Lake Baroon Catchment Care Group

Working with our community...for our waterways

Projects 2018-19

Upper Alcorn Creek Riparian Fencing Stage 1 (Crick)

seqwater WATER FOR LIFE

Sunshine Coast. COUNCIL

PROJECT PLAN

Project No. 1819-006

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How to read this Plan

This Plan is split into five sections.

PART A: Executive Summary (pp. 5-6) is a two page brief description of the project and includes summarised details of the stakeholders, budgets, outputs and outcomes.
PART B: Project Background & Previous Stages (pp. 7-11) is a brief report on previous Stage progress.
PART C: Project Plan (pp. 12-26) outlines the implementation of the latest Stage project.
PART D: Attachments (pp. 27-56) provides additional information to support the Project Plan.

Previous Plans

This Plan is a new standalone project however Garry Crick has received LBCCG funding in the past. The following Plan may be useful for an improved understanding of the Project:

1718-006 Northern Alcorn Creek Stage 3 (Crick, Colley & Costello)

Confidentiality

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DOCUMENT VERSIONS & APPROVALS

Version	*Date*	*Version/Description*	*Result*
1.0	30/8/2018	Draft LBCCG Project Proposal completed. Project emailed to LBCCG Committee for comments.	n/a
1.0	9/8/2018	Project Plan will be presented at August LBCCG Meeting for approval.	Approved (Minutes 110.7.4)
1.0	15/8/2018	Project Proposal forwarded to Seqwater for approval (email)	Approved
n/a	April 2019	Application by landholders to Sunshine Coast Council 2019 LEG grants (successful applications notified in June 2019)	TBD

Cover: Alcorn Creek riparian zone on Crick property

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PART A EXECUTIVE SUMMARY

PROJECT NUMBER & TITLE: 1819-006 Upper Alcorn Creek Riparian Fencing (Crick)

Upper Alcorn Creek Riparian Fencing will be implemented in a very high priority management unit (Alcorn Creek) that delivers high levels of nutrients and high volumes of sediment to Bridge Creek and ultimately Baroon Pocket Dam. Garry Crick owns a 104 hectare property immediately to the north and recently purchased the ex-Marsson property (two titles) to expand his intensive beef grazing enterprise. Alcorn Creek splits the property in two and has no riparian fencing allowing unmanaged cattle access. Properties in the Alcorn Creek catchment remain large as the topography does not lend itself to broad scale subdivision or development. The land has several key management issues – steep, landslip prone hillslopes (although the new Crick property is stable), variable soils that are easily compacted and/or eroded, and numerous watercourses fed by springs and soaks. The property has two small stands of remnant vegetation and a large area of regrowth vegetation in an inaccessible valley. The project primarily aims to reduce livestock contact with streams but will also support weed management activities in the degraded remnant and riparian zone by facilitating other external funding support.

APPLICANT/LANDMANAGER DETAILS

Names	Garry Crick

PROJECT / SITE LOCATION

Property Name & Address	150 Maleny Kenilworth Rd, Maleny		
Latitude/longitude	-26.747086 152.830013		
RP Numbers (Lot)	RP805288 (6); RP179002 (11)		
Property Size	77 hectares		
Land-use & stock carried	Beef (150 + including adjacent 104 ha)		
Sub-Catchment/MU	Bridge Creek BR1		
M.U. Priority *(LBCCG IP)*	**Low**	***M.U. Priority*** *(Pollution)*	**Very High**
Water Quality (ANZECC)	More than 95% of samples between 1991-2005 exceeded ANZECC guideline levels (Traill 2007)		

PROJECT PARTNERS/STAKEHOLDERS & ROLES – STAGE 1 ONLY

Lake Baroon Catchment Care Group (Seqwater 2018-19 CORE Project Funding)	On ground project implementation **($12,400)**
Lake Baroon Catchment Care Group (Seqwater 2018-19 CORE Administration Funding)	Project coordination, administration, reporting, monitoring & evaluation (**In kind $3,951**)
Landholder	Landowner, labour, cash and in-kind contributions (**$22,775** total)

PROJECT DETAILS – STAGE 1 & 2

Note this project is scheduled to occur over two years (Stage 1 and 2). Stage 2 has been included as all project components are dependent on each other.

Start Date	Aug 2018	***Completion***	June 2020	**Duration** (implementation)	2 years
OUTPUTS					
Off stream water (Stage 1)		8 troughs	***Stream crossing (Stage 1)***		1
Riparian fencing (Stage 2)		2,300 m	***Weed management (Stage 1 & 2)***		5 ha
OUTCOMES					
Length of watercourse fenced (stock managed)				1,050 metres	
Priority Property engagement				1 new property	
Area of remnant vegetation excluded from grazing				1 hectare	

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 Crick property lies in a high priority sub-catchment (Management Unit) in the Bridge Creek catchment – MU BR1. This MU is characterised by steep slopes, heavy black cracking clays, intensive livestock grazing, and numerous permanent and ephemeral watercourses fed by springs and soaks. As a result, the Management Unit contributes very high volumes of sediments generated by large landslips, high levels of nutrients (and likely pathogens) from livestock and threats to remnant vegetation and wildlife habitat.

The proposed project aims to complete five components over two years/Stages:

Activity	Description	Funded by
Off stream watering	8 troughs	LBCCG CORE/landholder
Stream crossing	1 crossing	LBCCG CORE
Riparian fencing	2,300 metres	LBCCG CORE
Weed management (riparian)	3 hectares	Landholder
Weed management (remnant & riparian)	2 hectares	Sunshine Coast Council - TBD

Note: the project was NOT identified as a <u>priority</u> in the LBCCG 2018-19 Annual Investment Strategy – Part 1: Projects.

Garry Crick purchased the property in July 2018, after the LBCCG 2018-19 Annual Investment Strategy – Part 1: Projects was submitted. Garry has immediately commenced property reorganisation for intensive beef grazing including installing internal fencing. Once internal fencing is set, particularly if it relies on natural watercourses for livestock water, it is far more difficult to get landholders to fence riparian zones and implement other activities that provide water quality benefits.

PART B PROJECT 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 Alcorn Creek catchment has been targeted for on ground activities (projects) since 2011 as this sub-catchment is recognised as delivering high volumes of sediment, nutrients and other contaminants. Prior to 2011 no LBCCG projects had been implemented in this largely hidden valley as it was dominated by large agricultural properties practising intensive grazing with little concern for water quality or the environment.

A concerted effort to engage landholders, particularly following the sale of key holdings, has enabled LBCCG to build multiple projects and develop widespread acceptance and engagement.

The key land management issues for landholders in Alcorn Creek centre around the steepness and inaccessibility of the catchment; extensive landslips and instability, difficulties managing livestock, invasive agricultural (and environmental) weeds and flood damage to infrastructure such as stream crossings (pipes etc) and fencing.

For LBCCG and Seqwater the key concerns are the large volumes of sediment leaving the catchment, high levels of nutrients (particularly naturally occurring phosphorus mobilised by erosion), unmanaged livestock access to waterways and inaccessibility due to the topography. The Lake Baroon Implementation Plan (2007) considered this part of the catchment as low priority for works as it was deemed virtually beyond repair, or at least would require significant levels of investment compared to other sub-catchments to improve water quality outcomes. A change in 2010 to how catchments are assessed for priority has resulted in greater emphasis on areas that are identified as high contributors of contaminants.

Garry Crick has recently purchased the Marsson property (two land parcels – Lot 6 and 11). This property is adjacent to the ex-Thorne property he purchased in 2015. With the purchase Garry now owns a total of 181 hectares and is the largest private landholder in the Lake Baroon catchment. Half of the property (Lot 11 fronting Macadamia Drive) has been managed very well with most of the properties' watercourses and vegetation fenced and some off-stream water installed. Pasture has been well maintained and weeds controlled. The other half of the property (Lot 6 Maleny

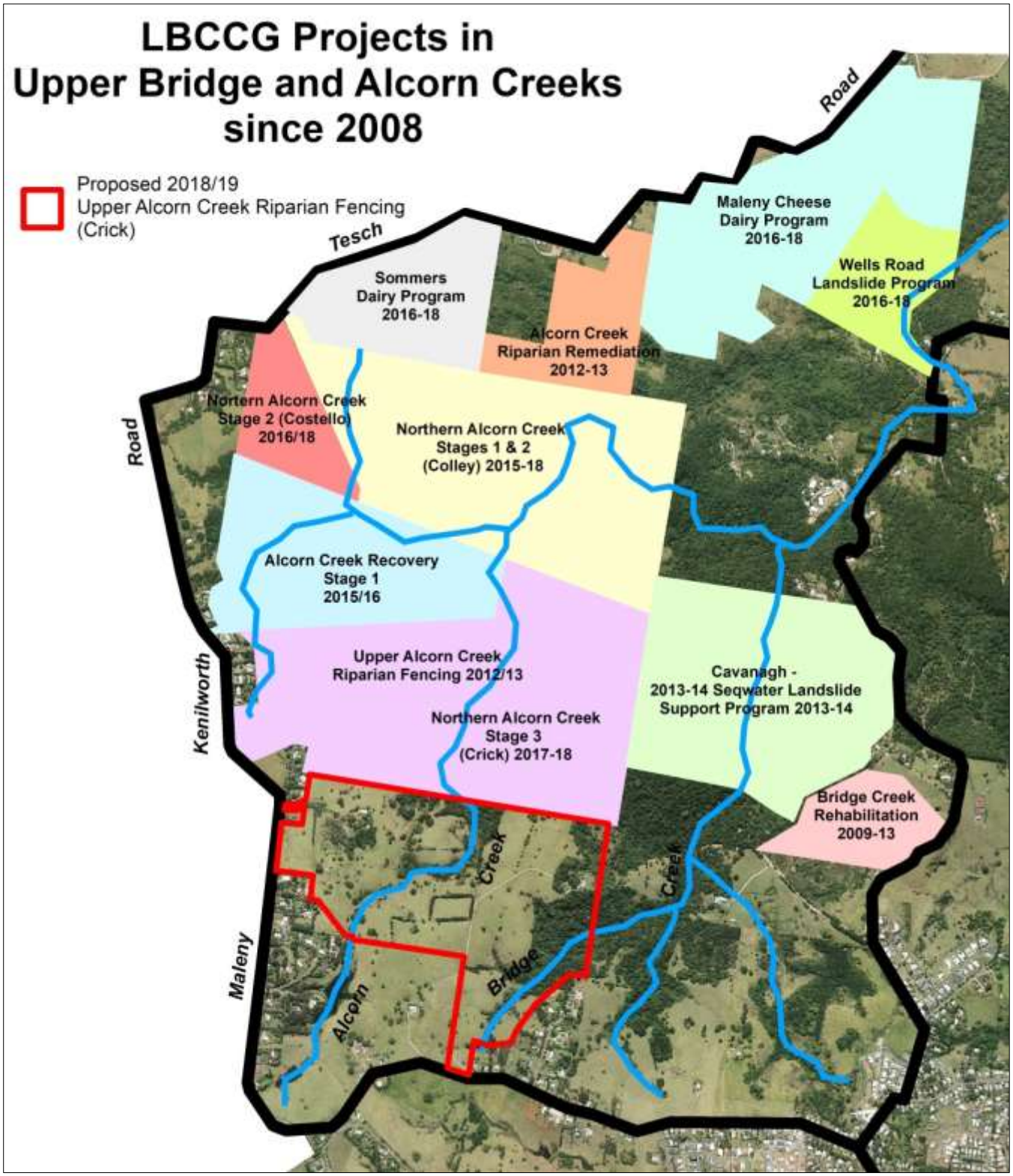
Kenilworth Road) however has been neglected with boundary and internal fencing in poor condition and considerable weed issues.

