



Lake  
Baroon  
Catchment  
Care  
Group

*Working with our community...for our waterways*

# Projects 2019-20

## Daley Creek Riparian Fencing & Off Stream Water Stage 2



## PROJECT PLAN

Project No. 1920-008

This Project Plan has been prepared by, and all enquiries to be directed to:

Luke Ferguson  
 Project Manager – CORE  
 Lake Baroon Catchment Care Group

PO Box 567 (455 North Maleny Rd)  
 Maleny, 4552  
 Email - [info@lbccg.org.au](mailto:info@lbccg.org.au) Phone - (07) 5494 3775

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**How to read this Plan**

This Plan is split into five sections.

**PART A: Executive Summary** (pp. 5-7) is a two page brief description of the project and includes summarised details of the stakeholders, budgets, outputs and outcomes.

**PART B: Project Background and Previous Stages** (pp. 8-15) provides useful background information and summarises projects that have occurred on the property and nearby since 2000.

**PART C: Project Plan** (pp. 15-38) outlines the implementation of the latest Stage project.

**Previous Projects**

The upper Obi Obi Creek including Daley and Clark Creek sub catchments have been targeted by LBCCG recently to address unmanaged livestock access to watercourses. Stage 1, Daley Creek Riparian Fencing and off Stream Watering, will give a greater understanding of the project and its background.

**1819 – 008 Daley Creek Riparian Fencing and Off Stream Watering Stage 1**

**Confidentiality**

Much of the information contained herein is confidential and must not be reproduced or passed on to any person outside Seqwater without prior written permission from Lake Baroon Catchment Care Group.

**DOCUMENT VERSIONS & APPROVALS**

Version	Date	Version/Description	Result
1.0	27/4/2020	Draft LBCCG Project Proposal completed. Project emailed to LBCCG Committee for comments.	n/a
1.0	11/6/2020	Project Plan will be presented at June LBCCG Management Committee meeting for approval.	Approved (minutes 127.7.3.4)
1.0	1/5/2020	Project Proposal forwarded to Seqwater for approval (email)	Approved 5/5/2020

**AUTHORISATIONS**

Name	Signature	Date
<b>Prepared by:</b> Luke Ferguson - Project Manager, LBCCG		27/4/2020
<b>Approved by:</b> LBCCG Management Committee (signed by Peter Stevens – President)		11/6/2020
<b>Endorsed by (Seqwater):</b>		
<b>Approved by (Seqwater):</b>	<b>Joel Hodge (email)</b>	5/5/2020

Cover: Daley Creek winding through the Gartshore and Keyes property.

**TABLE OF CONTENTS**

<b>PART A: EXECUTIVE SUMMARY</b>		
<b>Executive Summary</b>		<b>5</b>
<b>PART B: BACKGROUND &amp; PREVIOUS PROJECTS</b>		
<i>i.</i>	Introduction	8
<i>ii.</i>	Background	8
<i>iii.</i>	Previous projects in area/catchment	9
<i>iv.</i>	Current Status	10
<i>v.</i>	LBCCG CORE Funding	12
<i>v.i.</i>	Off Stream Watering	12
<i>v.ii.</i>	Stream Crossing	13
<i>v.iii.</i>	Laneway Rehabilitation	14
<i>v.iv.</i>	Riparian Fencing	15
<b>PART C: PROJECT PLAN</b>		
<b>1.0</b>	<b>What</b>	<b>16</b>
<b>2.0</b>	<b>Where</b>	<b>17</b>
2.1	Location	18
2.2	The Obi Obi Creek Catchment	18
2.3	Catchment Land Use	19
2.3.1	Land Use in Management Unit OB1	20
2.3.2	Land Use in Management Unit OB2	21
2.3.3	Land Use and Property Management	21
<b>3.0</b>	<b>Why</b>	<b>23</b>
3.1	Alignment with Key Plans & Strategies	23
3.1.1	Priority Actions for Obi Obi Creek and Project Objectives	23
3.2	Water quality	25
3.3	Options Analysis	26
<b>4.0</b>	<b>How</b>	<b>28</b>
4.1	Riparian fencing	28
4.2	Weed management	29
4.3	Riparian revegetation	30
4.4	Future Stages & Activities	31
<b>5.0</b>	<b>When</b>	<b>32</b>
5.1	Schedule & Milestones	32
5.2	Monitoring, evaluation & reporting	32
<b>6.0</b>	<b>Project Maps</b>	<b>33</b>
<b>7.0</b>	<b>Budget</b>	<b>36</b>
<b>8.0</b>	<b>References</b>	<b>38</b>
<b>9.0</b>	<b>Appendix: 2018/19 Daley Creek Riparian Fencing and Off Stream Water Stage 1 Budget</b>	<b>39</b>



**PART A EXECUTIVE SUMMARY**

**PROJECT NUMBER & TITLE: 1920-008 Daley Creek Riparian Fencing & Off Stream Water Stage 2**

Daley Creek Riparian Fencing & Off Stream Water Stage 2 will be implemented in moderate to high priority management units (headwaters of Obi Obi Creek including the major tributary Daley Creek) that deliver very high volumes of nutrients and likely high levels of faecal material (*E.coli* and pathogens) to Obi Obi Creek and ultimately Baroon Pocket Dam.

The project is a medium sized project, but is very complicated due to requiring the co-ordination of two landholders to successfully complete riparian fencing and revegetation. Years ago, agreements were made between landholders, in regards to rural boundaries along creeks and in rough country, to have a “give and take fence” which follows a line that is easier to construct or maintain, or provides both landholders access to creek water for livestock. In these circumstances fences are generally not fenced on the surveyed line, as is the case for this project. As a result there is a need to coordinate with both landholders, Gartshore and Keyes, and the Barlows’, to ensure that there is a continued agreement upon the management of the give and take area.

The landholders own a 40 hectare property that has extensive frontage to Obi Obi Creek (800 m) and Obi Obi tributary Daley Creek (890 metres). Following on from the riparian fencing in Stage 1, Stage 2 continues to manage livestock in riparian zones through fencing Obi Obi Creek. Currently (until riparian vegetation is established and livestock are excluded permanently), livestock have unrestricted access to riparian zones along Obi Obi Creek.

Yolande and Stewart Barlow own a 46.7 ha property that also has extensive frontage to Obi Obi Creek (800 m). The block is used for cattle grazing primarily, similar to Gartshore and Keyes. The Barlows currently have some riparian fencing in place along Obi Obi creek opposite, and as such cattle currently are restricted access to Obi Obi Creek. However, due to the give and take fence line not following exactly where the property boundary is, there is a need to coordinate with the neighbours, as new riparian fencing and revegetation will occur on their land, even though it is outside of their property boundary.

The absence of riparian fencing along Obi Obi Creek on the properties, and a lack of internal property fencing results in animals spending long periods in these areas grazing, drinking and loafing (minimal shade is present in paddocks). Completing the riparian fencing will improve livestock management (split property into more paddocks) and pasture health, and will stop a reliance on natural watercourses for stock water. The project primarily aims to reduce livestock access contact with streams but will also support landholder (and Sunshine Coast Council) interest in protecting and revegetating property riparian zones.

**APPLICANT/LANDMANAGER DETAILS**

<b>Names</b>		
<b>Postal Address</b>		
<b>Phone Number</b>		
<b>E-mail</b>		

**PROJECT / SITE LOCATION**

<b>Property Name &amp; Address</b>		
<b>Latitude/longitude</b>		
<b>RP Numbers (Lot)</b>		
<b>Property Size</b>		

<b>Land-use &amp; stock carried</b>	Beef (45) Farm stay accommodation		Beef (60)
<b>Sub-Catchment/MU</b>	Obi Obi Creek OB1	Obi Obi Creek OB2	Obi Obi Creek OB1
<b>M.U. Priority (LBCCG IP)</b>	<b>Low</b>	<b>Moderate</b>	<b>Low</b>
<b>M.U. Priority (Pollution)</b>	<b>High</b>	<b>Moderate</b>	<b>High</b>
<b>Water Quality (ANZECC) (Trail 2007)</b>	Almost 100% of samples between 1991-2005 exceeded ANZECC guideline levels	80% of samples between 1991-2005 exceeded ANZECC guideline levels	Almost 100% of samples between 1991-2005 exceeded ANZECC guideline levels

**PROJECT PARTNERS/STAKEHOLDERS & ROLES – STAGE 2 ONLY**

<b>Lake Baroon Catchment Care Group (Seqwater 2019-20 CORE Project Funding)</b>	On ground project implementation <b>(\$18,450)</b>
<b>Lake Baroon Catchment Care Group (Seqwater 2019-20 CORE Administration Funding)</b>	Project coordination, administration, reporting, monitoring & evaluation <b>(In kind \$4,390)</b>
<b>Sunshine Coast Council (Landholder Environment Grant &amp; Land for Wildlife)</b>	Project funding and technical advice <b>(TBC – estimated \$6,000)</b>
<b>Landholder</b>	Landowner, labour, cash and in-kind contributions <b>(\$21,000)</b>

**PROJECT DETAILS – STAGE 2**

<b>Start Date</b>	March 2020	<b>Completion</b>	June 2020	<b>Duration (implementation)</b>	1 year (Stage 2)
<b>OUTPUTS</b>					
<b>Riparian fencing (Stage 2)</b>	400 m	<b>Weed management</b>			1 ha
<b>Riparian revegetation</b>	0.3 ha				
<b>OUTCOMES</b>					
<b>Length of watercourse fenced (stock managed)</b>	250 metres				
<b>Priority Property engagement</b>	2 properties				

Maintaining water quality is critical to providing safe bulk drinking water for the population of South east Queensland. All of the raw water storages managed by Seqwater are located in catchments which are developed to varying extents and support active and growing communities, including important industrial and rural economic activity. To provide a multi-barrier approach to the supply of drinking water, Seqwater must influence the management of land not owned by, but which exert an influence on Seqwater's core business.

