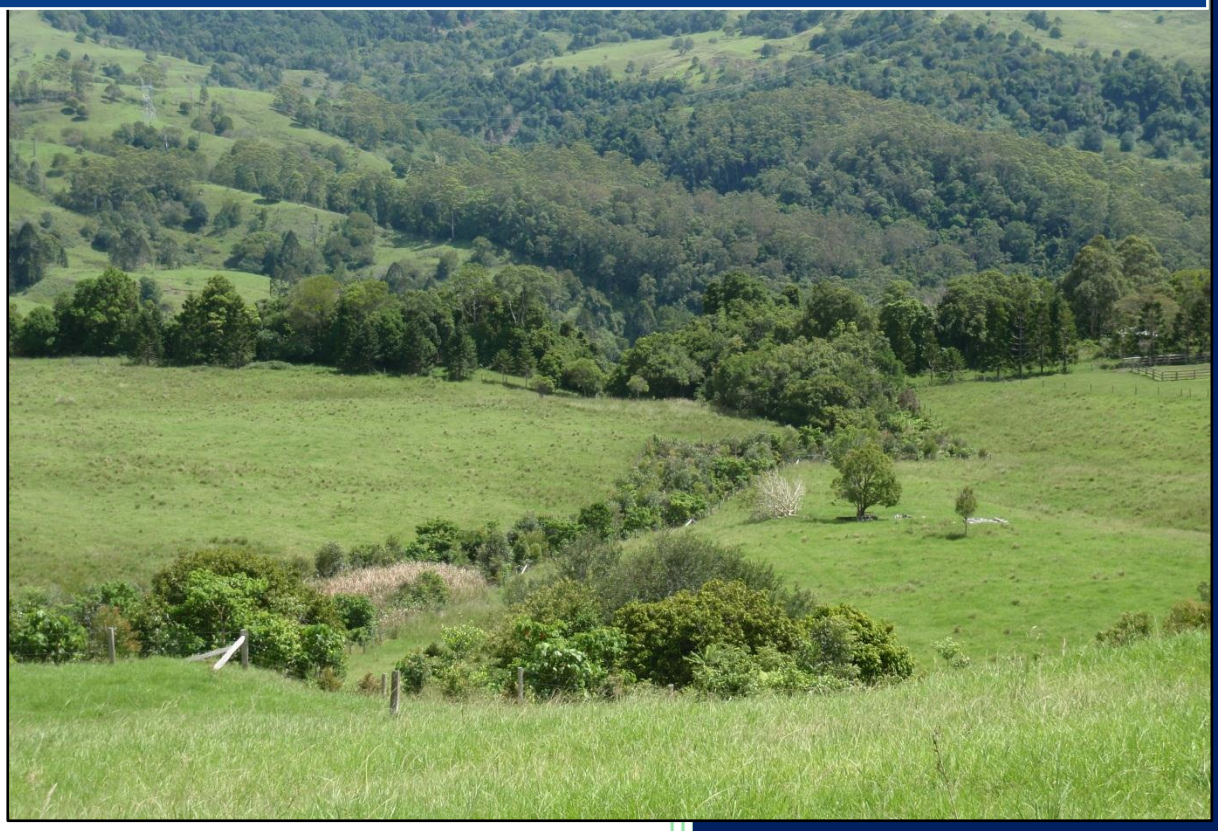
LAKE BAROON CATCHMENT CARE GROUP

Projects 2012-13

Bridge Creek Rehabilitation (Watter) Year 4



PROJECT PLAN

seqwater WATER FOR LIFE

Project No. 1213-007

(0910-007)

(1011-007)

(1112-007)

This Project proposal has been prepared by:

Mark Amos

Catchment Coordinator
Lake Baroon Catchment Care Group

PO Box 567
Maleny, Qld, 4552

Phone (07) 5494 3775
Email info@lbccg.org.au
Website www.lbccg.org.au

This 4th Year Project Plan should be read in conjunction with the previous Bridge Creek Rehabilitation (Watter) Project Plans [LBCCG Project No. 0910-007, 1011-007 and 1112-007)].

PROJECT VERSIONS & APPROVALS

Version	*Date*	*Version/Description*	*Result*
1.0	April 2013	Draft Project Proposal	n/a
1.0	11/4/2013	Project presented to LBCCG Committee	Approved (Minutes 61.6.5.3)
1.0	1/5/2013	Project Proposal forwarded to Seqwater for approval (email)	Approved B. Heck 22/5/2013

Cover photo: *Revegetation of the project site – February 2013.*

TABLE OF CONTENTS

i. SUMMARY

PROJECT NUMBER & TITLE: 1213-007 - Bridge Creek Rehabilitation (Watter) (0910-007; 1011-007: 1112-007)

The proposed project will enhance the filtering and buffering capacity of a degraded waterway in the Bridge Creek catchment; restrict livestock access to an area of hill-slope erosion while improving farm productivity by reducing nutrient, sediment and chemical export.

