHEW COLLIS**

1. **That the Annual Financial Report for 2016/2017 be received**
2. **That the Shire President's Report be received.**
3. **That the Chief Executive Officer's report be received.**

CARRIED

Liz Guidera Introduction
This year we have a fairly similar team to last year with the addition of Cr Kristy D'Aprile and Cr Ernie Menghini, with two Councillors retiring last year, welcome to the team. We also have two new Executive Staff Members, Lisa Hannagan Executive Manager Finance and Administration and Paul Webb Executive Manager Infrastructure and Development.

Thank you to our Executive Team and all our staff who have done a wonderful job. Thank you to the Councillors for their work towards the Corporate Planning and Policy Review, this takes a lot of time and thank you for your involvement.

5. GENERAL BUSINESS

1. Other Matters

Ernie Maples
I am the President of the Katanning Bowling Club and wish to raise concerns regarding the relocation. We have had meeting regarding the relocation strategy with the Country Club and I wish to put it to the Council, in August 2016 Cr Craig McKinley identified incentives for the Bowling Club to relocate to the Country Club or the Leisure Centre, moved 7/0. Wondering why nothing was put forward to relocate to the Leisure Centre?

I have also put in motion for the Shire to review at the Leisure Centre but now the discussion is on hold until we have an AGM at the Country Club. One of the first motions that was passed at the committee meeting on Tuesday evening was that the Management committee agreed to provide and facilitate a compensation to the Golf Club to the value of $200,000 for the co-location of Bowls to the Country Club. I feel like I have had a gun put to my head as I am on that committee and I do not think that the Country Club should be getting money through this project, whether it be for a new shed or tractor as they have asked for. And fees taken off and rates taken off and all sorts of wonderful things. Obviously, they have different plans than just having the Bowling Club as there is not fit, as such, for equipment for the Bowling Green as we need to have water supplied, rollers, sand fill and all sorts of other machinery.

A letter was sent to Shire of Katanning CEO Julian Murphy about the co-location and I do appreciate your return reply. The Shire of Katanning is developing the concept and obtaining costs to locate the bowling green in the car park of the Country Club within a reasonable distance to the club house. This proposal will be provided to the Bowling Club and Country Club in early March for consideration. There was a meeting held with a Shire representative at the Country Club and for some reason I was not invited. I am really concerned that there are some strange things happening and I would like to know what the Council, if they would even vote on it, to go to the Leisure Centre which would go on the gravel area next to the cricket grounds as it is the exact fit to what we need for a 12-rink ring. Wondering if the Council could put this into their meeting?

Julian Murphy
Thank you, Ernie. We appreciate your forthright approach in terms of the position of the Bowling Club. In regards to Cr Craig McKinley, I believe that there was a comment made in previous business case to relocate the Bowling Club to the Country Club but that was a comment made in that regard. In terms of the incentive, there is $1million on the table to facilitate the relocation that is not coming out of the Bowling Clubs pocket. That is a good incentive in itself, to provide the facility and handover to the Bowling Club to take over. In terms of the Golf Club incentive that is something that went through the Country Clubs meeting and not the Council. There is no commitment from the Council to offer any cash incentives.

Ernie Maples
The incentives have been at the Management Committee Meetings where they have requested $200,000 and there was a meeting last week where they have a written guarantee of receiving this money.

Julian Murphy
I have seen the minutes of that meeting and there is wording in the minutes surrounding cash incentives but it is not from the Council and certainly not from the project money. Where some facilities might be incorporated into the whole plan including golf course, tee-boxes and whatever else is required to facilitate the bowling club moving there is certainly part of it and potentially a shed which will facilitate the move. Reduction in a contribution from the Country Club to the Golf Club in terms of fees is none of Councils business. Council has not been asked for their opinion at all. We cannot comment on this issue directly although we are aware of it but that would be up to the Country Club to work out how they would fund those kinds of incentives.

Ernie Maples
I believe there is more pencil sharpening on the budget for it which is good news because we as a Bowling Group there is no compromise on a 12-rink ring, not an 8-rink ring which the Country Club are going to propose at their AGM. I am concerned that the Shire is going to see that it is a good thing to put the Bowling Club at the Country Club and not bother looking at the Leisure Centre. It is a better community at the Leisure Centre and why we are being forced to go with a private business or private land is beyond me.