Understandably Garry has immediately set about transforming the property into intensive beef grazing with plans for extensive weed management and new internal fencing. Garry approached LBCCG to assist with minor off stream watering intending to retain Alcorn Creek for livestock water. Mark Amos from LBCCG suggested that if Alcorn Creek was fenced and water troughs placed strategically, the property could be split up into a very effective rotational grazing system.

iii. PREVIOUS PROJECTS IN AREA/CATCHMENT

Previous major LBCCG projects in the immediate location include:

Project Name	*Years implemented*	*Project outputs*	*Total Project Value*
Upper Alcorn Creek Riparian Fencing	2012-13	Riparian fencing, stream crossings	$85,648
Alcorn Creek Riparian Remediation	2012-14	Riparian fencing and revegetation (landslip & riparian)	$25,637
Alcorn Creek Recovery – Stage 1 (Walker)	2015-16	Riparian fencing, stream crossings, laneway rehabilitation and landslip remediation (drainage, fencing and revegetation)	$96,772
Northern Alcorn Creek Stage 1	2015-16	Riparian fencing, stream crossings, laneway rehabilitation and landslip remediation (drainage, fencing and revegetation)	$124,219
Northern Alcorn Creek Stage 2	2016-17	Riparian fencing, stream crossing repair, off stream watering and landslip remediation (weed management, drainage, fencing and revegetation)	$145,832
Seqwater Catchment Improvement Program – Dairy (Sommers)	2016-18	Remnant fencing, laneway rehabilitation, off stream watering	$41,418
Northern Alcorn Creek Stage 3	2017-18	Riparian fencing, revegetation, weed management, off stream watering and landslip remediation (weed management, drainage, fencing and revegetation)	$54,032



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 property is identified by red border.

1.0 CURRENT STATUS

In 2017/18 Garry Crick received funding under *1718-006 Northern Alcorn Creek Stage 3 (Crick, Colley & Costello)* for minor off stream watering (1 trough). This activity occurred on the ex-Thorne property purchased in 2013. The new proposed project will occur on the recently purchased ex-Marsson property that in the past has received no LBCCG/Seqwater funding. Therefore, the proposed project is regarded a completely new project rather than a continuation of previous projects.

However, as the previous Crick project has not been acquitted/reported we will report here.

The 2017/18 project/activity (one component) has been completed:

Activity	Description	Property	Funded by	Completed?
Off stream watering	1 trough	Crick	LBCCG CORE	YES

Note – all other activities approved under *Northern Alcorn Creek Stage 3 (Crick, Colley & Costello)* have either been completed or are nearing completion (components funded by Sunshine Coast Council and the Community Sustainability Action Grant).

Budget vs Expenditure

LBCCG CORE funding only. Only Crick component reported on.

BUDGET	COMPONENT	EXPENDITURE
$4,303	Crick off stream water	$4,305
$4,303	**Balance**	**($2)**

Note – Project loss of $2.00 is reconciled from LBCCG Reserve Fund.

1.1 LBCCG CORE FUNDING

1.1.1 Crick off stream water

The off-stream watering (OSW) on the Crick property has been completed as per the Project Plan.

The OSW was installed to prevent livestock from continuing to access water from a spring on a landslip on the eastern slopes of the property. This spring was previously a farm dam that was removed by LBCCG in 2015/16. The spring however has continued to flow and other troughs are too far away. The new trough (installed at the northern end of the paddock as opposed to the previously installed trough at the southern end) has dramatically reduced the incidence of livestock visiting the spring on the landslip. This has reduced pugging and reduced water retention *(see photo on next page)*. Although currently stable, it is critical that water is not stored or allowed to collect on the slip. The landslip is being considered for remediation under the Seqwater Catchment Improvement Program (SCIP) Landslide Program.

Crick off stream watering (trough) installed. Note the placement of the trough within a small fenced off area allowing access from multiple paddocks. The landslip is on the slopes to the right of the photo.

Spring on Crick landslip. Despite a water trough placed in this paddock in 2016/17, livestock have continued to access the spring for water. Constant trampling affects drainage and consequently water pools here. The new trough has dramatically reduced livestock damage.

PART C PROJECT PLAN

Lake Baroon Catchment Care Group has been very active in the catchment for many years delivering on ground water quality projects. Most projects are implemented on established properties and involve simple activities such as addressing a particular issue, for example riparian fencing on a watercourse. Although these types of activities are worthwhile and effective, it is far more beneficial to influence whole property management. This can be difficult on established properties; however, when there is a change of ownership or land use, landholders can be influenced to reorganise a property with water quality and environmental considerations in mind. In these situations it is imperative to act quickly when a property sells and influence the new landholder before property redesign occurs so that activities such as riparian fencing can be integrated with internal fencing, off stream watering and other activities that might not directly influence water quality outcomes but indirectly reduces water quality risk.

The Crick property is an example where LBCCG was able to influence property management before internal paddock fencing was commenced. This too explains why this project was not identified in the previously submitted *Annual Investment Strategy – Projects* in mid-June 2018.

1.0 WHAT

(What activities will be implemented?)

The proposed project aims to complete seven components before June 30, 2020 (weather dependent) implemented (and funded) over two financial years. Stage 2 has been included as all project components are dependent on each other.

Stage 1 - 2018/19 Financial Year

Activity	Description	Funded by
Off stream watering infrastructure (troughs)	8	LBCCG CORE
Off stream watering installation	8	Landholder
Stream crossing	1	LBCCG CORE
Weed management (riparian zone)	1 hectare	Landholder

Stage 2 - 2019/20 Financial Year

Activity	Description	Funded by
Riparian fencing	2,300 metres	LBCCG CORE
Weed management (riparian zone and edge of remnant vegetation)	2 hectares	Landholder
Weed management (riparian zone and remnant vegetation)	2 hectares	Sunshine Coast Council (TBC) (1)

(1) Sunshine Coast Council 2020 Landholder Environment Grants (LEG). Expressions of Interest open in December 2019 and successful projects notified in mid May 2020.

2.0 WHERE

(Where in the catchment will the project occur?)

The project will be implemented on the Crick property in the Alcorn and Bridge Creek catchments (Alcorn Creek is a major tributary of Bridge Creek). The property is on two titles with different addresses.

(a) Crick Lot 6

150 Maleny-Kenilworth Road, Witta

Property is approximately 39 hectares – currently comprising the following:

- 32 ha of improved and unimproved pasture;
- 1 ha remnant vegetation;
- 4.5 ha of regrowth and other vegetation including woody weeds; *and*
- 1.5 ha dwellings, sheds and un-grazed driveways.

Alcorn Creek flows through the middle of the property with a total length of approximately 1,110 metres. Other minor stream length totals approximately 200 metres. The majority of stream length has fair to good vegetation although this is predominantly weedy large leaf privet, lantana and other environmental weeds.

(b) Crick Lot 11

156 Macadamia Drive, Maleny

Property is approximately 38 hectares – comprising the following:

- 23 ha of improved and unimproved pasture;
- 3 ha remnant vegetation;
- 11.5 ha regrowth vegetation (including weeds); *and*
- 1.5 ha of dwellings and sheds.

The property is situated in the headwaters of Bridge Creek and has a total of of approximately 1,435 metres of permanent and intermittently flowing flowing streams. The majority of stream length has good to excellent vegetation.

3.0 WHY

(What benefits will the project provide?)

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 (mainly primary producers) 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 RISKS TO WATER QUALITY

In excess, faecal material, nutrients (largely nitrogen and phosphorus) and pathogens are high risk to water quality. High levels of nutrients in surface water contribute to algae blooms that result in hypoxic or oxygen-deprived dead zones in water bodies (Baroon Pocket Dam). Throughout history, consumption of drinking water supplies of poor sanitary quality has been linked to illnesses in human populations. These illnesses most commonly present as gastrointestinal-related symptoms, such as diarrhea and nausea (Health Canada 2013).

Sampling is difficult and largely impractical due to the number of types and distribution variability of bacterial pathogens that can be present in animal and/or human wastes, and because detection requires significant resources. As a result, monitoring for a broad indicator of faecal contamination such as *Escherichia coli* is useful in verifying the microbiological quality and safety of the drinking water supply.

Although livestock in watercourses are the obvious risk, contamination can originate in many ways; failing or poorly performing wastewater systems, wildlife and birds, stormwater and so on. Anecdotal evidence suggests that pathogens present in faecal material survive for short periods (less than two weeks) when exposed to sunlight and drying. Excluding livestock from riparian zones is extremely beneficial to minimising E.-coli entry to raw water (Health Canada 2013).

3.2 WATER QUALITY MONITORING

Analysis of the raw water sampled from the Bridge Creek (Wells Road) sampling site between 1991 – 2005 (Traill 2007) shows:

- Turbidity levels exceeded guideline levels only once however it is unlikely the sampling program is accurately capturing the likely events (monitoring is scheduled and in the past would not have been completed during rainfall events when sediments are mobilised for a short period of time);
- Nitrate levels exceeded the guideline value 46% of the time although this was falling as dairy farms converted to beef;
- Ammonia levels exceeded the guideline value 48% of the time and varied throughout the sampling period making it difficult to pin point causes;
- Phosphate levels exceeded the guideline level 33% of the time although this is likely to be higher in reality as phosphates attach to sediment and turbidity levels have already been identified as unusually low;
- Total phosphorus levels exceeded the guideline level 44% of the time; *and*
- Faecal coliforms exceeded the guideline level 39% of the time although widely fluctuated during the sampling period.

ANZECC - Australian and New Zealand Environment and Conservation Council.
These guidelines were part of a suite of 21 documents forming the Australian National Water Quality Management Strategy (NWQMS) originally released in 1992. The guidelines are intended to provide government, industry, consultants and community groups with tools to facilitate the assessment and management of water quality in a range of water resource types.

3.3 OPTIONS ANALYSIS

Proposed option highlighted.

Option	Description	Benefits/Cons	Total estimated cost
Do nothing	Current livestock management continues with cattle having unrestricted access to Alcorn Creek for water, grazing and shade.	No water quality or environmental improvements. Possible deterioration as new landholder is likely to increase cattle numbers. Landholder will implement weed management over whole property including riparian zones with the risk that valuable native vegetation (stream buffers) will be impacted.	$0
Install off stream watering (OSW) only	Troughs installed in new internal paddocks. Troughs placed in centre of paddocks well away from watercourses.	Livestock likely to prefer water supplied by trough system reducing time cattle spend in riparian zones and possibly reduced faecal matter inputs. Cattle will still graze riparian zone unrestricted and are likely to utilise the shade and cool for loafing/resting.	$20,000
Install stream crossing only	Low level concrete crossing over Alcorn Creek. Livestock preferentially cross watercourses at crossings but will not walk long distances to do so. Required to provide access to a relatively small paddock in north east corner of property.	Likely to only moderately reduce erosion.	$8,000
Install OSW, riparian fencing and stream crossing only	Alcorn Creek fenced to manage livestock (stream crossing and OSW installed well away from watercourses).	Access to Alcorn Creek by livestock reduced by 80%. Livestock permitted only occasional access to manage pasture and weed growth.	$73,000
Install OSW, riparian fencing, stream crossing	Alcorn Creek fenced; stream crossing and OSW installed, and weed management in	Remnant vegetation (Queensland Government DES) has been identified on the northern boundary and requires (legally) sensitive management, particularly weed control.	$121,140

and weed management.	sensitive areas of the riparian zone implemented.	Additionally high quality regrowth vegetation mid-creek requires careful weed management. This provides the opportunity to partner with Sunshine Coast Council through the LEG program.	
Install OSW, riparian fencing, stream crossing and weed management with 100% stock exclusion	Alcorn Creek fenced; stream crossing and OSW installed, and weed management in sensitive areas of the riparian zone implemented. Livestock excluded.	Full exclusion of livestock creates management difficulties and would require regular weed and excessive pasture growth management.	$150,000
Install OSW, riparian fencing, stream crossing and weed management with 100% stock exclusion. Revegetation of fenced area.	Fenced riparian zone revegetated with diverse range of local flora species.	Ideal option however would be very expensive (approximately $100,000) and high risk (minimum of three to five years before self-managing). Landholder is not capable of implementation and has little interest in major revegetation.	$250,000

3.4 PRIORITY ACTIONS FOR BRIDGE 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 have a beneficial impact.

Baroon Pocket Dam in September 2013 (storage remained closed for almost 12 months). Cyanobacteria blooms disrupt recreational use of the storage and create difficulties in the production of potable water.