APPLICANT/LANDHOLDER DETAILS

Names	Kurt & Sally Watter
Postal Address	[redacted]
Phone Numbers	[redacted]
E-mail	[redacted]

PROJECT / SITE LOCATION

Property Address	77 Bridge Creek Road, Maleny		
RP Number (Lot)	RP169376 (1)		
Property Size (ha)	16 hectares		
Existing Land-use	Beef cattle		
Stock Carried	25		
Sub-Catchment	Bridge Creek		
Management Unit	BR2		
M.U. Priority *(LBCCG IP)*	**High**	**M.U. Priority** (Pollution)	**Moderate**

PROJECT PARTNERS/STAKEHOLDERS & ROLES

Lake Baroon Catchment Care Group	Project coordination, administration & reporting, monitoring & evaluation
Seqwater	Project funding ($135 – Year 4 only)
Sunshine Coast Council	Project funding (Land For Wildlife)
Kurt & Sally Watter	Landowners

PROJECT DETAILS

Project Start Date	June 2009	**Project Completion Date**	June 2014
Re-planting	90 plants		

supporting the Sunshine Coast Rivers Initiative

Lake Baroon Catchment Care Group is an on-ground implementation, not for profit community group focussed on improving water quality in the Lake Baroon catchment. 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).

Bridge Creek Rehabilitation (Watter) is a multi-year project commenced in 2009 (*see Project 0910-007 Bridge Creek Rehabilitation [Watter]*). The project focusses on the revegetation of first order watercourses and eroding hill-slopes in the upper Bridge Creek catchment – watercourses identified as contributing significant nutrients and sediments to the lower catchment and Baroon Pocket Dam (AquaGen 2004).

The project to date has met expectations with all components of the project completed on schedule and some activities under budget. Surplus funds has enabled an expansion of the project to include further fencing and revegetation which has effectively linked both project sites and further activities completed by the landholders.

The fourth and final year of the project is essentially a review and minor revegetation (replanting) to ensure the works are ensured of success well into the future and provide the benefits the investment has achieved are maintained into the long term.

The project has had minor issues throughout implementation. Particularly wet summers have somewhat highlighted poor species selection which was exacerbated by poor plant placement (ie species that require relatively dry soils were planted in high moisture areas).

Fencing alignment on the main watercourse resulted in 'choke' or narrow points where a satisfactory width of vegetation was not achieved. Although this will not greatly affect the aim of reducing water quality threats through the provision of a riparian buffer, it will result in greater maintenance burdens into the future (landholder).

Due to the three consecutively wet summers plant growth has been relatively slow, although weed and pasture grass growth has remained high. In hindsight the provision of Think Pink tree guards would have reduced maintenance and labour (once again borne by the landholders). Guards have been retrospectively fitted by the landholders through a Sunshine Coast Council, Landholder Environment Grant in 2011.

The biggest issue however has been the high rainfall event experienced on the Australia Day weekend 2013. Following a prolonged dry period (below average rainfall for six months) a large land slip occurred on the northern end of the hill-slope planting (Stage 2). This has damaged approximately 200 metres of fencing and affected approximately 150 trees.

The landholders have committed to the salvaging of fencing, earthworks to re-profile the landslip and revegetation to ensure the investment by LBCCG and Seqwater is maintained. LBCCG will assist in the repairs by providing surplus revegetation materials and support where possible.

1.0 INTRODUCTION

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

Modern agricultural activities have been identified as a major source of diffuse pollutants into waterways (Polyakov et al, 2005). Land management practices, such as stocking rates, grazing pressures, land clearing and the application of fertilisers have significant impacts on pasture and land condition. These practices can result in erosion processes, decreased infiltration of soils, and excess nutrient and sediment run-off, all of which impact on local water quality.

In an ideal world, all waterways in the Lake Baroon catchment would be rehabilitated to provide riparian buffers, lowering in-stream temperatures and providing habitat for aquatic ecology. However the limited resources available means the catchment needs to be prioritised into areas where the greatest gains can be achieved through the smallest (or most efficient) 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.