The Gartshore & Keyes property straddles two LBCCG Management Units – OB1 and OB2. Three quarters of the property lies in OB1 - a high priority sub-catchment with the remaining quarter in the adjacent OB2, a moderate priority Management Unit. Barlow's property lies in the OB1 Management Unit. These MUs are characterised by deep, fertile Ferrosol soils, moderate slopes and as a result intensive agriculture, historically prime dairying country. LBCCG has been very active in the upper Obi Obi Creek catchment addressing unmanaged livestock grazing in riparian zones, erosion originating from dairying practices and improving land management.

The proposed project (Stage 2) aims to complete:

Activity	Description	Funded by
Riparian fencing	400 metres	LBCCG CORE
Weed management	1.5 hectare	LBCCG CORE, Landholders/other tbd contributors (Sunshine Coast Council)
Revegetation	0.3 hectare	LBCCG Core, Landholders/other tbd contributors (Sunshine Coast Council)



## **PART B BACKGROUND & PREVIOUS STAGES**

### **i. INTRODUCTION**

Lake Baroon Catchment Care Group (LBCCG) is a not for profit community group focussed on reducing the risks to water quality in the Lake Baroon catchment - primarily through the implementation of on-ground remediation projects. This aim is consistent with Seqwater's objectives of producing high quality, competitively priced potable water for the Sunshine Coast (and greater South East Queensland) region.

Reducing risks to water quality is critical to providing safe bulk drinking water for the population of SEQ. All of the storages managed by Seqwater involve catchments are developed to varying extents and support active and growing communities, along with important industrial and rural economic activity (SKM 2012).

The activities of LBCCG are supported by Seqwater as they align with Seqwater's commitment to the NHMRC Framework and to environmental stewardship by supporting catchment planning and targeted remediation for reduction of catchment-based risks to water quality (Smolders 2011).

As this project is consistent with the shared aim of reducing risks to water quality from erosion, nutrients and pathogens and impacts on native vegetation from livestock and invasive species, the activities to install riparian fencing, control invasive environmental weeds and the revegetation of unstable slopes and watercourses are considered sensible to support.

### **ii. BACKGROUND**

The upper Obi Obi Creek catchment has been targeted for major on ground activities (projects) since 2009 as this sub-catchment is recognised as delivering very high volumes of nutrients and other contaminants (the sub-catchment is largely agricultural). Two different approaches have been used in this part of the catchment. Many works or activities have directly targeted the sources of point and diffuse pollution – stream crossings, riparian fencing and laneway rehabilitation for example. Further downstream where there are opportunities to fence and revegetate the Obi Obi Creek riparian zone (Farmhouse Macadamia, Kings Land Weir) large scale revegetation been implemented. These plantings are believed to 'decontaminate' flows as they pass through the system as water monitoring downstream indicate.

The Lake Baroon Implementation Plan (2007) considered this part of the catchment as low priority for works as it was deemed too costly to achieve worthwhile water quality gains. However, changes to how catchments are assessed for priority, has resulted in a greater emphasis on areas that are identified as high contributors of contaminants. When this is taken into account the Management Units are considered High Priority (almost 100% [OB1] and 80% [OB2] of samples exceeding ANZECC guideline levels 1991-2005 (Traill 2007).

Being primarily an intensive grazing Management Unit, the priority action is to reduce livestock contact with natural water; riparian fencing, alternative watering, stream crossings and rehabilitation of laneways.

Barry Gartshore and Sally Keyes have owned their property for almost a decade; before this it was part of the Thomas dairy (mainly used for dry dairy cows). Barry and Sally have continued to run moderate numbers of beef cattle and recently diversified into farm stay accommodation. Part of the reason for improving the management of riparian zones and livestock is to provide an enhanced experience for visitors.

Yolanda and Stewart Barlow have also owned their property for a number of years. Yolanda and Stewart run a substantial herd of approximately 60 breeders. Protecting and enhancing the Obi Obi creek is a very high priority for

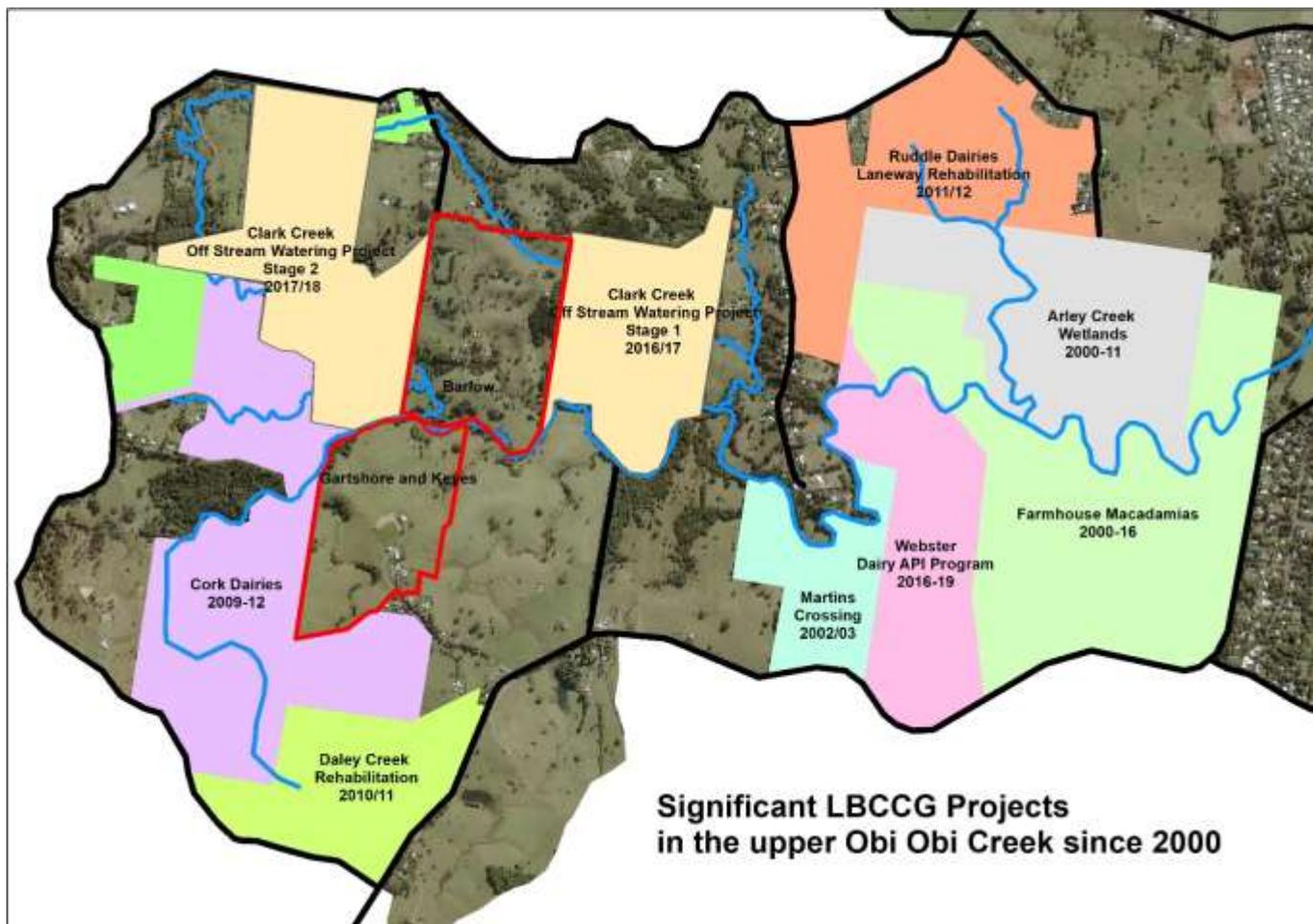
the Barlows', and they view this project as a starting point for future environmental projects that enhance the riparian systems on their property.