Priority Action (AquaGen 2004)	Project activities to address Priority Action	Objectives met by project
1. Revegetate first order streams throughout the sub-catchment to maximise buffer capacity and reduce erosion potential.	n/a	n/a
2. Provision of advice, encouragement and incentives to landholders to maintain adequate riparian buffers and erect riparian fencing and manage stock access to waterways. This includes the provision for off stream watering, shade and hardened waterway access points and livestock laneways.	a) Fencing of Alcorn Creek to manage livestock access; b) Installation of alternative livestock water; c)Installation of low level concrete stream crossing; d) Weed management to improve natural recruitment of native flora	• reducing erosion of the bed and banks of Alcorn Creek reducing turbidity and sedimentation; • reducing direct faecal deposition (nutrients and pathogens) to Alcorn Creek and enhance the buffer to overland flows;
3. LBCCG in partnership with AquaGen, monitor the quality of stormwater infrastructure (pre and post development) from new developments on overall water quality – particularly sediment, turbidity, and Total Phosphorus.	n/a	n/a
4. Encourage good farming practices, particularly on floodplains and steep slopes which reduces the rate of soil loss to below that of natural soil forming processes.	a) Installation of alternative livestock water – positioning of troughs in the centre of paddocks	• improves 'even' grazing, reducing risk of over grazing and resultant non-point source erosion. • improving livestock management (important for gaining and maintaining landholder acceptance and engagement); • build land manager engagement (including Priority Properties);
5. Actively support SCC Land for Wildlife, NRM Small Grants Scheme (now Landholder Environment Grants) and legal covenant agreement initiatives that protect and rehabilitate remnant vegetation and enhancement projects.	a) Application to Sunshine Coast Council LEG program in 2019	• introduces new landholder/ property to Council (Land for Wildlife). • enhance wildlife habitat and corridors; • protect remnant and good quality native vegetation; • control agricultural and environmental weeds;
6. Reduce faecal counts within the Bridge Creek catchment by targeting education programs to residents to address existing on-site effluent and wastewater disposal systems and their maintenance requirements.	n/a	n/a

4.0 HOW

(How will the activities be implemented?)

4.1 STAGE 1 - 2018/19

4.1.1 Off stream watering

Off stream watering (OSW) provides several water quality benefits. The most obvious benefit is allowing the fencing of streams and associated riparian zones. This reduces risk to water quality by greatly reducing livestock contact with water. The establishment of OSW allows the division of the property into paddocks or 'cells' which will promote more even grazing of pasture reducing the likelihood of overgrazing and allows pasture recover between rotations resulting in healthy (and more) pasture. This benefits water quality as paddocks are less likely to suffer erosion and will retain faecal material rather than running off during heavy rainfall and entering watercourses. Troughs placed in the centre of paddocks promote more even grazing, can be placed near shade on a rise that receives cooling breezes and improves the utilisation of mineral 'lick' blocks. Faecal material is usually concentrated around troughs and if these are placed a sufficient distance from watercourses there is less likelihood of this material reaching watercourses during heavy rainfall events.

To facilitate the fencing of Alcorn Creek in Stage 2 of the project, eight two metre diameter (6 foot) concrete troughs will be installed strategically throughout the property. LBCCG will supply the troughs and float valves while the landholder will be responsible for all installation costs. Concrete troughs are favoured over cheaper plastic troughs as they have a longer life span, are less likely to move resulting in leaks and possible erosion, and are far less likely to be moved by the landholder to other sites that might not deliver the same water quality benefits.

Farm dam on Alcorn Creek. Other than Alcorn Creek itself this is the only livestock water source on the property.

4.1.2 Stream crossing

Alcorn Creek splits the Lot 6 property in two with approximately two thirds to the west. Currently there is only one crossing over the creek – a crossing over the farm dam wall. With the fencing of Alcorn Creek in Stage 2 a stream crossing will be required on the downstream reach of the property.

A low level concrete crossing is proposed for access over Alcorn Creek near the northern boundary of the property. This will provide a controlled access to a paddock on the right bank and also access to remnant vegetation. Concrete crossings are preferred over traditional piped or culvert crossings as they are far less likely to be damaged from flooding, livestock or vehicles. Constructed at bed level flows pass over the surface and do not obstruct flows; although not a concern at this site (there is a small waterfall a short distance downstream), low level crossings permit aquatic passage, an important consideration when constructing any stream crossings. Concrete crossings reduce erosion to negligible levels and can also be constructed to provide a watering point for livestock (although this can create an artificial barrier) when an off stream watering system and/or trough is not feasible.

LBCCG will fund the stream crossing with the landholder supplying labour during construction, particularly when the concrete is poured and finished.

Location of proposed stream crossing to provide access to the east side of Lot 6. This will also assist with future management of the remnant in this corner of the property.

4.1.3 Weed management

The property currently supports large areas of agricultural and environmental weeds including in the riparian zone of Alcorn Creek and around the edges of the stand of remnant vegetation in the north east corner. To improve the carrying capacity of the property the landholder will commence weed management including weeds on the edge of the riparian zone of Alcorn Creek. Weed management will be required over several years to achieve effective control and will require several management methods. Annual weeds are easily controlled by herbicide application but require at least yearly spraying. Woody weeds however require more intensive management including the use of posi-tracked mulchers that reduce weeds to coarse mulch. Although costly these mulchers allow immediate pasture renovation provided follow up herbicide application on regrowth is timely.

Weed management in the Alcorn Creek riparian zone will be commenced, treating woody weeds that can be safely reached with the machine and where damage to native vegetation is minimised. All weed management in Stage 1 is the responsibility of the landholder.

Alcorn Creek riparian zone with a good coverage of vegetation although much of this is dominated by woody weeds. These weeds can be largely managed by the landholder (along the edges).

4.2 STAGE 2 - 2019/20

Stage 2 of the project is included in this Project proposal as the activities over the two phases are dependent on each other. Although Stage 2 activities, budgets and mapping are detailed here, Stage 2 will still be subject to a full Project Plan in 2019/20 although minor changes may be necessary.

4.2.1 Riparian fencing

Riparian fencing and the management of livestock in riparian zones is an effective method of reducing risk to water quality. It is a costly activity and one that is unlikely to be funded solely by landholders who prefer to invest in activities that are more likely to provide a viable financial return from the property.

The project proposes to entirely fence Alcorn Creek which not only protects the riparian zone but also improves the ability to create internal paddock fencing (the riparian fencing immediately creates two paddocks).

Un-vegetated riparian zones will grow weeds if left unmanaged. Therefore to control weeds and excessive growth livestock are intermittently used to crash graze the riparian zone when suitable conditions exist – dry periods when damage from stock is minimal and the risk of faecal material being washed into the watercourse. This helps gain support from landholders as they do not feel they are losing grazing from riparian fencing and are encouraged to continue to control weeds in the riparian zone (a significant ongoing issue). Improved water quality benefits are still realised as instead of livestock having full access to the watercourse they may have as little as 10% access. Heavier overall grass cover is retained so the vegetative filter to overland flows carrying faecal material and contaminants is improved and maintained.

As per most LBCCG projects, fencing will consist of the locally accepted four strand barb wire with timber split posts at four metre intervals, timber strainer posts and steel gates. This provides the highest quality and strongest fence available. If deemed necessary however, a plain wire may be installed instead of the top barb to minimise harm to native wildlife. It is important to note however that this does affect the overall strength and longevity of the fence.

Livestock access the riparian zone for water and grazing but also shelter from both summer heat and winter cold. Fencing will reduce contamination from faecal material, nutrients and improve bed and bank stability (reduced erosion).

4.2.2 Weed management - landholder

Weed management of the property and riparian zone commenced in Stage 1 will continue into Stage 2 and will be predominantly the responsibility of the landholder.

4.2.3 Weed management – LEG grant

Most of the property weed management is relatively straightforward although when woody weeds such as privet, lantana and other environmental weeds are located within both riparian and remnant vegetation, it requires careful management. It is important to use experienced bush regenerators to implement weed management so that damage to native vegetation is avoided. An application to the Sunshine Coast Council's Landholder Environment Grants will be submitted to assist with weed management in sensitive areas – remnant vegetation and riparian zones.

Remnant vegetation in the 'back' corner of Lot 6. Weed management in these areas requires skilled bush regenerators.

4.3 OTHER ACTIVITIES – WHOLE PROPERTY MANAGEMENT

Although not directly reducing risk to water quality, internal property fencing permits rotational grazing which generally results in improved pasture cover which in turn retains faecal material on paddocks during rainfall events. Without internal fencing livestock tend to spend more time in riparian zones grazing the more productive area and resting in the shade afforded by riparian vegetation.

It is critical for LBCCG to be involved in the early stages of property redesign as livestock water is the key determinant of property internal fencing. If LBCCG can influence the design of OSW then it is more likely riparian zones and watercourses can be fenced and protected. This however usually means taking a lead role in OSW and supplying infrastructure and materials at short notice. Often riparian fencing will need to be fast-tracked so that it ties into the internal paddock fencing.

4.4 FUTURE STAGES AND ACTIVITIES

The current project runs for two years divided into two stages. Beyond this there are no plans for any other activities although there may be the potential for strategic tree planting within the fenced riparian zone in the future. Weed management in the remnant vegetation may be considered but would be at the direction and funded by Sunshine Coast Council.

5.0 WHEN

(When will the activities be implemented?)

The project is staged over two years. Stage 1 activities (off stream watering, stream crossing and initial weed management) will be completed by June 30, 2019. Stage 2 activities (riparian fencing and weed management) will be completed by June 30, 2020.

The Sunshine Coast Council Landholder Environment Grant (weed management) if successful will be completed by June 30, 2020.