2.0 LOCATION

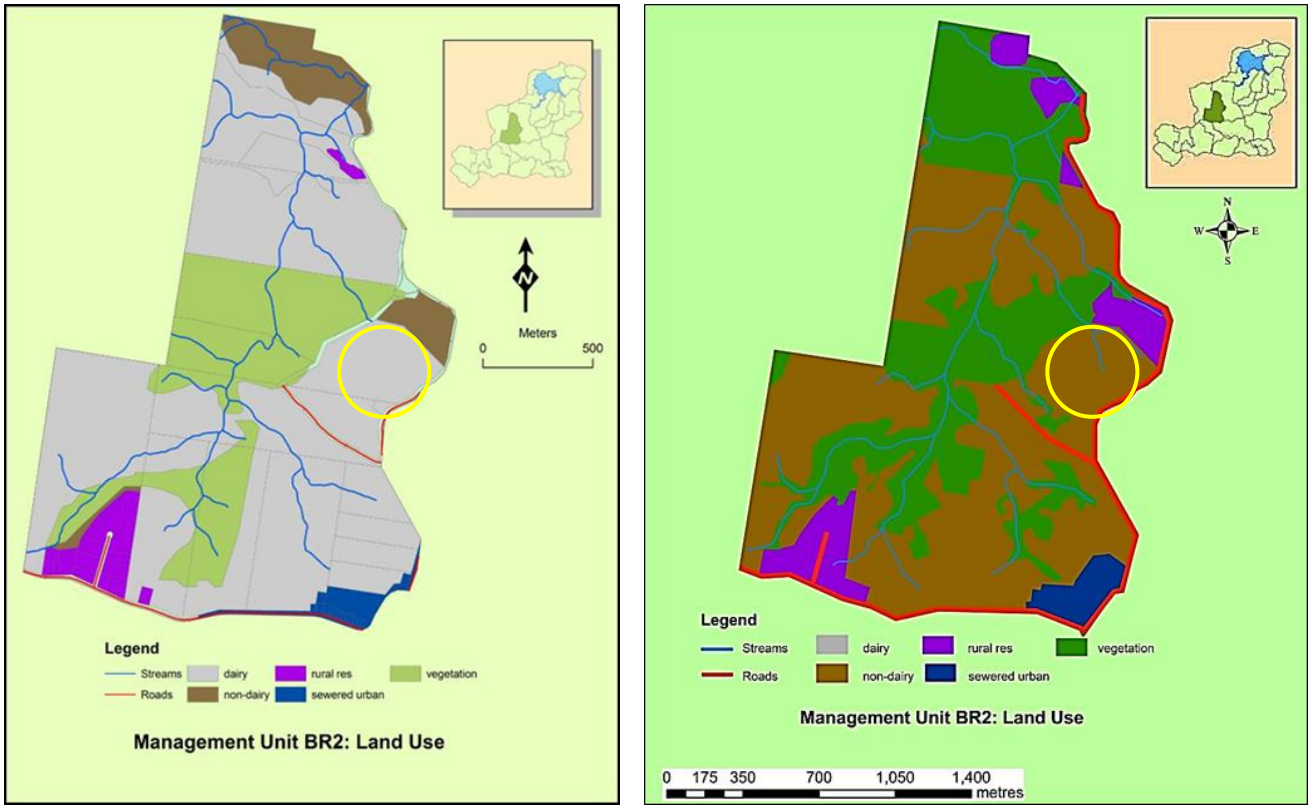
2.1 THE BRIDGE CREEK CATCHMENT

The Lake Baroon Catchment Implementation Plan 2007 describes the Bridge Creek sub-catchment as dominated by natural vegetation, though dairying and cattle grazing is a significant land use in several Management Units. The sub-catchment covers an area of 2,134 hectares and has a total significant stream length of 52 km. Approximately 43% of the sub-catchment has vegetation cover although much of this is significantly disturbed and degraded by environmental weeds (Dunstan 2007).

Bridge Creek has been divided into six management units that reflect property boundaries, physiography, vegetation, land use, point and diffuse source impacts, and administrative convenience. The project site is in Management Unit BR2.

2.2 LAND USE

The proposed project is located within Management Unit BR2. This MU is 323 ha in size and has 98 km of significant waterways. Riparian vegetation is present alongside 85% of the waterway length, although much of this is in a degraded condition from environmental weeds.

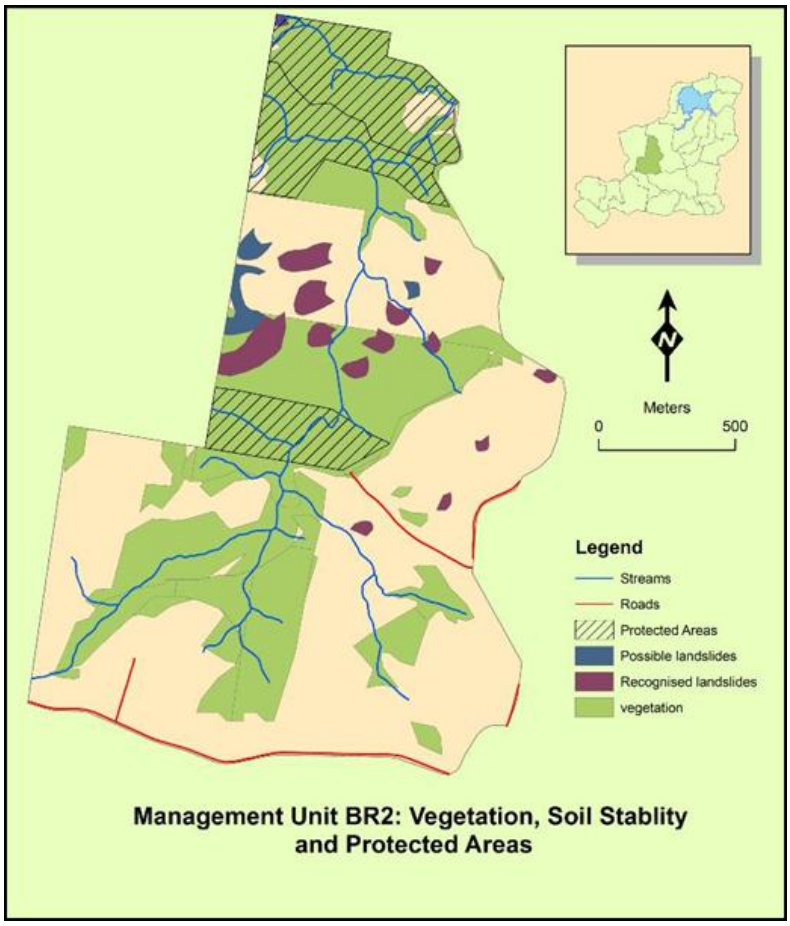


Above: Mapping from 2007 (left) and 2013 (right) highlighting the dramatic changes in land use. In 2013 there are no dairies (or dairy grazing) remaining in the upper Bridge Creek catchment. There has been further urban development in Maleny, and the rural residential growth in the catchment has led to an increase in vegetation. Beef grazing remains the primary land use in the catchment. Project site location highlighted in yellow.