### **iii. PREVIOUS PROJECTS IN AREA/CATCHMENT**

Numerous large projects have occurred in the upper Obi Obi Creek catchment – where large agricultural properties still dominate. Since 2008 there has been a concerted effort made to engage the landholders in this area as the sub-catchment provides high levels of nutrients (including faecal material, fertiliser run-off and other pollutants) and likely pathogens.

Previous major LBCCG projects in the immediate location include:

<b><i>Project Name</i></b>	<b><i>Years implemented</i></b>	<b><i>Project outputs</i></b>	<b><i>Total Project Value</i></b>
Martins Crossings (Martin)	2002/03	Stream crossings	\$1,337
Daley Creek Rehabilitation (Woods)	2002/03 2010/11	Riparian fencing, stream crossing construction and repair	\$36,420
Arley Creek Wetlands (Stevens) and other various projects	2002-2011	Riparian fencing, revegetation, stream crossings, off stream watering and weed management	\$102,810
Obi Obi Partnership	2003-06	Riparian revegetation	\$114,225
Kings Lane Weir	2005-10	Riparian fencing and revegetation	\$21,331
Clark Creek Riparian (Barlow)	2009/10	Stream crossing, riparian fencing and revegetation	\$13,197
Cork Dairies (Cork) (various projects)	2009-12	Stream crossings, laneway rehabilitation	\$118,135
Farmhouse Macadamias (various projects)	2010-2016	Revegetation, stream crossings and weed management	\$128,572
Ruddle Dairies Laneway Rehabilitation (Ruddle)	2011/12	Laneway rehabilitation	\$60,729
Obi Obi Creek Fencing and Revegetation (Macleod)	2014/15	Riparian fencing, revegetation and alternative watering	\$22,808
Webster Dairy API Program	2016-18	Off stream watering, fencing, laneway rehabilitation	\$51,865
Clark Creek Off Stream water Project Stage 1	2016/17	Riparian fencing, off stream watering, stream crossings	\$103,594
Clark Creek Off Stream water Project Stage 2	2017/18	Riparian fencing, off stream water, weed management, revegetation, wetland bank repair	\$61,686



*LBCCG projects since 2008 in the immediate area of the proposed project. Note the figure indicates the property individual projects occurred – not the actual on-ground activity. Proposed project properties are identified by red borders.*

**iv. CURRENT STATUS (Refer to Appendix for detailed project budget 2018/19)**

In 2018/19 Gartshore and Keyes received funding from the LBCCG – Core Program for 2000 m of riparian fencing (Daley Creek), off stream watering, construction of 2 low level concrete stream crossing, alternate shade trees and laneway rehabilitation.

The status of the 2018/19 Project Plan outputs:

Activity	Description	Funded by	Completed?
Off stream watering infrastructure (troughs)	4	LBCCG CORE/Commonwealth Government’s Smart Farms Small Grants	Yes
Stream crossing	2	LBCCG CORE	Yes
Laneway rehabilitation	40 metres	LBCCG CORE	Yes
Riparian fencing	2,000 metres	LBCCG CORE/Commonwealth Government’s Smart Farms Small Grants	Yes

Alternative shade	25 advanced trees	Commonwealth Government's Smart Farms Small Grants	Yes
Weed management	1 hectare	Landholders/other tbd contributors (Sunshine Coast Council)	Yes
Revegetation	1 hectare	Landholders/other tbd contributors (Sunshine Coast Council)	Yes

### Budget vs Expenditure

LBCCG CORE funding:

BUDGET	COMPONENT	EXPENDITURE
\$ 9,915	Off stream watering infrastructure (4 troughs)	\$13,388.11
\$12,000	Stream crossing (2)	\$9,356.85
\$1,600	Laneway rehabilitation (40 metres)	\$1,600.00
\$31,098	Riparian fencing (2000 metres)	\$34,825.73
<b>\$54,613.00</b>	<b>Balance</b>	<b>\$59,170.69</b>

**v. LBCCG CORE FUNDING**

v.i. Off stream watering

The OSW system was installed by the landholder, using the 4 troughs supplied by LBCCG. The OSW system lays the foundation for Stage 2 in preparation for the next section of riparian fencing along Obi Obi Creek. After fencing, cattle will be excluded from Obi Obi Creek. Even without fencing of riparian zones, off-stream water sources result in a significant reduction in time spent in the stream (watering) and adjacent stream side area (grazing and loafing) by livestock.



***Above: Two of the offstream watering troughs installed prior to Daley Creek being completely fenced and livestock excluded.***

v.ii Stream Crossings

Daley Creek cuts through the property from the south of the property through to the west of the property. The construction of the two concrete crossings across Daley Creek link with the riparian fencing constructed, allowing controlled livestock movements across Daley Creek.

Both low-level concrete crossings provide controlled access to the paddocks on the western bank of Daley Creek. Constructed at bed level, flows pass over the surface and as such the flow is not obstructed. The low-level crossing permits aquatic passage, reduces erosion to negligible levels and also provides a watering point in the event of temporary failure of the off stream watering system.

LBCCG supplied the funding of the stream crossing, with the landholder supplying labour during construction, particularly when the concrete was poured and finished.



***Above: Low level creek crossing on Daley Creek. The installation of the concrete crossing does not obstruct aquatic passage, reduces erosion to negligible levels and also provides a watering point for livestock (if the OSW infrastructure fails). The crossing will be one of the main thoroughfares for livestock and machinery across Daley Creek, following riparian fence installation in Stage 1.***

v.iii Laneway Rehabilitation

Rehabilitated laneways significantly reduce erosion in high stock traffic areas resulting in less sediment run-off. Carefully designed laneways are shaped with strategic cross drainage (whoa-boys) to shed water to the sides (onto pasture) and direct run-off contaminated with faecal material (nutrients) to pasture that can trap and filter nutrients, rather depositing directly to watercourses. Although mainly constructed on dairy farms where stock movement is constant, in some situations on other grazing properties they are required to reduce erosion.

A short 40 metre long laneway on a 'pinch' point between Denning Road and Daley Creek has been constructed. Additionally a short length of fencing at this point has been completed and has created two paddocks, preventing livestock tracking back and forth to water.



***Above: The hardened laneway above Daley Creek. The addition of fencing along the hardened laneway, will assist in controlling livestock pressure along the pinch point. The use of fencing also benefits the management of grazing pressures throughout the paddocks.***

v.iv Riparian Fencing

2000m of riparian fencing along Daley creek has been successfully completed. The fencing will be used to manage grazing in the Daley Creek riparian area. Reducing livestock contact with riparian areas greatly improves water quality through the reduction of faecal matter and nutrients making their way into the water systems.



***Above: The photo shows the erection of riparian fencing along Daley Creek. When the fencing is combined with off stream watering facilities and low level concrete crossings, there is an increase in a riparian systems ability to improve water quality.***

**PART C PROJECT PLAN****1.0 WHAT***(What activities will be implemented?)*

The proposed project aims to complete several components before June 30, 2020 (weather dependent).

Activity	Description	Funded by
Riparian fencing	400 metres	LBCCG CORE
Weed management	1.5 hectare	LBCCG CORE, Landholders/other tbd contributors (Sunshine Coast Council) <sup>(1)</sup>
Revegetation	0.3 hectare	LBCCG CORE, Landholders/other tbd contributors (Sunshine Coast Council) <sup>(1)</sup>

<sup>(1)</sup> Sunshine Coast Council Landholder Environment Grants (LEG).



*The Gartshore and Keyes property is located in the headwaters of Obi Obi Creek on deep, fertile Ferrosol soils with gentle slopes – ideal grazing country.*

## **2.0 WHERE**

*(Where in the catchment will the project occur?)*

The project will be implemented on the Gartshore & Keyes and Barlow properties in the upper Obi Obi Creek catchment (including the Obi tributary Daley Creek).

### **Barry Gartshore & Sally Keyes**

Denning Road, Reesville

Property is approximately 40 hectares + 1.5 hectares of Denning and Flesser Road easements – currently comprising the following:

- 38 ha of improved pasture;
- 3.5 ha of minor remnant, regrowth and other vegetation including woody weeds; *and*
- 0.75 ha dwellings, sheds and un-grazed driveways.

Daley Creek (major tributary of Obi Obi Creek) flows through the property with a total length of approximately 890 metres. Obi Obi Creek forms the northern boundary of the property for a distance of approximately 900 metres. The Obi Obi Creek here is fenced in a manner that provides access to water to both the Gartshore and neighbouring Barlow and Thomas properties and not strictly along property boundaries. There are no other significant watercourses on the property. Daley Creek has minimal vegetation coverage (small stand of remnant vegetation and several other weed dominated stands of vegetation) while Obi Obi Creek supports a moderate coverage of vegetation although much of this is comprised of woody weeds such as small and large leaf privet.