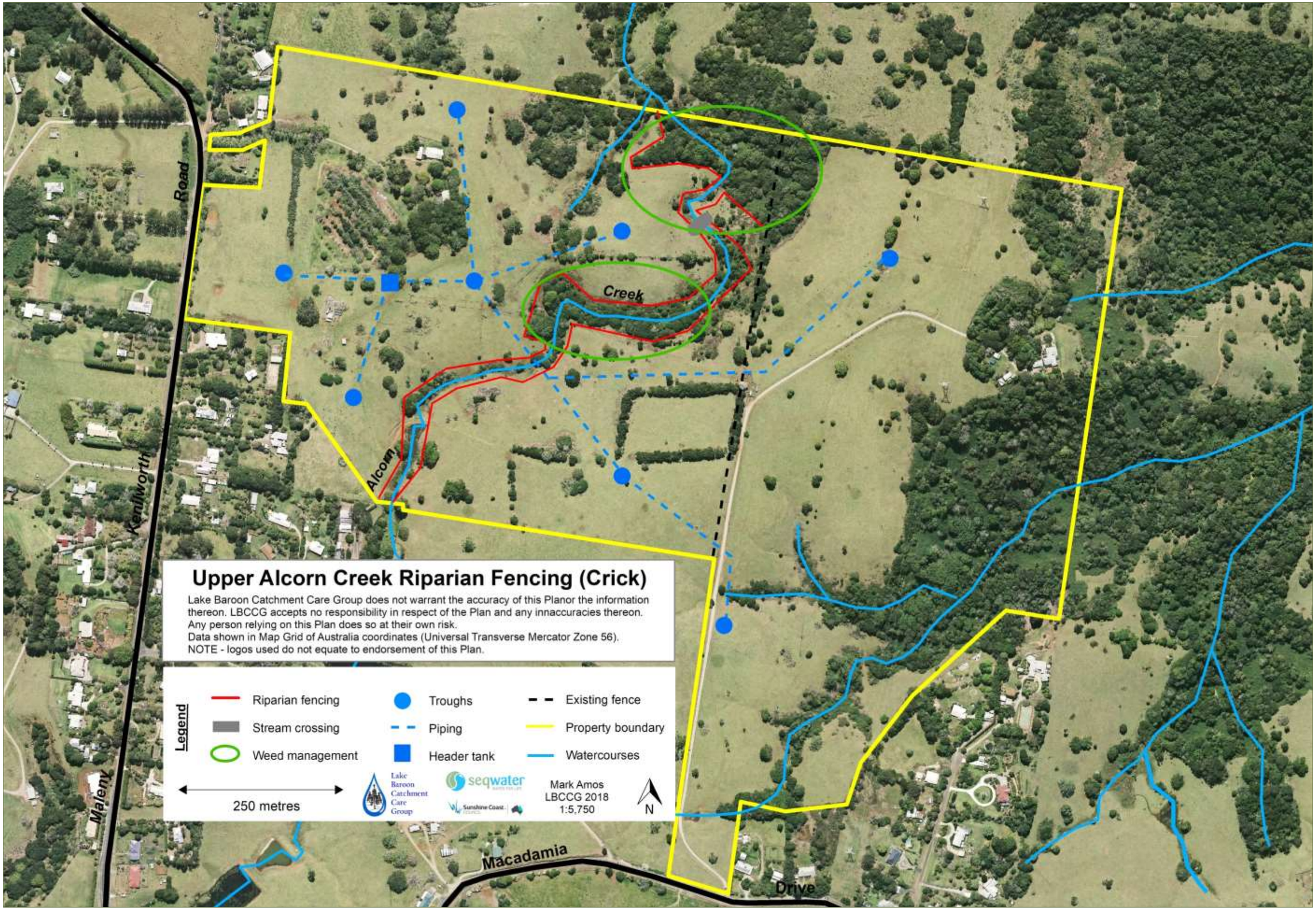
As per ALL LBCCG projects, completion of activities is weather dependent although as can be seen in the Table below it is unlikely activities will not be completed on schedule (June 30, 2019/June 30 2020).

Project Milestones

Milestone	*Action*		*Completion Date*
1	LBCCG Project Plan (Stage 1) completed and approved, pre works monitoring completed		Aug 18
2	***IMPLEMEMNTATION STAGE 1***	Off stream watering materials delivered (troughs)	Mar 19
3		Off stream watering installed	Mar 19
4		Initial weed management	Mar 19
5		Stream crossing installed	Jun 19
6	Stage 1 completed, monitoring ongoing, Progress Report		Jun 19
7	LBCCG Project Plan (Stage 2) completed and approved, pre works monitoring completed		Aug 19
8	***IMPLEMEMNTATION STAGE 2***	Riparian fencing	Oct 19
9		Weed management (landholder)	Dec 19
10		Weed management (LEG grant)	Mar 20
11	Post-works monitoring completed, Final Report		Jun 20

See PART D: 5.0 Action Plan for more detail.

6.0 MAP


Upper Alcorn Creek Riparian Fencing (Crick)
Lake Baroon Catchment Care Group does not warrant the accuracy of this Planor the information thereon. LBCCG accepts no responsibility in respect of the Plan and any innaccuracies thereon. Any person relying on this Plan does so at their own risk.
Data shown in Map Grid of Australia coordinates (Universal Transverse Mercator Zone 56).
NOTE - logos used do not equate to endorsement of this Plan.
Legend
Riparian fencing
Stream crossing
Weed management
Troughs
Piping
Header tank
Existing fence
Property boundary
Watercourses
250 metres
Lake Baroon Catchment Care Group
seqwater
Sunshine Coast
Mark Amos
LBCCG 2018
1:5,750
N
Road
Kenilworth
Maleny
Alcorn
Creek
Macadamia
Drive

7.0 BUDGET

The project is being implemented over two financial years. The fencing of Alcorn Creek necessitates both alternative livestock water (off stream water) and installation of a stream crossing to provide a hardened all weather access across the creek and possibly also provide a watering point. Currently all activities proposed under the 2018/19 project stage (Stage 1) are confirmed with activities under the 2019/20 stage (Stage 2) subject to change (*see Part D 7.0 for 2019/20 Budget*).

7.1 STAGE 1 PROJECT BUDGET (2018/19)

LBCCG has a policy of keeping Project Budgets confidential as individual project costings vary and can give misleading information. Detailed Budgets can be supplied on request. Please contact the LBCCG Project Manager on info@lbccg.org.au for further information.

PART D ATTACHMENTS

1.0 PROJECT RATIONALE

1.1 INTRODUCTION

In an ideal world, all waterways in the Lake Baroon catchment would be rehabilitated to provide riparian buffers and provide suitable habitat for aquatic ecology. However the limited resources available means the catchment must be prioritised into areas where the greatest gains can be achieved through the smallest investment. We cannot realistically completely restore cleared riparian zones to pre-European conditions, but we can improve the ability of the zone to maintain the quality of water delivered downstream.

Baroon Pocket Dam. Although the dam and most of the immediate surrounds are owned and managed by Seqwater, the vast majority of the catchment is privately owned. To influence land management that reduces the risk to water quality in the storage, Seqwater must engage the community. The most effective method to do this is work with existing community groups.

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.

1.2 GRAZING AND RIPARIAN ZONES

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.

Cattle when drinking at streams and dams enter the water to reduce bending; resulting in the stirring up of suspended solids (turbidity), and riparian zones can be difficult places for livestock to access (steep, muddy or rocky banks) placing greater effort and stress on individual animals. Additionally, when cattle enter a water source they tend to defecate directly into the water body (pers. comm. Colin Cork 2012).

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.

The project will enhance vegetation buffers on Alcorn (Bridge) 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).

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).

1.3 OFF STREAM WATERING

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.

Even without exclusion fencing of riparian zones, off-stream water sources reduce the amount of time free ranging cattle spend in or immediately adjacent to watercourses. Cattle prefer to drink from a trough over other sources of water available to them, resulting in a significant reduction in time spent in the stream (watering) and adjacent stream side area (grazing and loafing). Studies in North America have shown that following the installation of the off-stream watering (OSW) infrastructure, stream bank erosion decreased by 77% and concentrations of total suspended solids, total nitrogen and total phosphorous decreased by 90, 54 and 81% respectively (Sheffield et al, in McIver 2004). More recent studies indicate that although the installation of OSW by itself is effective, providing livestock supplements and shade near troughs reduced riparian zone pressures even further (Ganskopp 2001, McInnis and McIver 2001, Porath et al. 2002 in McIver 2004). Porath et al. (2002) also found that the provision of supplements increased weight gain in cows and calves.

Cattle when drinking at streams and dams enter the water to reduce bending; resulting in the stirring up of suspended solids (turbidity), and riparian zones can be difficult places for livestock to access (steep, muddy or rocky banks) placing greater effort and stress on animals. Additionally, when cattle enter a water source they tend to defecate directly into the water body (pers. comm. Colin Cork). Troughs provide a level, relatively dry watering point where the animal does not have to bend excessively, reducing stress by providing improved footing, increased visibility and reduced physical effort. This is likely to lead to healthier animals with less risk of injury.

Cattle use riparian areas for resources other than water - crossing points, forage, shade, grooming sites (scratching posts) and general loafing. A well-designed OSW system needs to take into account all these factors. Research by Gillen et al 1984 (in McIver 2004) shows that cattle prefer to graze within 200 metres of water. Therefore, to optimise uniform grazing and water efficiencies, cattle should not have to walk more than 200 - 300 metres to water.

Season and time of day also have an effect on the effectiveness of an off-stream water source in reducing degradation to riparian areas. In the warmer months, riparian areas give shade and protection from the heat and the coolness of the water often draws the animals to the water's edge. It is essential to ensure that alternative shade is provided within the paddock – preferably near the OSW trough and ideally on a high point exposed to cooling breezes.

1.4 WEED MANAGEMENT

Major environmental weeds pose a serious and immediate threat to native vegetation and water quality due to their ability to alter the structure and composition of plant communities. Species such as small leaf privet and Para grass can thrive in low-light conditions and over time will dominate riparian zones, out-competing native species and effectively developing mono-culture systems. Natural regeneration is reduced below sustainable levels and only mature individual native flora species persist. Similarly, lantana and blackberry form dense thickets excluding more desirable creek bank holding native species.

Vine species such as Blue morning glory, Madeira vine and Cats Claw vine, although requiring high light levels (and therefore not a major threat to robust remnant vegetation) spreads vegetatively and rapidly envelopes all other vegetation, and in time will kill those plants simply through the elimination of light and smothering. Vines rapidly form a mono-culture ground cover – even out-competing exotic pasture grasses. Although vines densely cover ground surfaces, they tend to be weakly-rooted and do not protect the ground surface from erosion during heavy rainfall events and high creek flows. Similarly, they do not provide an effective buffer to overland flows and will not filter sediments and nutrients effectively.

Lantana is very competitive in both riparian zones and open paddocks reducing natural regeneration and available pasture. Although relatively easily controlled in most situations it is very vigorous and will rapidly reinfest previously controlled areas without regular follow up. Lantana can be toxic to livestock and landholders spend significant

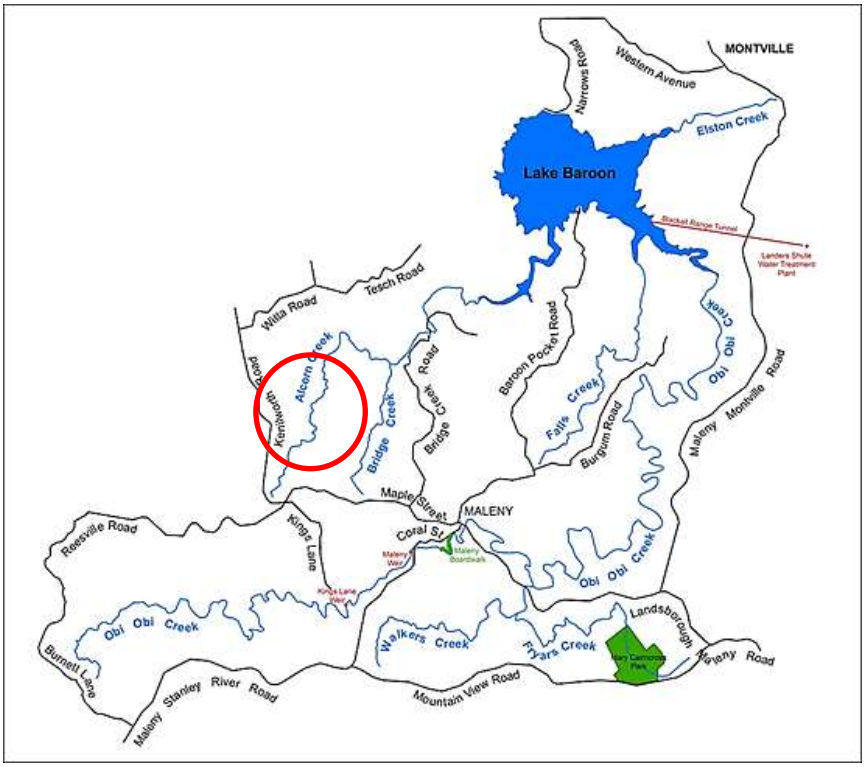
resources on its control and inappropriate herbicide use is a risk to water quality. The fencing of infested riparian zones that are difficult to manage can improve property management by limiting livestock contact with the lantana. In stable riparian zones lantana is not considered a high risk to water quality but rather degrades the habitat value for wildlife. In some cases, however lantana can provide an effective buffer to remnant vegetation and it is detrimental to control it (can allow other, more serious weeds to invade).