In the early 2000s land use changed dramatically (declining agricultural returns and particularly dairy deregulation), with the loss of all dairy grazing (replaced partially by less intensive beef grazing) and sharp increase in rural residential properties. Vegetation (a large percentage weed species) is returning to once largely cleared properties.

The Watter land parcel however has less than 5% vegetation cover, and as the landholders are not reliant on primary production for income, they have shown considerable interest in waterway rehabilitation and willing to contribute a high level of funds and in-kind support.

2.3 GEOLOGY, SOILS & STABILITY



The catchment is characterised by its steep slopes, lack of vegetation in the headwaters, and the inability of the soil to absorb nutrients and moisture.

Despite this the upper reaches are relatively stable with nutrient inputs relatively moderate.

The middle reaches of the Management Unit have areas prone to slips and mass movement – the most obvious occurring on the Cork property which is immediately downstream of the Watter property.

Left: The Watter property is situated in the middle right of the figure.

3.0 WATER QUALITY

3.1 INTRODUCTION

The environmental health of the Lake Baroon catchment is considered generally poor, and in some respects declining. 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 originate from three main sources:

- diffuse run-off from traditional grazing practices provides nutrient and pathogen inputs (fertiliser application and animal manure)
- sediments (from paddock erosion and bank erosion in watercourses from unmanaged livestock access)
- urban pollution (there is little urban influence in this part of the catchment however road run-off, litter and excessive organic matter remain a risk. Poorly performing rural residential wastewater treatment systems such as septic tanks with high nitrogen, phosphorus and pathogens are high risk).

Just under 45% of the sub-catchment is vegetated, and 27% of the waterways have riparian cover of varying quality. Despite the vegetation, the MU contributes a large nutrient load to Bridge Creek, with more than 95% of samples exceeding guideline levels (Dunstan 2007). This is most likely due to the steep topography, unstable soils and traditionally heavy grazing practices. Bridge Creek is noted for its naturally high phosphorus levels which are mobilised by mass movement and general erosion in the catchment. The riparian vegetation does not currently effectively buffer and filter nutrients originating in the catchment.

The Lake Baroon Catchment Implementation Plan (2007) rates BR1 a LOW priority for rehabilitation works due to its overwhelmingly poor condition (nutrients and erosion). 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 a VERY HIGH (the highest in the Lake Baroon catchment).

3.2 STATISTICAL ANALYSIS OF THE RAW WATER QUALITY DATA RECORDED FROM WELLS ROAD (Bridge Creek) 1991-2005

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 a short distance upstream of Lake Baroon. A short lived (1994-98) sampling site on Wilson's Farm provides some mid-section data however this virtually 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.

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

Parameter	***pH***	***Turbidity***	***NOx (N)***	***NH3 (N)***	***PO4 (P)***	***Total P***	***Faecal Coliforms***
(units)	***(pH units)***	***(NTU)***	***(mg/L)***	***(mg/L)***	***(mg/L)***	***(mg/L)***	***(number/ 100 mL)***
Guideline Value	***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 above GV	0	1	23	24	17	22	20
Count	51	51	50	50	51	50	51
% above GV	0.00	1.96	**46.00**	**48.00**	**33.33**	**44.00**	**39.22**

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).

Traill analysed the available data in 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), dairy and beef grazing and large areas of vegetation. High volumes of sediment are delivered to Lake Baroon from soil erosion also in the catchment.

Turbidity does not appear in the data as a major concern. All sampling sites throughout the catchment have recorded low turbidity despite evidence to the contrary (sediment slugs and visible extremely turbid water during rainfall events). Turbidity is a measure of the degree of scattering light, related to the amount of particulate matter suspended in water. Nutrients such as phosphorus adsorb onto soil particles suspended in the water column. Turbid waters can contain fine clay colloids that are difficult to remove from the water column. These clay colloids reduce light penetration into the water.

Nitrate levels are consistently high with inputs likely to be largely as a result of upstream contamination. Nitrogen is essential for plant growth. However, increased levels of nitrogen can contribute to excessive algal growth (particularly in the Lake Baroon storage) and weeds.

Ammonia levels have remained consistently high. Ammonia is the initial product of the decay of nitrogenous organic wastes - high concentrations of ammonia can be toxic to aquatic life.

Phosphate levels were moderately high in the early sampling period but appear to be declining. However as phosphates are usually bound to sediment and the low turbidity recorded it appears the high phosphate loads have not been captured by the sampling program.

Total Phosphorus has remained constantly high over the sampling period although significant rainfall events have probably been missed which would be expected to provide even higher levels. Phosphorus is an essential plant and animal nutrient. However, increased levels of phosphorus can contribute to excessive algal growth (particularly in the Lake Baroon storage) and weeds.

Faecal coliforms have remained relatively high. There have been considerable changes in land use over the sampling period and a growth in rural residential properties, indicating that either the majority of faecal coliforms are originating in the upper catchment and the intervening riparian vegetation ‘filters’ these pollutants to lower levels, or the replacement of livestock with people has merely changed the origin and not the levels of coliforms. Faecal coliforms are microorganisms found in animal and human excreta. Their measurement is used to indicate the potential presence of pathogens within water. Faecal coliform numbers are an important factor when determining the suitability of a water body for primary and secondary human contact.