### **Yolande & Stewart Barlow**

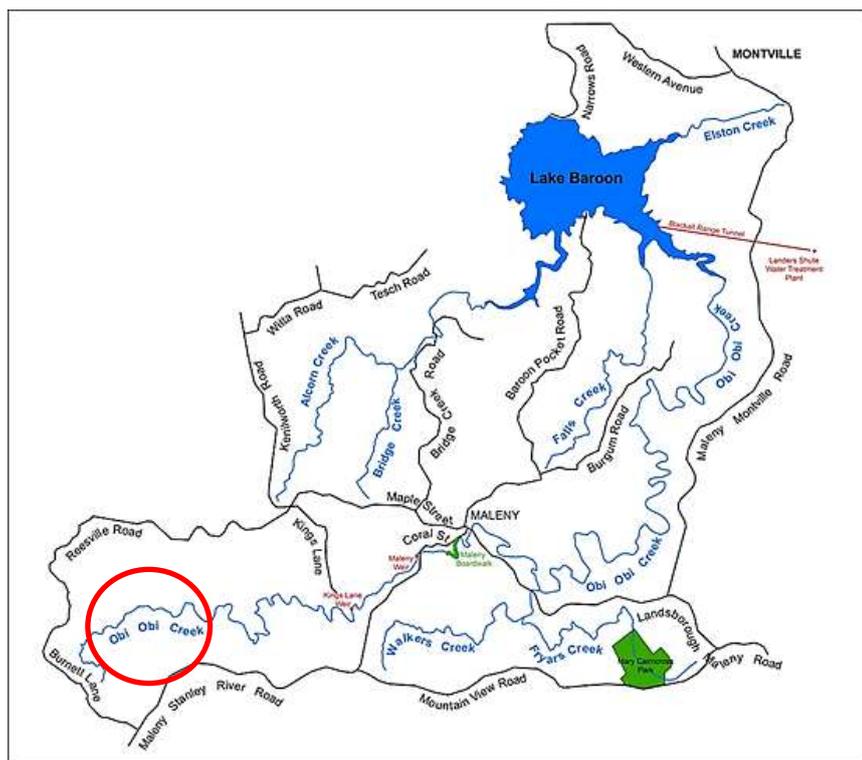
Flesser Road, Reesville

The property is approximately 46.7 hectares, comprising of:

- 36 ha of improved pasture
- 8 ha of minor remnant, regrowth and other vegetation including woody weeds; and
- 0.5 ha of dwellings and sheds.

Obi Obi Creek runs for approximately 800 m along the southern boundary of the Barlows' property. The Obi Obi is fenced in the same way as Gartshore and Keyes, with a give and take fence. The other main creek that runs through the Barlows property is Clark Creek. Throughout the Barlows Property there are pockets of vegetation that are minor remnant, regrowth and other vegetation including woody weeds.

## 2.1 LOCATION



*The Gartshore & Keyes property is located in LBCCG Management Unit OB1 and 2. Barlows property lies in OB1. These MUs lie in the uppermost Obi Obi Creek catchment in an area of intensive beef and dairy grazing. The establishment of riparian buffers and improved land management is a priority for LBCCG in this sub-catchment.*

## 2.2 THE OBI OBI CREEK CATCHMENT

The Obi Obi Creek is the most significant watercourse in the Lake Baroon catchment, consisting of 71 km of waterway in a sub catchment of 2,880 ha. A mere 18% of the sub catchment is covered in vegetation, with much of the area significantly disturbed, mostly supporting beef or dairy cattle; but also including urban Maleny (Dunstan 2007).

Dairy grazing (three farms) remains a significant land use although has been in decline since deregulation in 2000. However dairying has made a resurgence since 2016 with all local milk being processed by either Maleny Dairies or Maleny Cheese. Beef grazing has replaced dairying as the dominant land use.



*Kings Lane Weir on Obi Obi Creek. High nutrient and E.coli loads originating from intensive agriculture in the upper reaches of the catchment have been significantly reduced when flows reach Kings Lane Weir. It is understood riparian and aquatic vegetation to help filter and process raw water contaminants such as nutrients, pathogens and sediment.*

### 2.3 CATCHMENT LAND USE

Despite the extensive clearing, 17% of the Lake Baroon catchment is still heavily forested; a significant proportion in the immediate area around the dam, although much of this is degraded by environmental weeds. Today, the catchment is susceptible to impacts associated with an increasing diversity of land use (Keys 2009).

The area closest to the lake is popular with “tree changers” and has seen land use change from intensive grazing to smaller rural residential properties. This has resulted in the fragmentation of larger tracts of agricultural land into smaller parcels with a large increase in the number of on-site wastewater treatment systems in the catchment (Keys 2009).

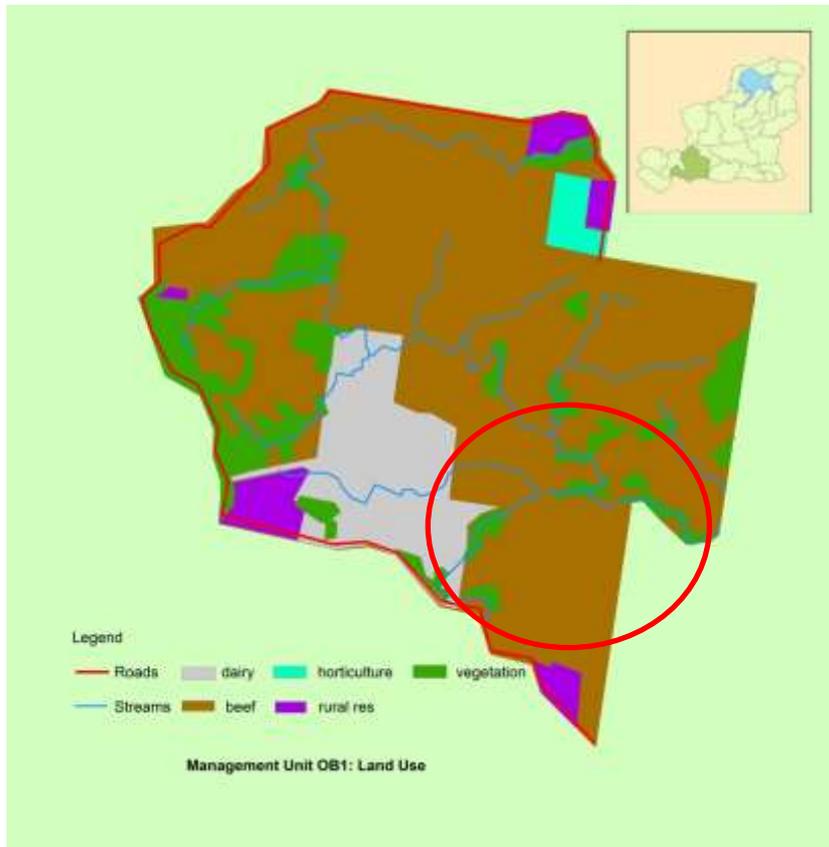
Presently the catchment is susceptible to a number of land use impacts (Traill, 2007; Dunstan, 2007) including:

- poorly managed dairying and cattle grazing;
- new developments and increased stormwater runoff;
- runoff from impervious surfaces of existing developed areas;
- irrigation of treated effluent associated with the Maleny Sewage Treatment plant;
- uncontrolled stock access to the lake and its tributaries;
- lack of riparian vegetation and integrity – a result of extensive vegetation clearing;
- abundance of weeds – shift in land ownership from land managers (e.g. farmers) to inexperienced residents has potentially led to the spread and proliferation of weeds (including emerging weeds); and
- varying pollution sources related to increased population.

Obi Obi Creek has been divided into nine Management Units that reflect property boundaries, physiography, vegetation, land use, point and diffuse source impacts. This provides administrative convenience and the ability to prioritise stream zones more accurately according to various threats.

The properties lie in Management Units OB1 and OB2 (25% of the Gartshore and Keyes property to the south of the Denning Road easement).