2.0 PROJECT LOCATION

2.1 BACKGROUND

Lake Baroon is situated on the Maleny Plateau in the headwaters of the Mary River, located inland from Sunshine Coast approximately 13 km south west of Nambour and 7 km North East of Maleny. Obi Obi Creek forms both the primary inflow and outflow of the dam. Walkers, Falls, Bridge, and Elston Creeks constitute the remaining significant creeks within the catchment providing water to Lake Baroon. The catchment encompasses an area of 74 km^2 (including the dam surface).

2.2 LOCATION



The Crick property is located in LBCCG Management Unit BR1 which lies in Alcorn Creek – the western tributary of Bridge Creek. This MU is a significant contributor of sediments nutrients primarily due to land use and the instability of the catchment.

2.3 THE BRIDGE CREEK CATCHMENT

Alcorn Creek is a significant tributary of Bridge Creek and thus is a sub-catchment of Bridge Creek.

Bridge Creek (2,413 hectares) is characterised by its steep slopes that lack stabilising vegetation. The soils of the catchment are predominantly black clays lacking the ability to absorb nutrients and rainfall, resulting in minimal filtering of run-off. Although there are significant areas of natural vegetation and most of the waterways have good riparian vegetation, the sub-catchment contributes high volumes of sediments, nutrients and potentially pathogens to Baroon Pocket Dam (Dunstan 2007).

Dairy grazing was the dominant land use until relatively recently (2000) however due to the widely varying topography, poorer soils and consequently relatively poorer pasture, dairy grazing has been restricted to three properties that have a larger proportion of grazing outside the catchment (Sommers, Oehmichen [recently leased by Maleny Cheese to run dry dairy cattle] and R. Cork dairies).

Bridge Creek varies widely in topography, land use and threats to water quality. Upper reaches are largely grazed, mid reaches support a mix of natural bush and rural residential properties with some grazing again in the lower reaches.

2.4 CATCHMENT REVIEW

2.4.1 Background

Since the arrival of European Settlers, Lake Baroon and its catchment area have undergone significant change. Timber operators first settled in the region in 1853 and selectively cleared the best timber from the area. Following the removal of the most valuable timber (1906), the majority of remaining vegetation was cleared for beef and dairy cattle (1918) (Dunstan, 2007).

As a result riparian zones have been irreparably impacted such as:

- vegetation fragmentation (as a result of clearing);
- increased erosion and sediment loads due to clearing and land use practices;
- changes to hydrology and water quality;
- altered natural processes such as grazing and urban development;
- introduction of foreign fill materials; *and*
- introduction of weeds, exotic plantings and
- exotic fauna.

2.4.2 Geology, soils & stability

The geology of the Maleny plateau is dominated by basalt lava flows occurring between 31 and 25 million years ago (MYA). However there are several other significant geological formations that influence the catchment – particularly soil type and consequently vegetation and stability.

The oldest rocks visible on the plateau are known as the North Arm Volcanics and originated somewhere in the North Arm region around 210 MYA. Multiple lava flows consisting of andesite and dacite to rhyolite form the northern bank of Lake Baroon and are visible in the lower reaches of Bridge Creek where erosion has exposed them. Rhyolite is very hard and resistant to erosion evidenced by the Narrows where the Obi Obi Creek was forced to cut a narrow gorge through (and where Baroon Pocket Dam wall was constructed).

The North Arm Volcanics underlay the entire Maleny plateau and extend as far south as the Glasshouse Mountains. Between 210 and 180 MYA the North Arm Volcanics 'sagged' into broad depressions that were subsequently filled with sediment, forming the deep Landsborough Sandstone formation (Willmott 2007). Other geological formations in the catchment include small areas of Cedarton Volcanics – visible in the upper reaches of Obi Obi Creek; andesite rock that produces lighter coloured moderately fertile soils; and an area of Amamoor Beds – 315 MYA of hard meta-sediment rocks that were historically folded and steeply inclined exposed at Howells Knob. Composed of quartzite, these rocks weather to variable cream or yellow soils.

Maleny plateau basalts although outwardly appearing very hard have high concentrations of iron which promotes fracturing and therefore can be very prone to erosion. The Obi Obi, Bridge and Falls Creeks have gradually cut channels into the basalt plateau revealing the described layers underneath. The edges of the plateau have also eroded to form escarpments (Willmott 2007).

Soils on the site predominantly consist of heavy black clays. The bed of the watercourses on the site consists of thin, black alluvial soils that have been deposited by a combination of mass movement (landslips), hill slope (paddock) erosion and gullying. The velocity and volume of the local streams however limits sediment deposits forming.

Clay soils erode easily and tend to reach their infiltration capacity faster than other soils, promoting overland flow. A potential consequence is that both bound and unbound nutrients will enter the watercourses via erosion and runoff (Lake Baroon Catchment Management Strategy & Caloundra City Council 2007).

Native vegetation is an indicator of soil types. The vegetation over the site therefore would have originally been a mix of rainforest (particularly in the gullies and wet and dry sclerophyll (eucalypt) forest on the lighter coloured soils to the east of Alcorn Creek.

2.4.3 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).

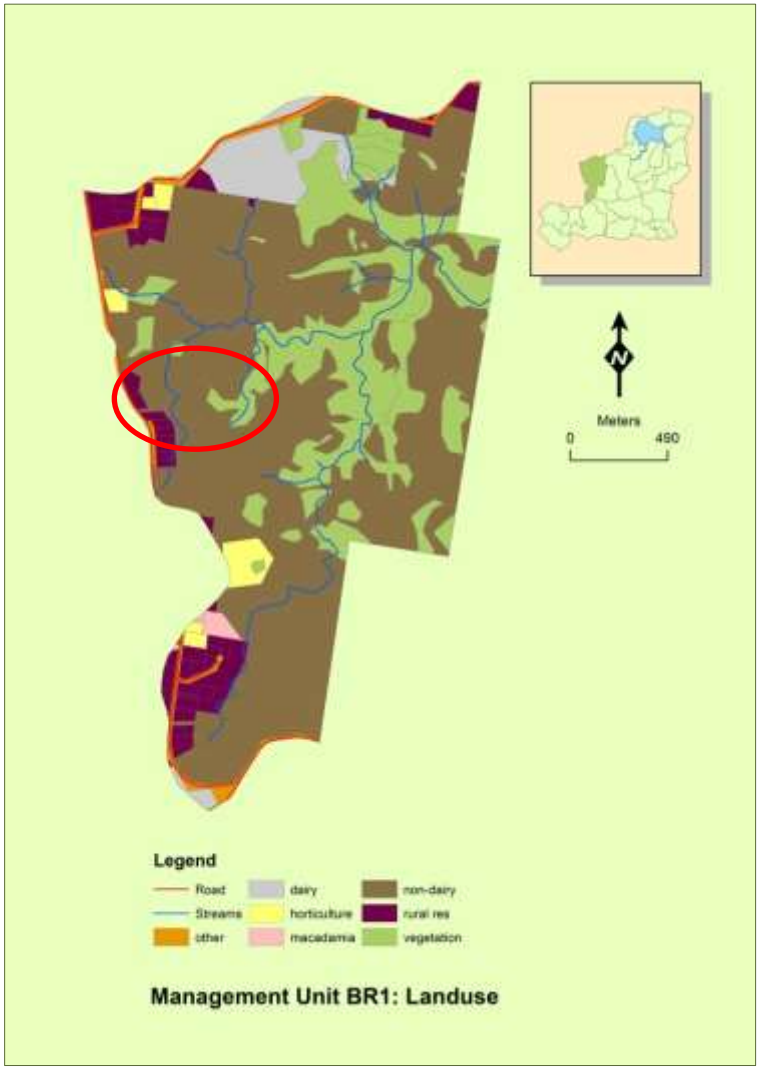
Presently the catchment is susceptible to a number of land use impacts (Traill, 2007; Dunstan, 2007) including:

- 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.

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

The proposed project is located within Management Unit BR1 – Alcorn Creek.

2.4.4 Land-use in Management Unit BR1



BR1 (Alcorn Creek) covers an area of 450 hectares with beef grazing the dominant land use with dairying (7%) and rural residential (including small scale horticulture) a small but significant use at 6% (Amos assessment 2015). Riparian cover is present along 27% of the creeks (although the mid to lower reaches of Alcorn Creek has excellent coverage, some of which is remnant vegetation, including *Of Concern* and *Endangered Regional Ecosystems*) (Dunstan 2007).

Land use in the Management Unit is dominated by beef grazing (85% of the management unit), with dairy grazing (including dry cow grazing) a minor use (7%) with rural residential properties making up the balance of land (6%).

Land use in MU BR1 is overwhelmingly beef grazing, with minor dairying and rural residential. Vegetation, including important remnant vegetation is largely present on the steep slopes associated with major watercourses.

2.5 CRICK PROPERTY REVIEW

2.5.1 Land use and property management

Garry Crick has recently purchased the ex-Marsson properties which lie immediately to the south of his ex-Thorne property purchased in 2013. Between the three titles Garry now owns 181 hectares which is now at a size where profitable beef production is possible. Consequently Garry is undertaking property reorganisation to maximise the ability to intensively graze. This includes weed management, external and internal fencing and pasture renovation.

Most of the new properties are good grazing country although there are significant areas of inaccessible regrowth and remnant vegetation – particularly on the steep slopes on the eastern side of the property. Grazing will be intensive with around 150 breeding cattle. Provided strict rotational grazing and herd management is followed there is no reason why good water quality and environmental outcomes cannot be achieved.

2.5.2 Hydrology

2.5.2.1 Drainage Lines, Watercourses & Wetlands

The property is split over two titles (Lots 6 and 11).

Lot 6

Alcorn Creek splits the property in two with two thirds to the west of the watercourse. Located in the upper reaches of Alcorn Creek, it is less steep than the downstream property and soils are predominantly Red Ferrosols that support improved pasture (Kikuyu). Due to the more gentle topography, the dominant watercourse is Alcorn Creek with very few other watercourses present. The property is very well drained and there are no natural wetlands although a single farm dam has been constructed on Alcorn Creek. Alcorn Creek has a fair coverage of vegetation although a significant percentage of this are woody weeds such as privet and lantana. The lower reach of the creek has a recognised stand of remnant vegetation but is threatened by past weed management activities around and in the stand. The middle reach has a good stand of regrowth vegetation that is degraded by woody weeds and would benefit from restoration activities (primarily weed management). There does not appear to be any major springs and consequently the property is stable (no landslips). None of Alcorn Creek is fenced.

Lot 11

Lot 11 has always been the 'home' block where the Marsson's lived and consequently has been better managed. Most of the watercourses are fenced or do not require fencing due to their inaccessibility to cattle (mainly due to them being steep, with cattle likely lost if entered). There is a large area (25% of the Lot) that is heavily vegetated and completely inaccessible. The property utilises off stream watering and there is little from a water quality perspective that can be done.

2.5.2.2 Flooding

Although high in the Alcorn Creek catchment flows during high rainfall periods are fast and damaging. The dam constructed on Alcorn Creek when viewed in July 2018 has several erosion issues (no spillway, semi-blocked outfall pipes and bank overtopping has affected the integrity of the dam wall) although Garry has commenced repairs. A spillway is not practical so there will always be a small chance of dam failure. Riparian fencing is unlikely to be impacted by flooding and the proposed stream crossing is unlikely to be damaged.