4.0 PROJECT JUSTIFICATION

4.1 GRAZING AND RIPARIAN ZONES

Poorly managed livestock grazing in riparian zones can:

- 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 widening or deepening 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 failure leading to accelerated sedimentation and erosion
- decrease wildlife habitat and place pressure on individual species

An effective grazing management plan balances animal demand with available forage supply, distributes livestock evenly, avoids grazing during vulnerable periods, and provides ample rest after grazing. Good management of riparian zones can still provide grazing while still maintaining environmental functionality. Once the vegetation has established grazing may be considered as a management tool.

4.2 VEGETATION AS A BUFFER

The project will re-establish vegetation buffers on the watercourse. Riparian buffer zones are very important for a number of reasons:

- they often contain diverse vegetation communities which provide a habitat heterogeneity for terrestrial and semi-aquatic organisms;
- they can influence water flow, both surface and subsurface, thereby improving water quality;
- they provide shade, which in turn helps control water temperature, algal growth and provides cover for aquatic species;
- they are a source of leaf matter as a source of food, and woody debris for habitat;
- they increase bank stability; and
- they provide corridors for movement of native fauna and flora between geographically separate areas.

The effectiveness of a riparian buffer at achieving each of the abovementioned functions varies depending on several key factors, namely bank slope, vegetation species composition and age, and sediment 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).

4.3 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 catchments (Keys 2009).

4.3.1 Lake Baroon Catchment Strategy 2004

The Lake Baroon Catchment Strategy, produced in 2004 by AquaGen and the Lake Baroon Catchment Care Group prioritised actions for the Bridge Creek catchment.

The first priority was identified as the revegetation of first order streams to maximise buffer capacity and reduce erosion potential. Secondly was the provision of incentives, advice and encouragement to landholders to maintain adequate riparian buffers, erect riparian fencing and exclude stock access to waterways.

4.3.2 Lake Baroon Catchment Implementation Plan (2007)

The LBCIP was developed in 2007 – a joint initiative of AquaGen (pre-Seqwater) and BMRG, and was delivered via LBCCG. The document aligns the summarised actions from the Lake Baroon Catchment Management Strategy (2004) with actions from the NRM plan Country to Coast - a healthy sustainable future. Relevant actions include the development of on-ground works that address water quality, aquatic biodiversity, habitat recovery and particularly community involvement.

4.3.3 Other Relevant Strategies

- Natural Assets Management Plan – Baroon Pocket Dam (2012)
- Catchment and In-Storage Risk Assessment for Water Quality – Baroon Pocket Dam (2009)
- Sunshine Coast Council Waterways and Coastal Management Strategy (2011)
- Mary River and Tributaries Rehabilitation Plan (2011)

5.0 PURPOSE & OBJECTIVES

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

Bridge Creek is characterised by its steep slopes, lack of vegetation in the headwaters and the inability of the soil to adsorb nutrients and moisture. The unique soil properties of the Bridge Creek sub-catchment contribute to the poor water quality results collected by AquaGen and Seqwater, including high loads of Total Phosphorus, oxidised nitrogen, ammonia and faecal coliform levels which consistently exceed guideline levels (ANZECC 2000).

It is essential to protect first order streams with riparian vegetation buffers because the soil and topography is prone to releasing nutrients into streams as part of the erosion process. Water quality results naturally are exacerbated after periods of high rainfall (although sampling is suspected of missing most events) and are attributed to livestock having access to waterways, leachate from wastewater systems, inefficient fertiliser application (more so in the early years of sampling) and steep areas that lack soil binding vegetation, particularly first order streams (AquaGen 2004).

The Lake Baroon Catchment Implementation Plan (2007) rates BR2 a HIGH priority for rehabilitation works. However, 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, BR2 rates as a MODERATE priority.[1]

The project will enhance the filtering and buffering capacity of a degraded waterway in the Bridge Creek catchment; restrict livestock access to an area of hill-slope erosion while improving farm productivity by reducing nutrient, sediment and chemical export.

Priority actions (in priority order) for Bridge Creek:[2]

1. Revegetate first order streams throughout the sub-catchment to maximise buffer capacity and reduce erosion potential.
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.
3. 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.
4. Actively support SCC Land for Wildlife, NRM Small Grants Scheme and legal covenant agreement initiatives that protect and rehabilitate remnant vegetation and enhancement projects.

[1] Dunstan, M. 2007, Lake Baroon Catchment Implementation Plan, Aquagen Water & Renewable Energy, Palmwoods.

[2] Traill, C.B. 2007, *State of the Lake Baroon Catchment, Volume 2: Appendices*, AquaGen Water and Renewable Energy, Palmwoods.

5.1 TARGETS

Project Objectives:
* community benefit
* environmental benefits
* water quality benefits
* demonstration of best practice

Re-vegetation Objectives:
* restore tree canopy with moderate diversity through revegetation
* restore 90% canopy within 5 years
* retain grasses between rows and in waterway channel until revegetation establishes
* after 2 years encourage natural regeneration

Target Condition:
* stable waterway with erosion reduced to natural levels
* 75% canopy closure (revegetation) in 3 years (90% in 5 years)
* extend vegetation corridor by 550 metres
* exclude livestock from 350 metres waterway
* exclude livestock from 200 metres of eroding hill-slope (4,000m^2)
* provide 1 hectare of new habitat

5.2 OUTCOMES

Healthy catchments lead to healthy waterways. Through the prioritisation and implementation of riparian protection and rehabilitation throughout rural catchments – particularly headwaters, we can provide multiple beneficial outcomes.