### 2.3.1 Land-use in Management Unit OB 1

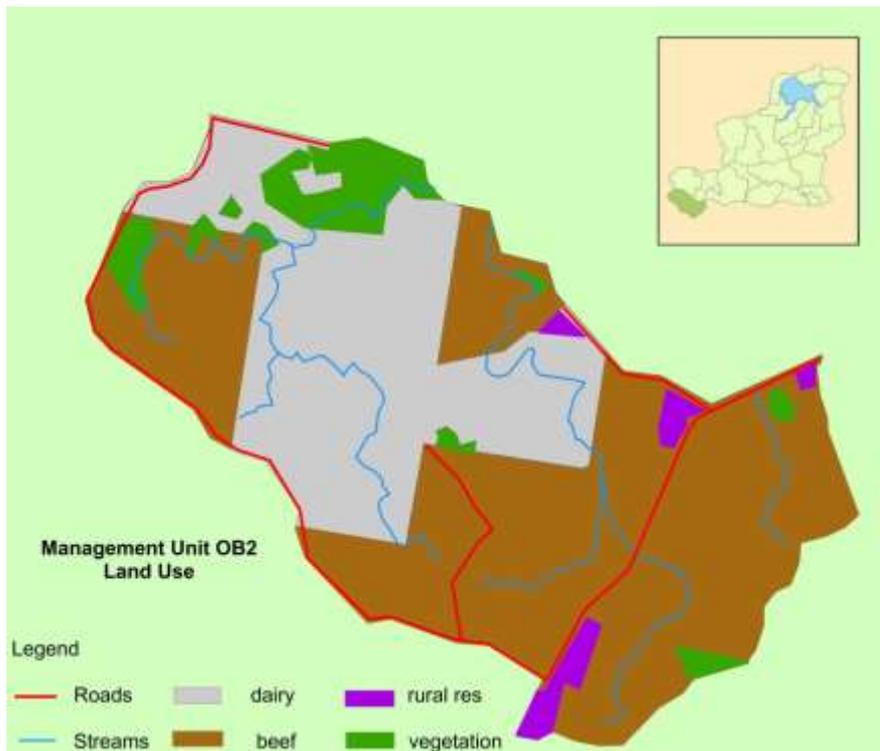


Management Unit OB1 covers an area of approximately 360 hectares and includes the headwaters of Obi Obi Creek (including Clark Creek); a highly disturbed landscape. The primary land use in the management Unit OB1 is beef grazing (75%) although dairying is still a relatively major land use at 20%. Other minor land use includes rural residential and plantation timber (<5%). A mere 10% of the MU is vegetated, while 11% of the waterways have riparian cover.

Despite the extremely stable geology of OB1, the MU contributes a huge nutrient load to the waterway (close to 100% of samples exceeded ANZECC guideline levels) (Dunstan 2007).

**Major land use in MU OB1 include beef grazing (75%), and dairy farming (20%).**

### 2.3.2 Land-use in Management Unit OB2



The primary land use in the management Unit OB2 is beef grazing (60%) with dairying a significant land use at 35%. Less than 7% of the 342 hectare sub catchment is vegetated, while 8% of the waterways have riparian cover. Despite the extremely stable geology of OB2, the MU contributes a significant nutrient load to the waterway (approximately 80% of samples exceeded ANZECC guideline levels).

***Intensive agriculture is characteristic of MU OB2 with extensive beef grazing and Cork Dairies.***

#### 2.3.3 Gartshore & Keyes land use and property management

The Gartshore/Keyes property is a moderate sized parcel of land with good access to water from Obi Obi Creek and the permanently flowing Daley Creek which runs through the property from east to west. The property is relatively flat with Red Ferrosol soils ideal for growing improved pasture. Originally part of a much larger dairy grazing property there is virtually no internal fencing which impacts the ability of the landholders to manage pasture efficiently. Approximately 45 head of adult beef cattle are run on the property (not including calves).

Cattle grazing has been the predominant land use in previous years, however, recent construction of accommodation facilities has provided a different direction for the property. The property lends itself to tourism and as a result Gartshore and Keyes are keen to improve the environmental credentials of the property. This has been assisted through Stage 1, 2018/19 of the project, and Stage 2 looks to further protect and enhance the properties natural assets, predominantly Obi Obi Creek. With tourism becoming increasingly important for the property, increasing the properties biodiversity and water quality are prominent in decision about the operation of the property.

Currently livestock have restricted access to Daley Creek (result of Stage 1 – riparian fencing) and to approximately half of Obi Obi Creek (irrespective of property boundaries neighbours on the other side of Obi Obi Creek; Kevin Thomas and Stewart Barlow have fencing in place to share access to the water in the Obi).

Flooding is not considered a major issue as the properties placement high in the catchment means that high flows are generally brief however any fencing installed will need to account for flooding. Low level concrete crossings are not impacted by flooding (hence their preference over piped crossings)).

There is a very small area of significant (remnant?) vegetation at the lower end of Daley Creek and several small stands of regrowth vegetation along the Obi Obi Creek (largely dominated by woody weeds but have value as good revegetation starting points and providing stability to stream banks).

The vegetation along the Obi provides a limited corridor for wildlife but provides a good starting point for the reestablishment of an Obi Obi Creek linkage; an excellent stand of remnant vegetation lies approximately 200 metres upstream on the “Book Farm” while significant vegetation including remnant is present on the Macleod property – approximately 700 metres downstream.

### **3.0 WHY**

*(What benefits will the project provide?)*

An estimated 80% of sediment and 35% of nitrogen in the waterways in south east Queensland comes from non-urban diffuse loads; sources such as unmanaged livestock grazing. Reduction of these loads clearly represents a major target for action if significant improvements in water quality are to be achieved in South East Queensland (DERM 2010).

Maintaining a healthy riparian system is essential for a productive landscape. When a riparian area is healthy it contains lush, thick vegetation, providing habitat for wildlife and aquatic species, maintains stream bank stability, influences morphology and provides shade which in turn lowers water temperatures and increases the oxygen carrying capacity of the stream. Additionally, riparian vegetation filters, utilizes and stores nutrients, thus preventing them from entering water systems. Weed invasion is an indicator that the riparian system is in decline and has the potential to alter the vegetation structure to such an extent that habitat and water quality outcomes are threatened.

Lake Baroon Catchment Care Group is focussed on improving raw water quality in the Lake Baroon catchment and achieves this by working with private landholders in the catchment. Supporting landholders to improve land management, in turn provides multiple beneficial outcomes; water quality and broader environmental benefits while enhancing property management. Catchment activities not only benefit the raw water flowing into one of south east Queensland's most important water storages (hence Seqwater's significant support) but by providing a range of other environmental outcomes, generates support from other funding providers (most notably Sunshine Coast Council).

### **3.1 ALIGNMENT WITH KEY PLANS & STRATEGIES**

Reducing the risk to water quality is particularly critical for the supply of bulk drinking water to the population of south-east Queensland. All of the storages managed by Seqwater involve catchments which are developed (to varying extents) and support active and growing communities, along with important industrial and rural economic activity. If these catchments are not managed properly, the risk of exposure to water quality hazards is heightened as development continues and the population increases. As a pre-emptive measure, Seqwater is undertaking initiatives to minimise and manage the risks to water quality in its storages. Identifying and engaging stakeholders on water quality issues is critical to developing robust risk mitigation strategies and achieving good water quality outcomes in the broader catchment (Keys 2009).

The project's objectives and outcomes are consistent with:

- 2018-19 LBCCG Annual Investment Strategy (Lake Baroon Catchment Care Group 2018)
- Lake Baroon Catchment Implementation Plan (AquaGen/LBCCG 2007)
- Seqwater Natural Assets Management Plan – Lake Baroon Catchment (Seqwater 2012)
- Sanitary Survey of Baroon Pocket Catchment Report (Seqwater 2015)
- Catchment and In-Storage Risk Assessment for Water Quality – Baroon Pocket Dam (Seqwater 2009)
- Sunshine Coast Council Waterways & Coastal Management Strategy 2011-12 (Sunshine Coast Council 2011)
- Mary River and Tributaries Rehabilitation Plan (Mary River Catchment Coordinating Committee 2001)
- Lake Baroon Catchment Management Strategy (AquaGen/LBCCG 2004) *see below*

#### **3.1.1 Priority Actions for Obi Obi Creek and Project Objectives**

Despite the 2004 Lake Baroon Catchment Management Strategy being a relatively outdated document, the identified actions to address poor water quality are sound and at a level where a local catchment group such as LBCCG can implement.

The Obi Obi Creek has three distinct reaches commencing from its head waters to the Baroon Pocket dam. The first reach is from the head waters to the township weirs, the second from the weirs to Gardners Falls and the third from

Gardners Falls to the Dam ending at the Narrows Gorge. Each reach has similar physical characteristics, experiences similar land uses and each requires its own unique strategy to address its particular attributes.

**Obi Obi Creek Headwaters to the Weir and the Weir to Gardners Falls**

The problems identified (in priority order):

- i. Elevated nutrient levels from catchment land use, stock access and fragmented poor riparian buffers leading to poor water quality, blue green algal blooms and colonisation of aquatic weeds.
- ii. Bank instability resulting from riparian clearance, cattle tracking (and other reasons), potentially increasing sedimentation of waterways.
- iii. Invasion of woody and viny environmental weed eg. Camphor laurel, cats claw, and privet impacting upon aquatic ecology. (Note Celtis, Cats claw and Madeira vine are now considered priority weed species due to their ability to negatively impact riparian zones).