Liz Guidera
My understanding on the whole project since I have been involved in it for 2 and a half years, is that the whole relocation of the Bowling Club to the Country Club was all about sustainable sporting facilities in Katanning. My understanding from Council is that we want to ensure that we have a Golf Club, Tennis Club, Squish Club and a Bowling Club for our community in the long term and the way to do that is assist with the co-location.

Your thoughts regarding the location at the Leisure Centre at the gravel area might be a little naïve in understanding how Council works and as that has not been raised it is certainly something that would not be happening very quickly. We will do everything we can to get the Country Club proposal over the line because that is about sustainable sporting.

We have not spoken about additional licences if the Bowling Club relocated to the Leisure Centre and other things that would take some time.

I think you will find that Cr Craig McKinley was looking at an area at the Leisure Centre not at the Country Club which was quite a while ago. The Country Club committee members who will vote need to think about the Community and not having those sporting services as they are essential for people's recreation. We do have a lot of retirees here and we want to make sure that we can provide for them. That is why we are very strong in supporting them. I think there has been problems with the last proposal which only included 8-rinks but my understanding is that the person who suggested the proposal didn't speak to Bowls and didn't speak with Golf. I understand that is being rectified in the next few days and you will get a different proposal that will go the AGM which will consider your specific requirements.

John Goodheart
I wish to give some clarity on the amount of work that has gone into this exercise and where we are hoping it will go as I am the Secretary at the Country Club. There are a lot of people at the Country Club that are excited about the prospect to invite the Bowling Club to the facility. It is a good cultural fit and a good opportunity to make this work.

We have had a few instances that have been unpalatable where people have tried to figure out how we will fit Bowls at the Country Club. The whole reason why we run into these issues is not because we do not want Bowls at the Country Club, it is because the Country Club is land locked. We have Golf Course on one side, road on another, Tennis Courts on the third side and Squash Courts on the forth side. Either the Country Club had to be relocated so that we could make space or we have to find one of the sports that would make some room to allow Bowls infrastructure to be put in at the Country Club. This has been the issue at the Country Club since I have been involved for the last 3 and a half years, where do we fit it in?

We have always wanted the 12-rink Bowling green and the reason we wanted it is because we are the Regional Centre (we are a super town) and we want a 12-rink bowling green. Why would we build an 8-rink bowling green when they are available in Tambellup, Broomehill and available everywhere else? We need a facility that is going to be a true Regional representation for Bowls and gives them the future that they are looking for, not just because we want you up there because it will make a difference in some other way, it is a real cultural fit. The type of sports we play at the Country Club;
Golf – one or two people can go out and play golf;
Squash – two people play squash;
Tennis – two people play tennis; and now
Bowls – a couple of people can go down any time and bowl together and have a good time. It does not need to be a carnival or pennants season or if you want to go and practice, you can go down on your own.

It is a total different fit, when you look at the Leisure Centre where you have football teams, basketball teams, soccer teams and all those other types of sport. I think the natural progression of the way things go, as you get older, you move into the secondary

sports, move away from football into squash and tennis and then into golf and bowls. Why not be a member in one location and be able to take up all opportunities under one membership instead of having to be a member in two or three locations. It is going to be financially beneficial to you and you can make a future. Yes, there has been people who have said “is this really what we want?”. I think those people are still confused and do not see the long-term benefits. I believe they will change their minds once this happens. If we can get together and present a unified front, I think we can win. The Bowling Club will be happy and the Country Club will be happy, there is no reason why this should not be so.

Ernie Maples
Thank you, John. Regarding the 12-rink, we also need equipment which has not been priced to the budget yet. Obviously, we are not fully aware of what pricing we are going to be needing on the equipment yet but I understand that will be worked out.

John Goodheart
Where we are at with the proposal at this stage, we are doing concept design. If you have ever been through an architectural or engineering course you will know that the concept is where we want to get it up there. Once we get the Country Club and the Bowls Club members to say, ‘let’s go ahead with this’, then we get around a table and discuss what each other need. The funding starts off, Bowls must be right and then what ever is left we can use what we need to do. Let’s fix the problem rather than walk away from it. Let’s sort out what we want to do so everyone is happy with it. That is what I am proposing as Secretary on the Country Club.

Ernie Maples
Thank you, John. The Golf Club is on a different line, from what you are.

Bernadette Bradley
I am a Golf Club Member and a Bowling Club Member. I would like to know how much longer the Bowling Club can wait and get a story that fits, and won’t be changed next week. We are continuously being told different stories of what we are allowed to do.