1. Reduce nutrient delivery to waterways.

Nutrient delivery to waterways is continuous and increases during episodic rain events.

Vegetative buffers intercept run-off contaminated with excessive nutrients from diffuse rural and urban sources (stormwater).

2. Reduce sediment delivery to waterways.

Soil from erosion leads to high turbidity and is transported to Baroon Pocket Dam and beyond.

Vegetative buffers stabilise eroding riparian zones and intercept run=off contaminated by sediments. Our project will re-establish riparian vegetation that will slow flows reducing erosive potential while capturing sediments.

3. Improve aquatic habitat.

Riparian vegetation plays a critical role in the creation and maintenance of aquatic habitats in freshwater ecosystems.

Riparian vegetation provides shade, limits nuisance aquatic plant growth, provides vegetative inputs that serve as habitat and food, and provides bank and bed stability.

4. 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 importance of excluding livestock from riparian zones and the reestablishment of vegetation to improve water quality – both throughout the catchment and Lake Baroon. 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 in the community.

5. Improve farm productivity.

Watercourses and riparian zones are difficult to manage in the farm management context.

Excluding livestock from riparian zones and watercourses can improve the health of livestock (providing off stream watering that provides cleaner water and less disease), facilitates easier mustering and reduces the risk of injury through misadventure.

6. Whole farm approach to property management.

Clear property management objectives that take into account environmental considerations lead to efficient and effective projects.

All the landholders involved have clear Property Management Plans and property objectives to ensure all activities will be implemented in a permanent and cost effective manner.

7. Reduce impacts of weeds.

Weed sources in the upper catchment contribute to the proliferation of weeds through seed and vegetative material.

The project sits in the headwaters of Lawley Creek and through staged and comprehensive weed management will remove weed sources – particularly WONS lantana, and to a lesser extent local priority Camphor laurel, Privet and Chinese elm.

8. Restore links between vegetation and create corridors.

Riparian zones provide wildlife corridors so that fauna can safely move from one area to another.

The project will reinstate a link between the remnant vegetation on lower Lawley Creek and vegetation in the headwaters of adjacent to urban Maleny.

9. Provide terrestrial habitat including 'Essential Habitat'.

Riparian vegetation provides important habitat for the adult stages of aquatic insects and amphibious organisms such as frogs and turtles.

The project will reinstate riparian and associated vegetation providing, in time, valuable habitat for a variety of native fauna. EPBC listed species will benefit from the enhancement and expansion of native vegetation.

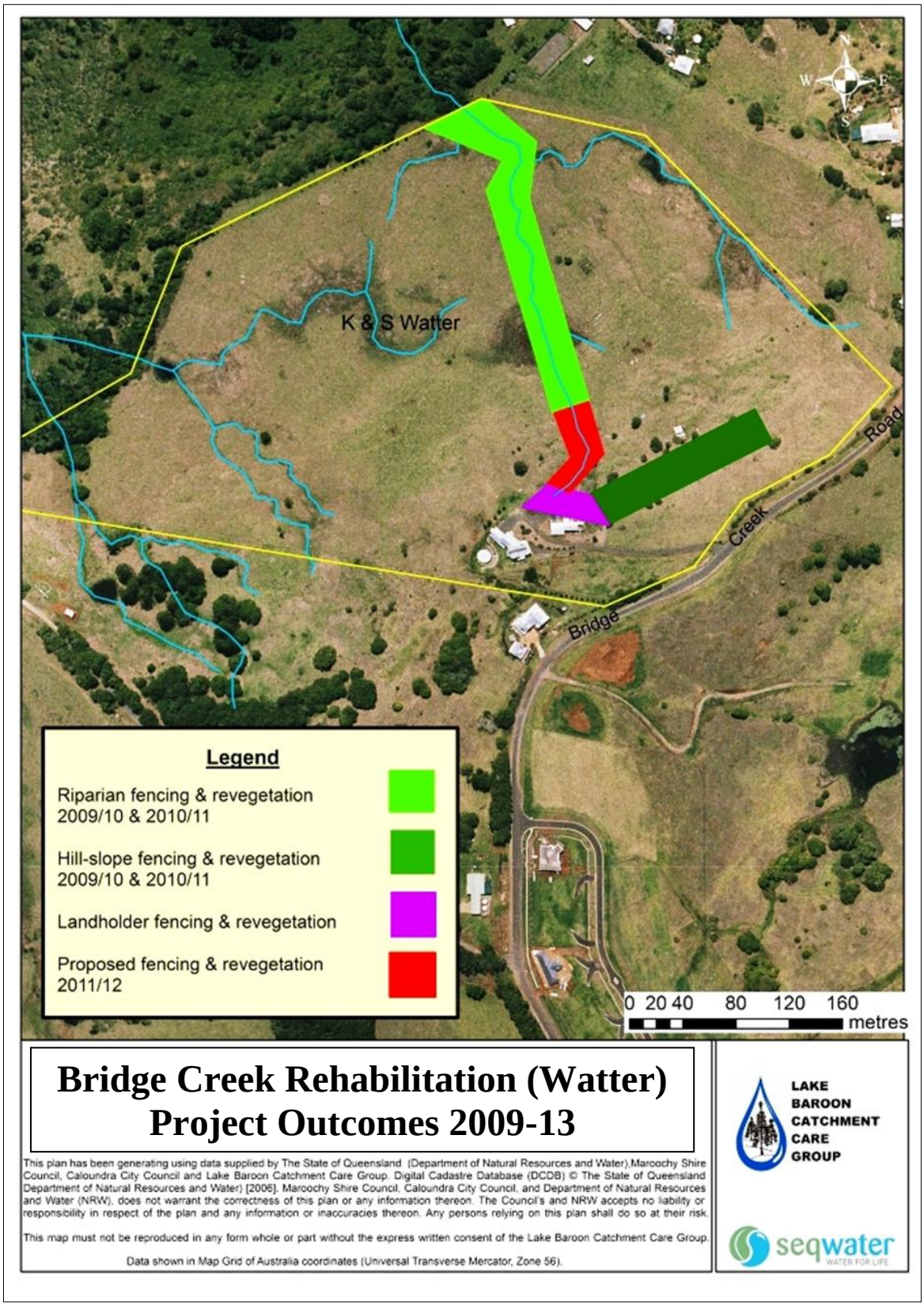
10. Reduce chemical delivery to waterways.