**Priority Actions for Headwaters of Obi Obi Creek to the Weir**

Priority Actions (AquaGen 2004)	Project activities to address Priority Action	Objectives met by project
1. Maintain adequate riparian buffers and erect riparian fencing and exclude or actively manage stock access to waterways, including the provision for off stream watering and shade and hardened access points.	a) Fence the entire Obi Obi Creek riparian zone; b) Install off stream watering points in appropriate locations; c) Provide adequate shade; d) Provide hardened access points.	<ul style="list-style-type: none"> <li>• Significant reduction of faecal material, nutrients and sediments entering Obi Obi Creek;</li> <li>• Reduce bed and bank erosion of Obi Obi Creek;</li> <li>• Encourage livestock to water and loaf away from streams.</li> </ul>
2. Actively promote the implementation of Industry relevant Environmental Codes of Practice.	a) Support the Gartshore/Keyes and Barlow properties to improve management of livestock in riparian zones and environmentally sensitive areas.	<ul style="list-style-type: none"> <li>• Improved land management ;</li> <li>• Improved awareness of water quality issues &amp; causes;</li> <li>• Improve land manager engagement (Priority Property).</li> </ul>
3. Provide incentives, advice and encouragement for riparian landholders to retain and actively manage existing native vegetation within riparian buffers.	a) Fencing of Obi Obi Creek to protect areas of vegetation and permit future weed management and revegetation by the landholders with Sunshine Coast Council support; b) Provide weed management advice that is practical and cost effective; c) Provide equipment and tools at no cost.	<ul style="list-style-type: none"> <li>• Reduce erosion of the bed and banks of Obi Obi Creek reducing turbidity and sedimentation;</li> <li>• Reducing direct faecal deposition (nutrients and pathogens) to Obi Obi Creek and enhance the buffer to overland flows;</li> <li>• Revegetation of riparian zone improves ability of buffer to trap and/or process sediment, nutrients and faecal material.</li> </ul>
4. Encourage good farming practices, particularly on floodplains and steep slopes which reduces the rate of soil	a) Installation of alternative livestock water – positioning of troughs in the centre of paddocks	<ul style="list-style-type: none"> <li>• Promotes ‘even’ grazing, reducing risk of over grazing and resultant non-point source erosion.</li> </ul>

<p>loss to below that of natural soil forming processes.</p>		<ul style="list-style-type: none"> <li>• Improve livestock management (gain and maintain landholder acceptance and engagement);</li> <li>• build land manager engagement (particularly Priority Properties);</li> </ul>
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### 3.2 WATER QUALITY

The environmental health of the Lake Baroon catchment is considered generally poor, and in some respects declining (personal communication with Seqwater water quality staff). A State of the Rivers Assessment (Johnson, 1996) indicated that significant sections of the waterways appear to be in moderately poor condition, with moderately to highly disturbed reach environs and considerable lengths of unstable banks and bed-streams. These were characterised by lack of native vegetation displaced by clearing, grass banks or exotic vegetation (Keys 2009).

Pollutants entering Obi Obi Creek originate from three main sources:

- Diffuse run-off from traditional grazing practices provides nutrient inputs (animal manure and fertiliser application) and sediments from paddock erosion;
- Urban run-off carries nutrients derived from fertilisers, car washing, heavy metals and hydrocarbons from road run-off, litter and organic matter; *and*
- There is also the potential for sewer overflows (from the urban sewer system and individual wastewater treatment systems such as septic tanks) with high nitrogen, phosphorus and pathogens.



***Most of the streams in the upper Obi Obi Creek catchment are unfenced to livestock (required for stock water) and the sub-catchment provides high levels of pollutants associated with intensive agriculture (grazing) – nutrients and E.coli.***

### 3.3 OPTIONS ANALYSIS

Proposed option highlighted. Options listed below cover all project Stages 1 + 2.

Option	Description	Benefits/Cons	Estimated remediation cost
Do nothing	Current livestock management continues with cattle having unrestricted access to Daley and most of Obi Obi Creek for water, grazing and shade.	No water quality or environmental improvements. Likely deterioration over time as bank and bed stability continues to decline.	\$0
Install stream crossings only (2)	Low level concrete crossings over Daley Creek.	Moderate reduction of erosion by providing hardened crossing points over creek. Although livestock will preferentially cross at these points they will not walk long distances to do so. Riparian fencing is generally essential to get stock to use crossings.	\$12,334
Install off stream watering (OSW) only (includes alternative shade)	Troughs are placed well away from watercourses in all paddocks. Advanced shade trees installed to provide shade lost from riparian fencing.	Troughs reduce time cattle spend in riparian zones, resulting in reduced faecal matter inputs and likely pathogens. Cattle will still graze riparian zone unrestricted and are likely to utilise the shade for loafing/resting. Unrestricted grazing limits natural regeneration of native species.	\$21,257
Install riparian fencing only (Daley Creek)	Fencing to manage grazing of riparian zone.	Significantly reduces livestock access to riparian zone. Not currently feasible - no alternative livestock water sources on southern side of Daley Creek. Requires OSW.	\$37,766
Install riparian fencing & OSW	Fencing to manage grazing and installation of OSW for alternative livestock water.	Reduces erosion of bed and banks of creeks, reduces faecal matter inputs and provides a buffer to overland flows that carry faecal matter. Permits revegetation of the riparian zone.	\$59,023
Install OSW, riparian fencing and stream crossings.	Daley Creek fenced to manage livestock, stream crossing installed and OSW in paddocks.	Access to Daley Creek by livestock reduced by at least 80%. Livestock permitted only occasional access to manage pasture and weed growth. Crossings provide a controlled crossing point reducing erosion of bed and banks.	\$71,357
Install OSW, riparian fencing, stream crossings with stock managed in riparian areas.	Livestock managed in fenced riparian zone of Daley Creek and 100% stock exclusion in the Obi Obi Creek fenced revegetated riparian area. Obi Obi riparian area revegetated with diverse	Most practical option in regards to return on investment. Will take several years for revegetation to be completed. Landholders will assume responsibility for revegetation with support and assistance from Sunshine Coast Council (Landholder Environment Grants).	\$121,578

	range of local flora species (1 hectare only).		
<p>Install OSW, riparian fencing, stream crossings with 100% stock exclusion. Revegetation of fenced riparian area along Obi Obi and Daley Creek.</p>	<p>Fenced riparian zone, Daley Creek and Obi Obi Creek revegetated with diverse range of local flora species (1 hectare only).</p>	<p>Ideal option but will take several years for revegetation to be completed, however this option is exceptionally expensive. Landholders will assume responsibility for revegetation with support and assistance from Sunshine Coast Council (Landholder Environment Grants).</p>	<p>\$202,203</p>

**4.0 HOW***(How will the activities be implemented?)*

Activity/works	Description	Benefits	Responsibility & Contractor
1. Riparian fencing (Obi Obi Creek)	Complete the fencing of Obi Obi Creek along Gartshore/Keyes and Barlow properties. Fencing will consist of four barbs; timber split posts at four metre spacing and timber strainers. Steel 3.6 metre gates.	Management of livestock in riparian zone dramatically reducing faecal matter (pathogen and nutrient) inputs, sedimentation and turbidity and other environmental benefits. Permits strategic planting of riparian vegetation and protects existing vegetation.	LBCCG - Langdale Stud (Tim Simpson)
2. Riparian revegetation	Strategic revegetation of Obi Obi Creek (2019/20) riparian zones with a diverse range of locally appropriate native species.	Optimal management of riparian zones with total livestock exclusion. Provides numerous long term water quality and other environmental benefits (wildlife corridors, habitat etc).	LBCCG – Contractors, appropriately skilled and insured planting team.
3. Weed management	Management of woody weeds in riparian zone – privet, lantana and others including in small stand of remnant vegetation.	Enhance protection of remnant vegetation by reducing weed threat. Provides numerous long term water quality and other environmental benefits (wildlife corridors, habitat etc).	LBCCG, landholders with Sunshine Coast Council support.

**4.1 Riparian fencing**

Livestock grazing is a land use that has the potential to alter the condition of a stream and riparian area if not managed properly. Improper livestock use of riparian areas can negatively affect riparian areas by changing, reducing or eliminating the vegetation within them.

In the sub-tropics, the majority of overland flow events occur during the summer to early autumn period. Conversely during the winter and spring months, most faecal contamination in water channels occurs from an animal defecating directly into the water. Any practice that reduces the amount of time cattle spend in a stream will therefore reduce the manure loading and decrease the potential for adverse effects on water from grazing livestock.

The direct effects of improperly managed livestock grazing on riparian vegetation include:

- change, reduce, or eliminate vegetation;
- decrease the vigour, biomass and alter species composition and diversity;
- change the channel morphology by widening and shallowing of the streambed;
- alter the stream channel through trenching or braiding depending on soil and substrate composition;
- alter the water column by increasing water temperatures, nutrients, suspended sediments and bacterial counts;
- alter the timing and volume of water flow;
- cause bank sloughing leading to accelerated sedimentation and erosion; *and*
- decrease wildlife habitat and species.