2.5.3 Environmental Factors

2.5.3.1 Significant Vegetation & Ecosystems

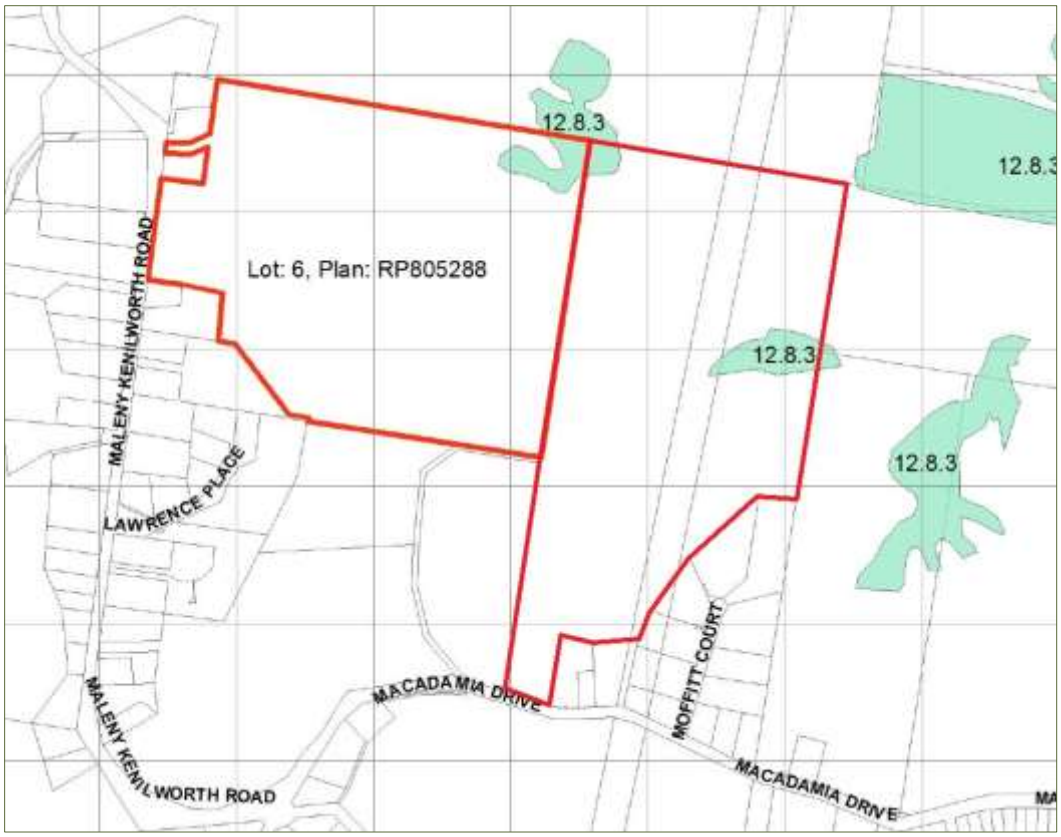
Alcorn Creek supports identified remnant vegetation.

RE12.8.3 – Complex notophyll vine forest

The majority of the property would historically have been covered by this Ecosystem. Although not considered a high priority for conservation in Queensland, there are few areas within the Lake Baroon catchment considered to be in good condition. The two stands are relatively intact but are small and degraded by environmental weeds (lantana) and grazing. Riparian fencing will provide protection but will also require significant weed management to ensure their protection long term.

Other

There are significant stands of regrowth vegetation present over the whole property (both blocks) that require further investigation to determine their value and importance in the landscape.



Remnant vegetation on the Crick property is mainly associated with Alcorn Creek and the uppermost reach of Bridge Creek. Although fragmented and small, it along with fair condition regrowth vegetation are considered important 'stepping stones' for wildlife out of the catchment and into neighbouring Elaman Creek.

2.5.3.2 Flora, Fauna & Corridors

Although the vegetation along Alcorn Creek on Lot 6 is fragmented and dominated by woody weeds Land for Wildlife officers have identified vegetation in the upper catchment as important wildlife 'steeping stones' for movement between the Lake Baroon catchment and neighbouring Elaman Creek to the south west. Restoration of the riparian zone on the Crick property through fencing, weed management and possibly revegetation in the future will contribute to the enhancement of these links.

3.0 PURPOSE, OBJECTIVES & OUTCOMES

3.1 BACKGROUND

A healthy aquatic ecosystem is stable and sustainable; maintaining its physical complexity, biodiversity and resilience. It has the ability to provide ecosystem services that in turn contributes to good water quality, wildlife habitat and recreation.

Riparian areas are the transition zones between land and water environments. They are generally more productive in terms of total biomass than the adjoining area (which contributes to their clearing) and are critical for biological diversity. The protection, enhancement and rehabilitation of riparian zones is essential for sustainable catchment management and reducing risks to water quality.

3.2 WATER QUALITY

The environmental health of the Lake Baroon catchment is considered generally poor, and in some respects declining (personal communications 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 Bridge Creek occur 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.

The sheer volume of excrement produced by cattle, horses, and to a far lesser extent other domestic animals, when in large herd sizes renders them significant contributors within an open drinking water catchment. Reducing connectivity (paddock to stream), through the management of riparian fencing and revegetation, would reduce the likelihood at almost all of the sites identified as high likelihood (pers. comm. A. Smolders 2012).

Less than 10% of the sub-catchment is vegetated; with minimal length of waterways supporting riparian cover of varying quality (mostly poor). The MU contributes a large nutrient load to Bridge Creek, with more than 98% of samples exceeding guideline levels (Dunstan 2007). This is most likely due to the number of rural residential properties combined with intensive grazing although the area utilised for dairying has dramatically reduced since 2007 (fall from 66% of the MU to less than 10%). Recent water quality sampling is not available but it is suspected there has been little improvement and most likely a deterioration as rural residential properties have increased and dairy grazing converting to beef grazing is high risk due to the sharp reduction in investment (pasture management, erosion etc). The MU is noted for its poor water quality but this is probably exacerbated by the fact there is insufficient riparian vegetation to filter nutrients originating in the catchment.

The Lake Baroon Catchment Implementation Plan (2007) rates BR1 a LOW priority for rehabilitation works. When assessing the Management Unit using a modified version of the Prioritisation Process, which prioritises MU's on pollution input levels and land instability parameters, BR1 rates as VERY HIGH; due to the contribution of nutrients and sediments to Bridge Creek.

3.2.1 Statistical Analysis of the Raw Water Quality Data Recorded from Wells Road 1991-2005

Water quality monitoring and analysis sampled at the Bridge Creek crossing (Wells Road) between 1991-2005 by AquaGen shows, that despite a relatively dense coverage of vegetation, the catchment contributes significant nitrates, ammonia, phosphates, total phosphorus and faecal coliforms.

Parameter	*pH (pH units)*	*Turbidity (NTU)*	*NOx (N) (mg/L) (NITRATES)*	*NH3 (N) (mg/L) (AMMONIA)*	*PO4 (P) (mg/L) PHOSPHATE)*	*Total P (mg/L) (TOTAL PHOSPHORUS)*	*Faecal Coliforms (number/ 100 mL)*
Guideline Value (GV)	***6.5-8.2***	***<25.0***	***<0.040***	***<0.010***	***<0.030***	***<0.030***	***<100***
Max	8.2	85.6	0.316	0.166	0.068	0.335	1480
Min	6.7	0.6	0.000	0.000	0.001	0.005	0
Mean	6.9	3.6	0.059	0.026	0.023	0.043	233
Median	6.9	1.4	0.036	0.010	0.013	0.027	60
Std Dev	0.3	16.0	0.214	0.183	0.047	0.068	4627
20th Percentile	6.8	1.0	0.003	0.006	0.008	0.020	20
80th Percentile	7.0	2.3	0.118	0.040	0.041	0.050	390
Count outside GV	0	1	23	24	17	22	20
% outside GV	0.00	1.96	**46.00**	**48.00**	**33.33**	**44.00**	**39.22**

Alcorn Creek is a rugged and remote watercourse with large primary production properties the norm. Access is difficult when dry and impossible during wet weather – particularly in the 1990s/early 2000s - therefore AquaGen sampling sites were confined to the very upstream (Porters Farm) and downstream on Wells Road close to where the creek enters Lake Baroon. A short lived (1994-98) site on Wilson's Farm (unknown location) provides some mid-section data however this almost mirrors the data collected at the Wells Road site. Therefore even though the Wells Road site is a considerable distance downstream of the project site, it provides the best source of data.

The routine sampling programs (CalAqua, AquaGen, Seqwater and others) are suspected of not adequately capturing the major pollution events that regularly occur in the catchment. Conducted either monthly (1991 – 1998) or bi-monthly (1999 – 2005), significant rainfall events in the catchment have probably been missed and the data collected may over-estimate the catchment's water quality (Traill, 2007). The following data analysis has been sourced from Traill, 2007.

As previously mentioned Wells Road is downstream in the catchment and is affected by numerous impacts – urban Maleny, rural residential impacts (septic tanks etc), minor dairy and beef grazing and large areas of vegetation. High volumes of sediment delivered to Lake Baroon from soil erosion also occur in the catchment.

Note: The routine sampling programs (CalAqua, AquaGen, Seqwater and others) are suspected of not accurately capturing major pollution events. Conducted monthly (1991 – 1998) or bi-monthly (1999 – 2005), significant rainfall events in the catchment have likely been missed with the data collected over-estimating the catchment's water quality (Traill, 2007).

Livestock in waterways are high risk to water quality.

Excessive erosion and nutrients delivered from the catchment contribute to cyanobacteria (blue green algae) blooms in Lake Baroon.

3.3 WATER SUPPLY CATCHMENT

The Crick property lies within the Lake Baroon Pocket Dam Catchment. Bridge Creek (2,134 hectares) comprises one of Lake Baroon's three major sub-catchments. Consequently it is a major supplier of total water to the dam.

Baroon Pocket Dam (BPD) is a key source of water supply for Seqwater. Minimum flow volumes from BPD through the Northern Pipeline Interconnector (NPI) northwards are 7 ML/day (subject to availability if BPD falls below 60% capacity) to Noosa NTP; and 30 ML/day (20 ML/day if BPD falls below 70% capacity) southwards to Caboolture, Morayfield and Narangba. This indicates both certainty of supply, location and cost effectiveness of Landers Shute Treatment Plant (AOP 2013).

BPD, along with Image Flat (South Maroochy System) is the predominant source of water supply for northern South east Queensland with Ewan Maddock Dam (EMD), Lake McDonald and Mary Valley Water Supply Scheme considered additional intermittent sources (AOP 2013).

EMD operates on an as needed basis, typically during high demand periods or when raw water quality in BPD is compromised by algal blooms (and possibly turbidity). EMD, relative to Landers Shute (LSTP) is more expensive to produce potable water (despite its recent construction), hence the reliance on BPD and LSTP (AOP 2013).

It's important to note that the NPI (and all pipelines for that matter) require minimum transfer flows at all times to maintain operation and water quality. Typically this is a minimum of 5 ML/day (AOP 2013).

BPD is a reliable source of raw water (volume) but is plagued by quality issues. These issues were somewhat expected when BPD was constructed and hence the design of LSTP, however demand for supply was never intended beyond the southern half of the Sunshine Coast region.

The value of the raw water that originates in the catchment as a whole greatly exceeds the value of primary production.

Lake Baroon catchment	74 km^2 or 7,400 ha
Gross yearly value of water sold by Seqwater (*Saxton et al, 2013*)	$60,000,000
Value of water per hectare	$8,108 per hectare
Area of the Crick property	77 hectares
Annual gross value of raw water originating from the property	**$624,316**

Tourism has become the dominant economic driver in the catchment but relies on both the agricultural landscape (rolling green hills) and natural values equally. This is demonstrated by the popularity of Maleny Dairies milk processing plant and farm tours (in excess of 20,000 visitors per year; pers. comm. Keith Hopper) and the popularity of Mary Cairncross Park (300,000 visitors per year?).