Ernie Maples
It has also been 5 years in the making, to get to where we are now and we are still at ground zero.

Liz Guidera
The only thing that I will say is that this funding was announced in May 2016. You may have done preliminary talking previously; the timeframe is only two years. I have heard a lot of people saying the same thing, that it has gone on forever, but the real opportunity has only been around for 2 years. Yes, there was a side track from Hockey, then Tennis, trying to find a location was difficult but with the Country Club moving to close the road and locate Bowls right outside the door, as I understand location was an issue, has really changed the game.
Bernadette, what you will find is that the Country Club must commit next week at their AGM. Once they commit, that’s it. It will be design, build and play.

Derek Stock
I am speaking on behalf of the Miniature Railway in regard to the All Ages Playground. What is the timeline for the All Ages Playground to be completed?
Will there be more play equipment there, than there already is?
From what I have seen on the proposal on the television presentation is that there doesn't seem to be any extra play equipment. When people visit the All Ages Playground, they come for the equipment, not for the landscaping and trees. From what I see so far is that there is a lot of landscaping and not much equipment.

I am still unsure about relocating the entrance to Albion Street. I still believe that it is better where it is. I believe will drive past and they won't turn in unless there is a lot of signage.

What is going to happen with the Truck and Windmill? There is no drawing of this being located at the All Ages Playground or at the Lions Park. That is our entry statement.

I have been speaking with people regarding how the All Ages Playground will the Miniature Railway and apparently still in concept stage they still do not know how it will be affected. Apparently, the fence will be moved in slightly to accommodate the roads but I still do not know if this will affect us or not.

Liz Guidera
You are right Derek, we are in concept design. The timeline to completion, as at the last Ordinary Council Meeting was April 2019 for the major components.

Is there going to be more play equipment then there is now? Certainly, Councillors hope so. We have gone through the concept design and we have been assured through the whole process that now that we go to design documentation is where the working group will be able to see what kind of equipment is going to be there. We have quite a number of invested Councillors that are looking for good equipment.

Moving the entrance to Albion Street, that really was about making better use of the parking space and having an overflow parking. It is all linked up, coming in a bit further but we do think the design will flow well and there will definitely be signage. Signage is an issue in this town, all the way through, and Council have raised this very early and has been picked up in all of the Master Planning and all of the Project Planning. We need to make sure people can find their way clearly through town.

The Truck and the Windmill, it was raised again once we received the concept design. The Lions Club have written to the Council and said that they were happy for it to go in the Lions Park, that has been the presumption from Council all this time. We were a little bit disappointed not to see it physically in the concept design because at this stage, that is where we believe it will go.

How will the All Ages Playground affect the Miniature Railway? At this stage we are only looking at taking that corner piece of land and that is about the flow of the traffic, only the corner. We acknowledge the amazing job you do as a group of volunteers to provide entertainment for the community and visitors. We hope that improving the whole park

will invigorate the Miniature Railway as well. There will be disruption during the build. We have not received a schedule as yet but once received we are hoping to be able to tell the community exactly what the stages are going to be, how it will affect them and what opportunities we will be able to give them with alternative play areas.

Derek Stock
Before you move the fencing, could you please consult with the Miniature Railway?

Julian Murphy
Between myself and Andrus Budrikis, we will make sure you are informed.

Julie Stock
I have noticed that the temporary fencing around the big slide has been removed. Children can climb up and slide down and really hurt themselves. Can something be done so children cannot climb up the slide?

Liz Guidera
Thank you for bringing that to our attention. We will make sure something is arranged shortly.

Peggy Sambell
There is a rumour going around town regarding the Veterinary Practice extending the building to accommodate large animals. Is that a rumour or is that the truth?

Liz Guidera
The Shire of Katanning has not received a formal application by the Kojonup Vet but what they want to do is treat larger animals out the back of their current Veterinary Practice. There is a lot of development to happen between now and then. We have received correspondence from our current Vet and we hope that we will be able to sit together a work out the way forward for those proposals. Councillors are informed on both sides of what can happen. What we need to do is ensure that we do have Veterinary Services in Katanning for the future so it has presented a good opportunity and I was pleased to receive a letter from Dr Maxwell outlining his possibilities. Council will have an informal discussion and proceed from there.

Peggy Sambell
I wonder if, we as a community and as a town, would fancy the idea of having smelly large animals in the town centre? As a community, will we be presented with an opportunity to say anything about it or is it something that Council have the say?