However when tightly controlled, fencing can be an invaluable, and sometimes essential tool to manage grazing in riparian zones whether permanent exclusion or managed grazed is performed.

Stage 2 of the project will enhance vegetation buffers on Obi Obi Creek. The effectiveness of a riparian buffer to provide multiple environmental and water quality benefits varies depending on several key factors, namely bank slope, vegetation species composition and age, and soil type. Slope gradient appears to be the most important variable in removal of sediment or particulate pollutants, whereas buffer width is most important for the effective removal of dissolved nutrients (Barwick et al 2009).



*Obi Obi Creek; most of the stream is straightforward to fence with relatively gentle banks. Currently livestock have unmanaged access to the stream.*

#### 4.2 Weed management

Normally LBCCG does not actively manage woody weeds in riparian zones as any vegetation in riparian zones is better than none (except for a few key species that have a detrimental impact on water quality). Weed management is only completed where:

- Priority weeds are present (Chinese elm, Madeira vine, Cats claw creeper)
- There is a long term plan to ensure the weeds do not return (as part of a revegetation project)
- Weedy vegetation is affecting water quality (blocking flows, causing erosion, diverting flows etc)

The Obi Obi Creek riparian zone (and Obi Obi Creek) has a low to moderate coverage of woody weeds and low level management will assist in the protection of the limited native vegetation present. Weed control will occur in the

revegetation area of the Obi Obi Creek, which will be carried out by the landholders, covering an area of approximately 0.5 ha.

Other areas to be controlled will be the three regrowth riparian areas along Daley Creek. These areas, totalling approximately 1 ha, will be selectively controlled as the weedy vegetation is affecting water quality, blocking flows, causing erosion, diverting flows etc. Large and Small leaf privet, devil's fig, lantana and other woody weeds are present along the waterway.



*Riparian vegetation on the downstream reach of Obi Obi Creek is impacted by woody weeds (primarily large leaf privet, lantana and other weeds). Areas like this are ideal to expand revegetation from.*

#### 4.3 Riparian revegetation

Riparian vegetation provides a buffer between water and agricultural activities. Buffers trap sediment, nutrients and faecal material before it reaches a flowing watercourse. Additionally, any contaminants that do reach the flowing water are more likely to be processed by in-stream vegetation if present. A combination of both native woody vegetation (trees) and grasses are ideal for buffers to utilise a wider range of nutrients so 'messy' riparian zones are likely more efficient despite possibly being 'ugly'.

Riparian zones due to their nature of being the most productive with good soils and moisture tend to grow thick stands of weeds (along with grass) and require either heavy management or require revegetation with native vegetation to out compete and shade most weed species. Revegetation therefore is a long term management solution for fenced riparian zones.

Riparian buffers comprising grassed buffer strips are effective at trapping sediments and nutrients adsorbed to sediments (such as phosphorus), but tend to be relatively poor at trapping dissolved nutrients, or for the provision of shade, food sources, in-stream structure or corridors for many species. Riparian buffers comprising taller, woody vegetation are typically good at providing shade, as a source of food and woody habitats, as a screen for light and

noise, as corridors for terrestrial fauna (to a varying extent depending on species composition), and as a means for reducing soluble nutrient inputs.

Designed riparian buffers usually incorporate multi-tiered systems of both native woody vegetation to enhance ecological function, and vegetated filter strips for the management of water quality. In essence, this approach seeks to mimic the complexity and effectiveness of a natural riparian buffer system, and often the best approach is to provide the required buffer width to enable a self-sustaining buffer of native vegetation (Barwick et al, 2009).

#### 4.4 FUTURE STAGES AND ACTIVITIES

After completion of the 2019/20 planned works there are no further planned activities on the Gartshore and Keyes property. Gartshore and Keyes have expressed eagerness to continue to develop their property with biodiversity and sustainability at the forefront of any future projects. Gartshore and Keyes are also undertaking further revegetation activities by themselves to continue the environmental aesthetics of the property for tourism.

At the end of the 2019/20 planned works it is planned that LBCCG will continue to work with the Barlows on further projects, focusing on riparian fencing and weed management along Obi Obi Creek.

LBCCG will continue to provide advice and ideas to the landholders, to help maintain the reduction of risk to water quality.



***Obi Obi Creek on the Gartshore and Keyes property. The landholders have shown interest in continuing fencing and revegetation of the riparian zone.***

**5.0 WHEN***(When will the activities be implemented?)*

Stage 2 (2019/20) of the project only.

**5.1 SCHEDULE & MILESTONES**

<b>Milestone</b>	<b>Action</b>		<b>Completion Date</b>
<b>1</b>	LBCCG Project Plan (Stage 2) completed and approved, pre works monitoring completed		Apr 20
<b>2</b>	<b>IMPLEMENTATION 2019/20</b>	Riparian fencing	Jun 20
<b>3</b>		Revegetation	Jun 20
		Weed management	Jun 20
<b>4</b>	Post-works (LBCCG/Seqwater funded components) monitoring completed, Final Report		Jul 20

**5.2 MONITORING, EVALUATION & REPORTING**

Monitoring of rehabilitation activities, will be split into periodic and episodic monitoring. Periodic monitoring is important to measure the effectiveness of the activities over time and will occur on a biannual basis by LBCCG.

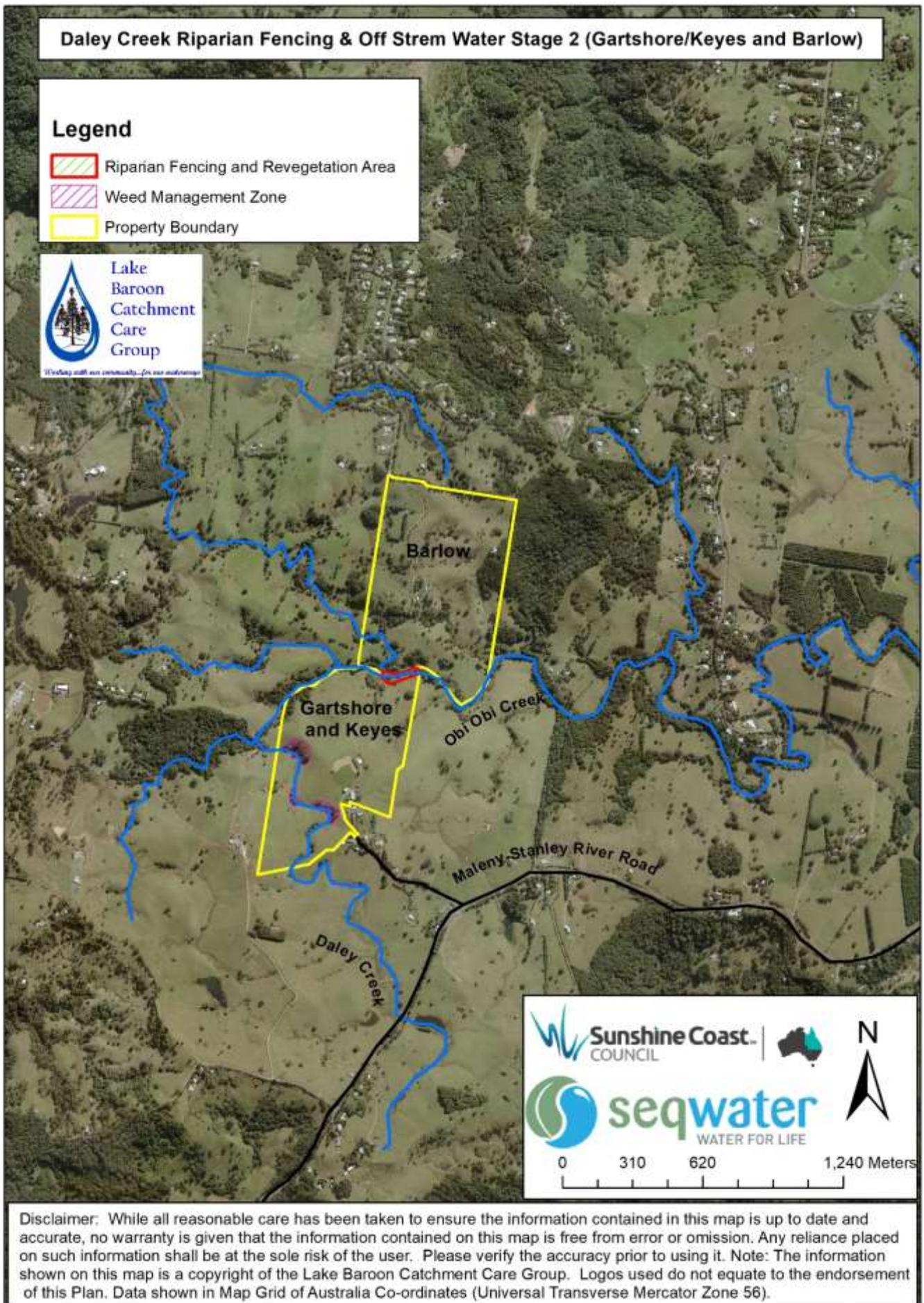
Episodic monitoring will occur following significant storm/rainfall events (or extended dry periods). This may, depending on the severity of the event, be achieved by a phone call to the landholders.