Improved water quality monitoring and analysis by Seqwater has identified pesticide and herbicide contamination in Baroon Pocket Dam.

The project will reinstate riparian vegetation on 1st and 2nd Order streams adjacent to agricultural land (and urban Maleny) providing a buffer to pesticides and herbicides.

6.0 IMPLEMENTATION

6.1 PROJECT OVERVIEW



Above: Project Overview - proposed on-ground works.

6.2 PROJECT EVALUATION

6.2.1 Planned Activities

Several projects commenced in the 2009-10 financial year were planned over several years. This was done primarily to implement property management plans (completed by the landholders in conjunction with LBCCG) in realistic timeframes and to maximise resources (including funding). It also meant that LBCCG wouldn't commit high levels of funding without a staged process, ensuring that each step of the project was evaluated before the next step of activities and funding was committed.

The Lake Baroon catchment is unique in its climate (2,000 mm rainfall), topography and land use. Property management plans need to be flexible, landholders and project stakeholders adaptable and projects especially, continually evaluated to ensure that aims are met and maintained, and property management follows best practice.

Above: The project is designed to remove livestock access from a first order stream and re-establish a vegetative buffer to reduce erosion and filter agricultural pollutants.

The project (at least up until recently) has performed quite well although plant establishment in Site 1 (the main watercourse on the property) has been difficult. Species selection on Site 1 has proved to be reasonably poor – mainly due to the wet conditions experienced since planting and was compromised further by poor placement of species during planting (Barung Landcare). Ultimately losses have been higher than normal and growth rates far slower than ideal. Replanting has been completed by the landholders at their own expense.

The waterway has immediately started to recover with the livestock excluded. The channel itself is becoming more defined and over time this will result in less waterlogging which played a large role in revegetation species selection for the site. The sparse native sedges and rushes present in the waterway are gradually spreading and assisting to stabilise the waterway.

Some of the revegetation species selected tolerate the wet conditions and they will assist in drying the saturated soil profile enabling follow up planting of more suitable riparian species. The use of *Melaleuca quinquenervia*, although technically not an indigenous species to the property will provide a very useful role of providing canopy in waterlogged areas but also assist in drying the soil profile

(these can be removed in the future if deemed to be troublesome or becoming weedy to the detriment of more useful or appropriate species).
It is clear that minimum width buffers need to be established (particularly when being revegetated). High edge to total area ratios compromise the effectiveness of vegetative buffers and will result in higher maintenance inputs for a longer period of time. Despite this the riparian buffer will still provide the project aim of reducing threats to water quality by providing a barrier between the stream and agricultural activities (grazing).

The fencing budget was underspent and surplus funds were used to extend the fencing to link Site 1 and 2. This area has been revegetated, along with an area immediately below the house that suffered from land slip in 2011. This has been completed by the landholders.

Survival rates on Site 2 have been exceptional with barely any trees requiring replacement. This is surprising as this site was predicted to suffer from excessive dryness, poor soil structure and low fertility. With the wet years experienced on the Maleny plateau this site has performed well, although the conditions have been to the detriment of Site 1.

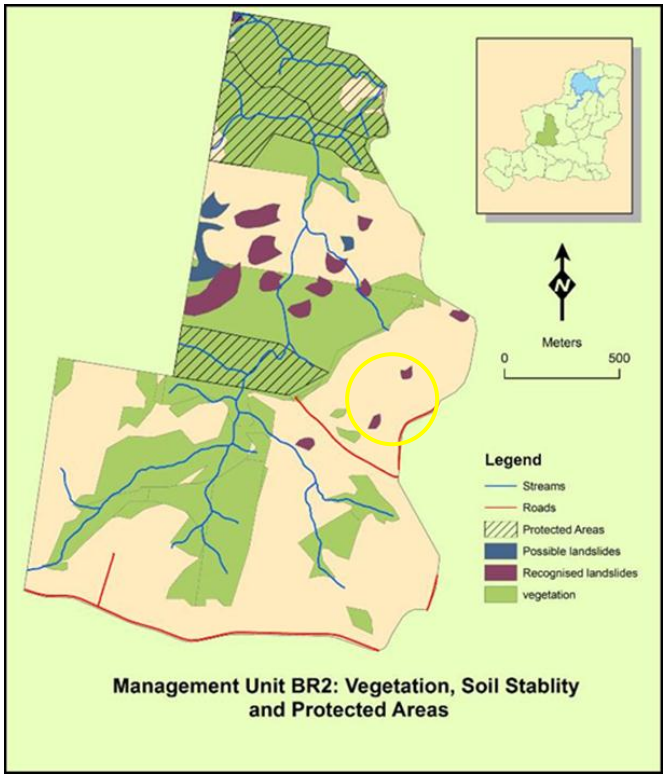
Maintenance is carried out by the landholders Kurt and Sally Watter and has been performed to a high quality.