Julian Murphy
I am not sure where the application process has got to at the moment as it is still going back and forth between the Environmental Health Officer and the applicant. Certainly, no decision has been made yet. From my understanding it will be an extension of the hospital service including a treatment room for larger animals, not holding yards. At this stage it is still in process and for this kind of sensitive application it would be wise for Council to consider public comment before we make a decision.

Jim Sambell
I have an issue with the parking on Koobelya Avenue, including two areas across from either entrance at the Hospital. There is a large area there occupied by the English Oak Trees which I believe are now classified as protected. That area is at interest to my wife and I because we live there. We have now seen the area under the trees has deteriorated, it is basically just gravel as it has been parked on over a period of time. We have seen a threat to the trees themselves as some of them are showing signs of stress. Each morning at least a dozen cars are parking under the trees, they are hospital staff. In some occasions the parked cars block the entrance to our driveway. I understand from my discussion with Julian Murphy that the Council does have the power to restrict parking in the area. If you would please look into this and see if something can be done? I understand there is sufficient parking for the Hospital Staff on their own grounds.

Koobelya Avenue has always been a speed area. Some cars are going to the medical centre and some cars are going to Koobelya. We have cars come up the road to pick up and drop off their children. There are no speed signs, the only speed sign near to Hospital is if you look down Clive Street you will see a little sign by the NBN box saying slow down to 50km per hour. I think there should be signs on both sides of the hospital, large signs that make it clear that there are speed limits. I have spoken with one of the Shire Officers and he said he would come up and have a look around, I said that I would love that to happen.

Liz Guidera
Paul Webb will be the Officer that will go see you and view the issue. We did have a look at restricting parking to the area when the Hospital was under construction but we thought that it would be for a short period of time. We might need to talk to the Hospital about the continuation of parking.
Paul Webb will also have a look at the speed signs while he is there.

Lisa Blacklow
Is there a footpath strategy and connectivity of footpaths from kerb to kerb in the future plans of Katanning? At the moment there are no clear linkages from top to bottom of town, in particularly the rejuvenation of Piesse Lake and All Ages Playground area becomes a natural addition to future budgeting. Need to consider children on scooters, people with prams, people with gophers.

Liz Guidera
Footpaths has certainly been raised within Council and it is on the list. The list is very long, we do recognise that it is important to have connectivity through town and for healthy communities, we do want people to be out and be able to walk and get around. Paul Webb has also got Footpaths on his list of the strategies that are going to come through to Council and we will be dedicated and we will make sure we look out for any funding opportunities and apply for whatever we can.

Julie Stock
Tony is on a gopher and he has great problems going past some of the shops with furniture, signs and all things over the footpath. In fact, I know he uses the road more

than he should but sometimes he can't get through. If something can be done to ask shops to keep their stuff closer to their shop and not all over the footpath?

Liz Guidera
This issue has been taken up previously. This issue is a tricky one as it does add to vibrancy of the community having things on the street and making them welcoming but obviously there needs to be a clear walk way. We will certainly have a chat again.

Teresa Flugge
Fruit fly baits, are we ever going to do that again or not?

Liz Guidera
Probably not. The Shire could not sustain the cost in the past. I think Landcare have previously done some environmental baits and maybe we could work with them to see if we could get something cost effective and assist.

Colin Lockhart
Question on traffic along Arbour Street. When the Shire closed off Clive Street to do the construction works at the roundabout Arbour Street became very busy and it has not let up. People now travel down Arbour Street and they do it very quickly. There is not a sign on Arbour Street to inform that it is a 50km per hour street. I had an instance where I was watering my lawn and a truck went past texting away on his phone and not watching the road which is a problem. Do we make a request for a speed hump?

Liz Guidera
I think that is a truck route through town so I do not think you will get a speed hump through there but we can consider the 50km sign. Because it is a main road through town, out to the Dumbleyung Road that people might assume that you can go 60km. Paul Webb will also add this item to him list.
Generally, it is 50km per hour to build up areas unless signed.

Please remember that you have Councillors here and we are always happy to have a chat and certainly I am happy for people to call me, and they do. I appreciate people bringing issues to me because we cannot be everywhere. Thank you all very much for coming along tonight. It is great because you all care about our community and that is why we are here as well. Thank you everyone and goodnight.

6. CLOSURE

The meeting closed at 8.30pm.