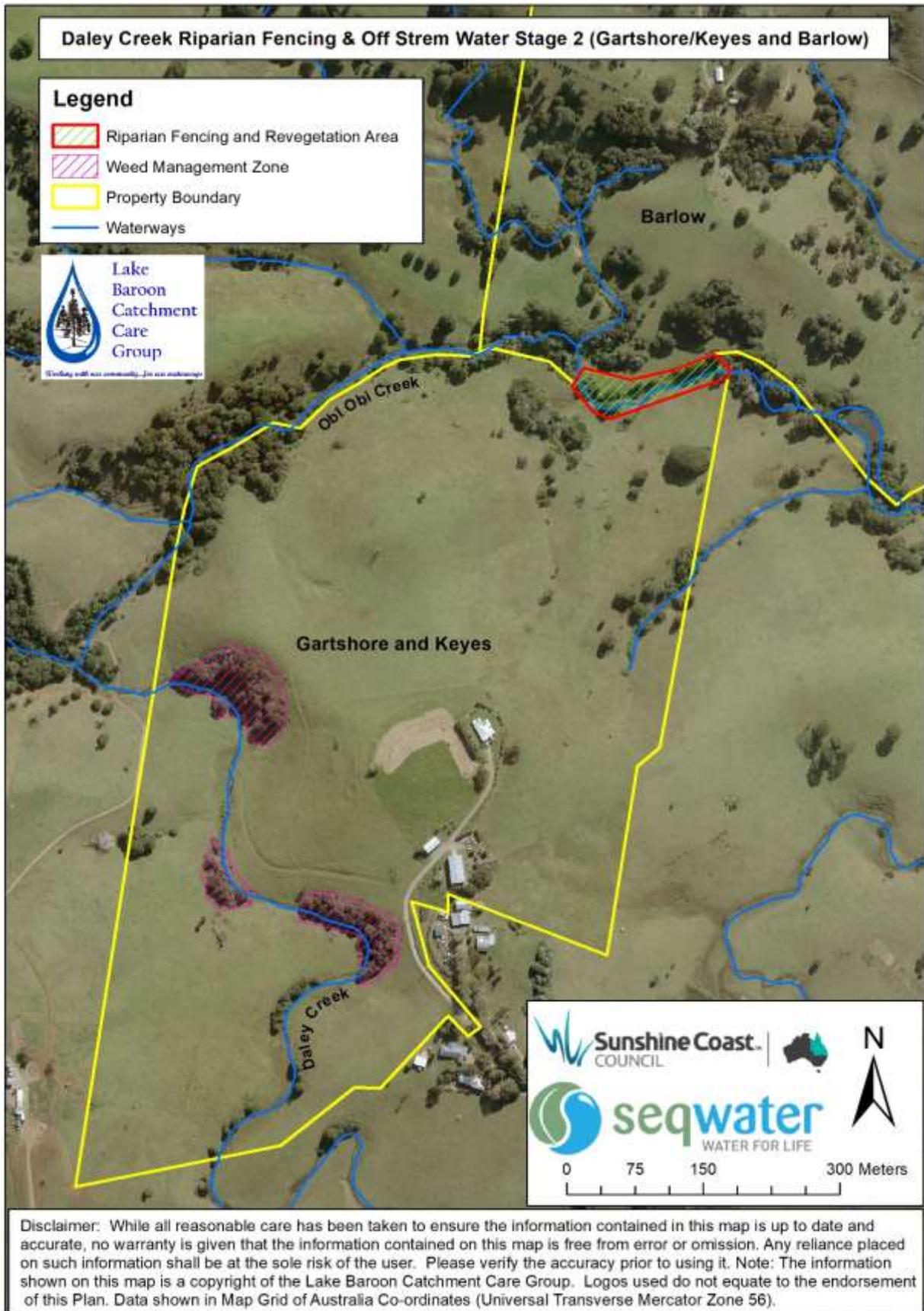
Photo point monitoring will provide valuable evidence of works completion, a record of changes over time, and provide an important assessment tool to evaluate the project.

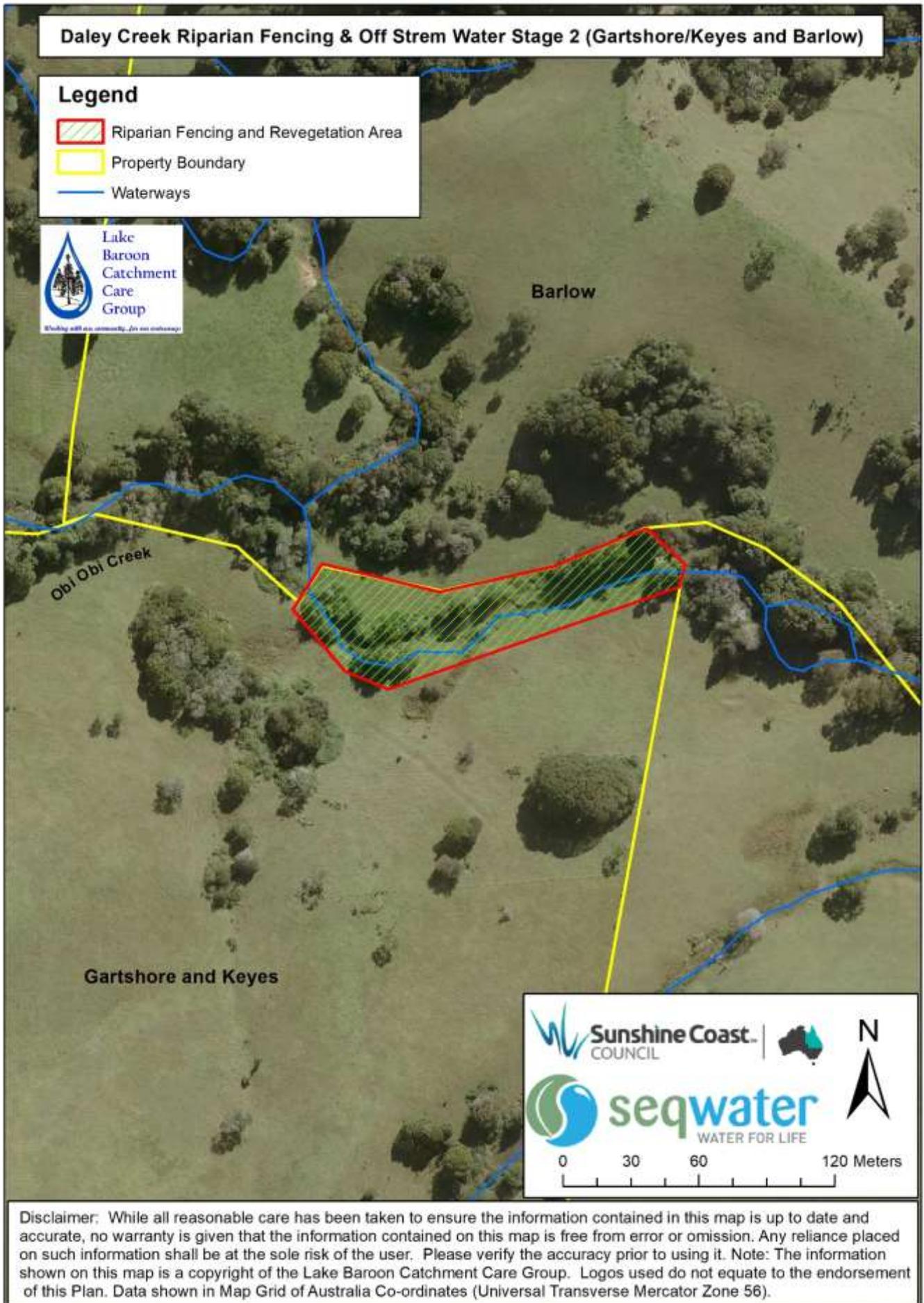
Project updates will be provided at monthly LBCCG meetings.

A modified version of the Project Plan (specific financial details and landholder contact details deleted) will be placed on the LBCCG website: [www.lbccg.org.au](http://www.lbccg.org.au).

6.0 MAP







## **7.0 BUDGET**

All figures exclusive of GST

## **8.0 REFERENCES**

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