Seqwater who receive the benefits of raw water flowing from the catchment into BPD, have an obligation to invest back into the catchment if water quality improvements are desired; into activities that reduce risks to water quality and its maintenance and protection, and broad environmental health.

The likely scenario under climate change modelling suggests more variable and possibly severe weather events; longer and more severe droughts (below average rainfall per month) and more intense rainfall events.

This will undoubtedly impact on both raw water quality entering BPD and on the storage itself. Between 2010 and 2014 unseasonal dry periods followed by intense high rainfall events have seen an increase in erosion (reactivation of land slips), turbidity and flood damage.

The community expects good water quality at their tap – free from discolouration, odours and the assurance it will not impact their health, and increasingly demands the environment is protected as part of supply.

3.4 OBJECTIVES

Upper Alcorn Creek Riparian Fencing is designed to reduce the impacts of livestock access on watercourses and reduce the delivery of a range of raw water contaminants (pathogens, nutrients, sediments) to Bridge Creek and Baroon Pocket Dam. The project is addressing a key priority in this part of the Lake Baroon catchment – reducing livestock access to and impacts on watercourses. This directly reduces risks to the production of a safe water supply to the Sunshine Coast and beyond. However the project provides far broader environmental benefits that increasingly the community demands and expects.

The project aims to:

- implement an on-ground project that delivers water quality benefits;
- promote integrated catchment management in the Lake Baroon catchment;
- reduce pathogens present in waterways;
- reduce nutrient delivery to waterways;
- reduce sediment delivery to waterways;
- protect and improve aquatic habitats;
- raise community awareness (including water quality issues);
- support and work cooperatively with like-minded community and government organisations;
- protect and enhance habitat;
- contribute to the conservation of threatened species;
- contribute to climate change adaptation; *and*
- demonstrate best management practice of riparian zones, landslips and remnant vegetation.

Effective riparian areas can improve water quality by trapping sediment, reducing erosion, storing nutrients and filtering contaminants before they reach water storages (Lake Baroon). Riparian zone health is a key factor in a riparian area's ability to improve water quality.

3.5 OUTCOMES

Healthy catchments lead to healthy waterways. By improving the health of riparian zones we ultimately aim to mitigate the impacts that can affect water quality. Seqwater provides generous funding and LBCCG offers appropriate incentives to landowners to implement activities that are designed to reduce risks to water quality. Through the prioritisation and implementation of riparian protection and rehabilitation throughout rural catchments – we provide multiple beneficial outcomes.

Outcomes are the 'end product' of our activities – what we actually achieve. It can be very difficult to measure outcomes as they may take many years to be fully realised and can be enormously expensive to quantify – potentially far more than the actual implementation of the project. We must rely on best management practice, anecdotal evidence and ideally partnerships with universities and/or Seqwater to produce 'hard' data to prove the effectiveness of projects.

Our project will:

1. **Reduce pathogen delivery to waterways.**
   Managing livestock in riparian zones reduces the volume of faecal material reaching waterways.

Managing livestock in the riparian zone reduces the opportunity for direct deposition of faecal material into the watercourses. Vegetation buffers (a mix of groundcover and woody vegetation) intercept run-off contaminated with excessive nutrients from diffuse paddock sources.

2. **Reduce nutrient delivery to waterways.**
   Nutrient delivery to waterways is continuous and increases during episodic rain events.

Managing livestock in the riparian zone reduces the occurrence of direct deposition of faecal material into the watercourses. Vegetation buffers intercept run-off contaminated with excessive nutrients from diffuse paddock sources.

3. **Reduce sediment delivery to waterways.**
   Soil from landslips and general erosion leads to high turbidity and is transported to Baroon Pocket Dam and beyond.

Improved management of livestock management in riparian zones reduces bed and bank erosion.

4. **Improve aquatic habitat.**
   Improved management of sediments, nutrients and pathogens improves instream habitat.

A reduction in turbidity, sediments, nutrients and pathogens will improve raw water quality and contribute to enhancing in-stream biodiversity.

5. **Raise community awareness.**
   The majority of land in the Lake Baroon catchment is privately owned and without landholder and community support, activities improving catchment health and water quality is impossible.

The project will demonstrate the value and importance of effective livestock management. On-ground works provide the opportunity for land managers to apply their knowledge and experience at the local level whilst contributing to landscape scale outcomes, increasing the skills and capacity of the community.

6. **Contribute to the viability and resilience of primary production in the Lake Baroon catchment.**
   Primary production has been in decline since 2000.

For long term water quality outcomes it is preferential to work with experienced landholders who understand the catchment and are skilled land managers. New landholders to the area are often ill equipped to manage land and are high risk to raw water quality.

For landholders to implement a water quality improvement project there needs to be a cost benefit rather than a burden on available resources. This project provides a win-win scenario where all stakeholders benefit.

7. **Provide terrestrial habitat and wildlife corridors.**
   Riparian vegetation provides habitat for aquatic and terrestrial wildlife and provides linkages between habitats.

The project will enhance riparian and associated vegetation by limiting livestock access to the riparian zone.

3.6 PRIORITY PROPERTIES IN THE LAKE BAROON CATCHMENT

Priority Landholders are now referred to as *Priority Properties* as there is a relatively high turnover of properties in the catchment.

Priority Properties were initially identified in 2007 (updated regularly, last being 2018) based on land-use, property size, and proximity to Seqwater infrastructure (Baroon Pocket Dam, Maleny Weir, and King's Lane Weir) and/or their potential to adversely impact on catchment water quality.

The Crick property was identified as a priority when it was owned by John Marsson due to size, land use and positions within the Bridge Creek catchment.

3.6.1 Priority Property engagement since 2000

There are 58 Priority Properties in the Lake Baroon catchment (down from 61 in 2017). LBCCG has endeavoured since 2007 to engage as many as possible and implement projects that deliver water quality benefits. Not all landholders will agree to be involved however currently LBCCG has worked with 33 of these properties with a further two receiving minor, non-project assistance (less than $1,000).

A key aim for LBCCG is to spread the funding over as many properties as possible and therefore always prioritise previously un-funded projects/properties over those that have received funding in the past. A simple table is reproduced below showing a 'rough' order of priority and level of engagement. Garry Crick is still listed under three separate properties and the proposed project sites are in bold.

Priority properties engaged

I.D. No	Landholder	Property size Ha	Land use	MU Priority
8	P. Mumford/C. Porter	169	Beef	Very high
9	K. Hopper	62	Dairy	Very high
10	C. Cork	118	Dairy	Very high
11	R. Cork	126	Dairy	Very high
12	G. Muller	74	Dairy	Very high
41	R. (Scott) Newsham	34	Beef	Very high
17	R. McLauchlan	50	Beef	Very high
34	S. Cavanagh (C. Cork)	68	Beef	Very high
1	N. Colley	90	Beef	Very high
2	G. Crick (ex R. Thorne)	104	Beef	Very high
3	V. Richardson	51	Beef	Very high
32	P. Ruddle	73	Dairy	High
33	K. Webster	57	Dairy	High
36	Pacific Farms	134	Horticulture	High
18	D. Beacom	56	Beef	High
19a	Maleny Cheese (Oehmichen)	86	Dry dairy	High
13	K. Thomas	80	Beef	High
26	E. Ferriday	26	Beef	High
27	C. Ling	17	Mixed grazing	High
15	D. Barlow	30	Beef	High
16	G. Newton	25	Beef	High
20	S. Barlow	47	Beef	High
21	B. Gartshore	40	Beef	High
4	**Crick (ex-Nedgus Trustees)**	**39**	**Beef**	**High**
5	R. Sommers	29	Dairy	Moderate
19b	Cimesa/O'Connor (ex Oehmichen)	86	Conservation	Moderate
43	CK Denning	58	Beef/flowers	Moderate
44	N. Macleod	54	Beef/alpaca	Moderate
45	C. Daley	55	Beef	Moderate
53	C. Taylor (ex-King)	44	Beef/horses	Moderate
35	R. Newsham	48	Beef	Moderate
42	P. Howes & Co	40	Beef	Moderate
37	C. Taylor (ex-Stevens)	62	Dry dairy/Beef	Moderate
38	G. Martin	33	Beef	Moderate
39	Montana Park	42	Horses	Moderate
50	Willims	39	Horses/beef	Moderate
14	E. Lawley	60	Beef	Moderate
6	R. Donovan	21	Beef	Moderate
40	F. Woods	49	Beef	Moderate
46	M. Keleher	52	Beef/flowers	Moderate

I.D. No	Landholder	Property size Ha	Land use	MU Priority
52	K. Watter	16	Beef	Moderate
55	D. Boyd	23	Beef	Moderate
54	Unknown (ex-Harwood)	43	Beef	Moderate
7	T. Porter	18	Beef	Moderate
22	R. Lee	27	Beef	Moderate
23	B. McFarlane	38	Beef	Moderate
24	S. Marquardt	15	Beef	Moderate
25	C. Waugh	18	Beef	Moderate
49	K. Garner	27	Beef/horses	Moderate
57	Uniting Church of Aust (Erowal)	26	Dairy	Moderate
58	C. Vermuelen	20	Beef	Moderate
51	N. Forbes	24	Beef	Moderate
28	R. Tonkin	13	Beef	Moderate
29	K. Trevor	20	Horticulture	Moderate
56	B.M. O'Rourke	13	Beef/residential	Moderate
48	**Crick (ex-J. Marsson)**	**38**	**Beef**	**Low**
59	I.L. Porter	30	Beef	Low
60	G. Kruck	13	Hort./grazing	Low

Properties engaged under CORE and/or SCIP Landslide, Dairy or Weed Programs

Minor (less than $1,000) engagement

Projects currently under development

3.7 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 primary area LBCCG (and other community groups) can assist in the management of risk is land use – essentially livestock grazing and the associated key issue of pathogens. A number of factors can contribute to pathogen contribution by livestock. A high likelihood ranking has been attributed by Keys 2009 to any site where the following conditions exist:

- direct animal access to waterways;
- intensive feed lots and dairies;
- heavy broad scale grazing; and
- animal deposition (including bio-solids piles) possible within 50 m of intermittent or permanent waterways.

The sheer volume of excrement produced by cattle, horses, and to a far lesser extent other domestic animals, when in large herd sizes renders them significant contributors within an open drinking water catchment (Baker 2011).

With current control measures in place, water quality is still at high risk from risk sources dominated by land use activities and human access. Key issues in this section include hazards associated with the population growth in the area and the increasing rural lifestyle and urban and peri-urban land uses. Possible future mitigation measures are dominated by improved land management practices, land acquisition (especially close to the dam's edge), reduced access to the dam wall, increased public education and enforcement, as well as monitoring and research (Keys 2009).

The project's objectives and outcomes are consistent with:

- 2015-16 LBCCG Annual Investment Strategy (Lake Baroon Catchment Care Group 2014)
- Lake Baroon Catchment Implementation Plan (AquaGen/LBCCG 2007)
- Lake Baroon Catchment Management Strategy (AquaGen/LBCCG 2004)
- Seqwater Natural Assets Management Plan – Lake Baroon Catchment (Seqwater 2012)
- Sanitary Survey of Baroon Pocket Catchment Report (Seqwater 2015) ***see below***
- 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)

4.0 IMPLEMENTATION

4.1 STAGE 1 2018/19

4.1.1 Off stream watering

LBCCG is only providing troughs and float valves to the off stream watering system. These will be purchased from Grahams Precast Concrete Products (Kyogle NSW). All other materials and installation are the responsibility of the landholder. It is likely Tim Simpson will be engaged to install the OSW.

4.1.2 Stream crossing

Local earthmoving contractor P & K Nash will be engaged to construct the low level concrete stream crossing with landholder labour utilised during the concrete pour and finishing. Cordwells Concrete (Yandina) are the preferred concrete supplier as they are experienced in rural work (such as driving in grazing paddocks).

4.1.3 Weed management

Initial weed management will be the responsibility of the landholder. This will be implemented using tractor mounted quick spray unit. Quick sprays are fast and effective however the potential for off-target damage is relatively high.

4.2 STAGE 2 2019/20

4.2.1 Riparian fencing

All fencing will be completed by local Contractor Tim Simpson (Langdale Stud/Bald Knob Fencing). Tim has long been LBCCG's preferred fencing Contractor and also is exclusively used by Garry Crick for boundary and internal fencing.

4.2.2 Weed management – riparian zone

Weed management will be the responsibility of the landholder. To efficiently manage the weed issue a posi-track mulcher will be engaged. The posi-track will be able to clear weeds selectively in the riparian zone as well as weeds in the grazing paddocks. Posi-track weed management must occur before fencing. Follow up will utilise the tractor mounted quick spray.

4.2.3 Weed management – remnant vegetation

Weed management within remnant vegetation needs to be completed by experienced bush regenerators utilising a range of techniques including the cut and paint method. Contractors utilised will be selected following a successful application to Sunshine Coast Council Landholder Environment Grants.

5.0 ACTION PLAN

Activity Start and Completion dates are indicative only and will be dependent on weather conditions.

Mile-stone	*Action*		*Responsibility*	*Start Date*	*Completion Date*	*Measurable Output*
1	LBCCG Project Plan		LBCCG Project Manager	Aug 18	Aug 18	Project Plan
	Project presented to LBCCG Committee for in principle approval (emailed)		LBCCG Project Manager & Committee	Aug 18	Aug 18	Approved Plan
	Project presented to LBCCG Committee for approval (Management Committee meeting)		LBCCG Project Manager & Committee	Aug 18	Sep 18	Approved Plan
	Project Plan sent to Seqwater for final approval		LBCCG Project Manager	Aug 18	Mar 19	Approved Plan
	Pre-works monitoring (including photo points)		LBCCG Project Manager	Jul 18	Mar 19	Photo & data set
2	***IMPLEMEMNTATION STAGE 1***	OSW materials delivered (troughs)*	LBCCG Project Manager	Mar 19	Mar 19	8 troughs
3		OSW installed	Landholder	Mar 19	Mar 19	(8 troughs)
4		Initial weed management	Landholder	Mar 19	Jun 19	1 hectare
5		Stream crossing installed*	Contractor, landholder	Apr 19	Jun 19	1 crossing
6	Stage 1 completion, monitoring and evaluation, Progress Report		LBCCG Project Manager	May 19	Jun 19	Progress Report
7	LBCCG Project Plan (Stage 2) completed and approved, pre works monitoring completed		LBCCG Project Manager & Committee	Jul 19	Aug 19	Project Plan Stage 2
8	***IMPLEMEMNTATION STAGE 2***	Riparian fencing*	Contractor, landholder	Aug 19	Oct 19	2,300 metres
9		Weed management (landholder)	Landholder	Jul 19	Dec 19	2 hectares
10		Weed management (LEG)	Contractor, landholder	Dec 19	Mar 20	2 hectares
11	Post-works monitoring		LBCCG Project Manager	May 18	Jun 19 ongoing	Photo & data sets
	Progress Reports		LBCCG Project Manager	Jun 18	Jun 20	20 Reports
	Final Report		LBCCG Project Manager	Jul 20	Sep 20	Final Report
12	Further stages		LBCCG Project Manager, landholder	Sep 20	ongoing	TBD

*** activities funded by LBCCG CORE**

Note – the Project Action Plan will be used as the basis for Monthly Reporting (LBCCG Management Committee meetings.

6.0 PROCUREMENT

6.1 SERVICES & PRODUCTS

The Project Manager will have the authority to engage and arrange payment for services and products for all activities once the Project Plan is approved. Any deviation over $300 from the approved Project Budget requires approval from the Project Committee. Services and products will be sourced locally wherever possible and from not-for–profit community organisations if applicable.

Service/Product	***Supplier***	***Contact (if applicable)***
Off stream watering materials	Grahams Precast Concrete Products	-
	Toowoomba Tanks	-
Stream crossing	P & K Nash Excavations	Phil Nash
	tbd	-
Fencing	Langdale Stud	Tim Simpson
	Hicks Fencing	Guy Hicks

Multiple service and product providers are listed to ensure timelines are met. In the event of a provider being unable to supply the requested service or product an alternative supplier will be selected from the list of preferred suppliers. All suppliers must demonstrate full insurance and liability requirements and that all staff or personnel on site are appropriately trained and/or experienced.

7.0 BUDGETS

7.1 STAGE 2 BUDGET

LBCCG has a policy of keeping Project Budgets confidential as individual project costings vary and can give misleading information. Detailed Budgets can be supplied on request. Please contact the LBCCG Project Manager on info@lbccg.org.au for further information.

8.0 HAZARD & RISK ASSESSMENT (HRA)

LBCCG has a comprehensive Safety Management System that clearly directs all aspects of Projects; Project selection (on the basis of safety), Project development, Contractor and/or volunteer engagement, Landholder expectations and requirements, Project implementation and ongoing Project monitoring and evaluation.

LBCCG adheres to the relevant legislation, policy and standard requirements:

- **AS/NZS Risk Management Standard 4360:1999**
  Establishes and implement a risk management process that involves the identification, analysis, evaluation, treatment and ongoing monitoring of risks.
- **AS/NZS 4084:2001 Occupational Health and Safety Management Systems – General Guidelines on Principles, Systems and Supporting Techniques**
  Provides guidance on the development and implementation of occupational health and safety management systems (OHSMS) and principles, and their integration with other management systems.
- ***Workplace Health and Safety Act 2011* (Qld)**
  To prevent a person's death, injury or illness being caused by a workplace, by a relevant workplace area, by work activities, or by plant or substances for use at a workplace.

8.1 ASSUMPTIONS AND LIMITATIONS

Assessment of hazard and risks associated with the project was undertaken as part of the project development process. As a result, the risks and hazards identified are based on existing information about the project at the time of writing, and proposed construction and operational features. Further risks and hazards may be identified in future stages or identified risks could be downgraded or upgraded in terms of the level of risk they pose. Additional mitigation measures as required will be developed and documented in the Implementation Risk Management Plans for the project which will need to remain live documents throughout the relevant project phases. The consideration of natural hazards is based on existing information about the project area including overlay mapping from the former Caloundra and Maroochy Shire Councils (now Sunshine Coast Council). This enables a high level assessment to be made of the risk of natural hazards in the project area, however, detailed modelling or prediction of natural hazards has not been undertaken.

8.2 IDENTIFICATION OF RISKS

Landholder to coordinate Contractors and liaise with LBCCG where required. All activities included regardless of funding responsibility. Hazards (and related risks) have been identified relating to the two on-ground phases of the project (LBCCG components only):

1. Stream crossing installation;
2. Fencing.

The project is believed to be both a safe and efficient livestock management project. All activities and phases present some level of risk however, which can be identified through a HRA so that appropriate management measures can be implemented to reduce or remove the risk.

All site visitors will be provided with a site specific induction. Contractors engaged complete with the LBCCG Project Manager, a *Contractor Field Safety Induction Form* (LBCCG Form No. 007) providing current Insurances, accreditations and acknowledgement of Contractor responsibilities.

9.0 CULTURAL HERITAGE

The Native Title Determination in November 2012 awarded the Jinibara People non-exclusive title of the Maleny area including Baroon Pocket.

The paramount legislation in Queensland, with regard to Aboriginal cultural heritage issues, is the *Aboriginal Cultural Heritage Act 2003*, which states that a person who carries out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage (the 'cultural heritage duty of care') (Section 23[1]). The Act defines cultural heritage as (S8):

- a significant Aboriginal area or Aboriginal object
- evidence, of archaeological or historic significance, of Aboriginal occupation of an area.

A significant Aboriginal area is 'an area of particular significance to Aboriginal people' because of either or both of the following:

- Aboriginal tradition
- the history, including contemporary history, of any Aboriginal party for the area (S9).

The Act states that it is an offence for a person to harm, remove or possess cultural heritage if the person 'knows or ought reasonably to know that the object is Aboriginal cultural heritage' (S26).

The Maleny area and particularly the Baroon Pocket area have significant cultural heritage values for a long period of time. Items of cultural heritage significance can be discovered anywhere in the catchment however riparian zones are a likely location.

The project will involve five activities that could potentially unearth artefacts:

1. Stream crossing – excavation up to 400 mm deep ;
2. Fencing – holes up to one metre deep;

All activity locations other than the areas of intact remnant vegetation have been largely disturbed since European settlement (deforestation) and have undergone significant movement of soil layers – particularly the areas to involve earthmoving activities. Visual inspection of the sites before and during activities will be carried out and if artefacts or suspected features are unearthed activities immediately suspended and the relevant representative contacted (Ken Murphy, Jinibara Elder).

10.0 MONITORING AND EVALUATION

10.1 INTRODUCTION

Monitoring and evaluation strategies are essential components of any environmental rehabilitation project. Evaluation is the best way to improve our knowledge about what works, what doesn't and how we can best direct our rehabilitation efforts. Monitoring strategies are key components of the overall evaluation process that allows you and others to learn from the project and assess whether rehabilitation aims have been met.

Furthermore, monitoring results and information will be used to:

1. Raise awareness and encourage further remediation works with priority landholders (primary producers and large landholders in the Lake Baroon catchment).
2. Promote cooperative projects between Lake Baroon Catchment Care Group, Seqwater, Sunshine Coast Council and other Natural Resource Management organisations.
3. Critically examine techniques and methods used throughout the project to continually improve the service to landholders conducting on-ground works in the catchment and improve best practice management.
4. Develop cost-effective strategies and techniques to perform on-ground activities.
5. Continue to develop monitoring and evaluation program that meets the requirements of funding bodies, but also provides the relevant information and feedback to the LBCCG and Seqwater to improve project delivery.

It can be very difficult to measure outcomes as they may take many years to occur or reach the final result and can be enormously expensive to quantify – potentially far more than the actual implementation of the project. We must rely on best management practice, anecdotal evidence and sometimes partnerships with universities and/or Seqwater to produce 'hard' data to the actual effectiveness of the project.

10.2 MONITORING PROGRAM

Monitoring of rehabilitation activities, particularly the LBCCG funded component – the waterway crossing and drainage works 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) and will check all the fencing integrity. 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.

11.0 REPORTING

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. The project will also be included in the LBCCG newsletter.

Reporting will be completed in two phases.
LBCCG CORE reporting will be completed in September 2018 however the CSA component will continue until June 2010. PowerPoint presentations presented at LBCCG Management Committee meetings will be converted to PDF and placed on the LBCCG website and forwarded to Seqwater.

12.0 REPONSIBILITIES & ROLES

The Project Manager will be responsible for project implementation, management, reporting, evaluation and general management of the project. Other contributions will be on an as-needed basis and the following register of roles will ensure the project is implemented efficiently, effectively and follow best practice.

Role	***Individual***	***Organisation***
Project Manager	Mark Amos	LBCCG
Project Owner	Peter Stevens	LBCCG (President)
Project Committee	LBCCG Management Committee	LBCCG
Technical advice	Tim Simpson	Contractor
	Phil Nash	Contractor
	Tim Odgers	Seqwater
	Matt Bateman	LBCCG Project Manager (Weeds)
	Paul Mackay	LBCCG Project Manager (Beef)
	Alan Wynn	Sunshine Coast Council

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