6.2.2 2013 Landslip Damage

The Australia Day weekend rainfall event saw approximately 830 millimetres of rain fall over a four day period. Combined with the exceptional dry period experienced in the preceding six months resulted in numerous land slips throughout the Lake Baroon catchment. Many previously stable slips were reactivated – with one occurring at the eastern end of the hill-slope revegetation site (Site 2).

The slip has damaged approximately 200 metres of fencing and 150 trees. The landholders have committed to the salvaging of fencing, earthworks to re-profile the landslip and revegetation to ensure the investment by LBCCG and Seqwater is maintained. LBCCG will assist in the repairs by providing surplus revegetation materials and support where possible.

Left: The landslip on the Watter property has damaged fencing and trees.



Catchment soil stability mapping had previously identified the property as having two small areas prone to land slip although the hill-slope at the beginning of the project was thought to be stable. The hill-slope grew little pasture and was criss-crossed with cattle tracks which resulted in sediments being washed down hill in rainfall events and entering the waterways.

It is suspected that the nearby Bridge Creek Road drainage was directing flows onto an area already compromised by deep cracking (a result of the previous dry soil conditions). This has been remedied by Sunshine Coast Council.

The landholders have engaged an experienced, local earthmover to profile the site and improve drainage.

The salvaged fencing will then be re-erected and the site revegetated. Hoop and Bunya pines have been suggested to plant on the debris slide and on the hill-slope above to provide long term stability.

Left: The Watter landslip from Tesch Road Witta.

Left: The top of the slip.

6.3 2012-13 ACTIVITIES

6.3.1 Replanting

Re-planting has already been completed and effectively the project has entered the 'on maintenance' phase.

7.0 PROCUREMENT

7.1 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.

7.2 FINANCIAL YEAR LBCCG FUNDING BUDGET

All figures are exclusive of GST

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.

7.3 CURRENT FINANCIAL POSITION

All figures are exclusive of GST

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.

7.4 2012/13 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 ACTION PLAN

Re-planting has already been completed and effectively the project has entered the 'on maintenance' phase.

9.0 MONITORING AND EVALUATION

9.1 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.

9.2 MONITORING PROGRAM

Monitoring of rehabilitation activities, particularly the LBCCG funded component – fencing, will be split into periodic and episodic monitoring.

Periodic monitoring is important to measure the effectiveness of the fencing over time and will occur on a biannual basis by LBCCG.

Episodic monitoring will occur following significant storm/rainfall events (or extended dry periods or frosts) and will check fencing integrity and revegetation condition. 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.

10.0 COMMUNICATIONS

Project reports will be provided at monthly LBCCG meetings. A Progress Report will completed once all Seqwater funded activities have been completed with a Final Report produced once all on-ground activities are completed. 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.

11.0 ROLES & REPONSIBILITIES

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 Sponsor	Tim Odgers	Seqwater
Project Committee	Steve Skull	LBCCG (Management Committee)
	Gillian Pechey	
	Keith Schelberg	
Technical advice	Wayne Webb	Barung Landcare Nursery
	Karen Shaw	Brush Turkey Enterprises Nursery

12.0 REFERENCES

Abal, E.G., Bunn, S.E & Denison, W.C. (Eds.) 2005, *Healthy Waterways Healthy Catchments: Making the connection in South-east Queensland, Australia*, Moreton Bay Waterways and Catchments Partnership, Brisbane.

Alt, S., Jenkins, A. & Lines-Kelly, R 2009, *Saving Soil – A landholder's guide to preventing and repairing soil erosion*, Northern Rivers Catchment Management Authority, NSW.

Baker, D. 2011, *Sanitary Survey of Somerset and Obi Obi Catchments*, ALS Water Resources Group, Penrith, NSW.

Barwick, M, Wassman, D & Pitman, K. 2009. *Maleny Community Precinct Environmental Management Scoping Document*, Australian Wetlands Pty Ltd, Caloundra, Qld.

Department of Environment and Resource Management, *Development of a water quality metric for south east Queensland*, 2010

Dudgeon, S & Dunstan, M. 2007 *Large Scale Waterway Rehabilitation Business Case: Final Report*, Natural Solutions Environmental Consultants, Noosa Heads, Qld.

Dunstan, M 2007, *Lake Baroon Catchment Implementation Plan*, AquaGen Water & Renewable Energy, Palmwoods.

Keys, S., Murton, S., Costanzo, S. & Thompson, A. 2009, *Catchment and In-Storage Risk Assessment for Water Quality – Baroon Pocket Dam*, Sinclair Knight Merz, South Brisbane.

Murton, S. & Keys, S. 2012, *Seqwater Natural Asset Management Plan – Lake Baroon*, Sinclair Knight Merz, Brisbane

Stockwell, B., 2001, *Mary River and Tributaries Rehabilitation Plan – Implementation Edition*, Mary River Catchment Coordinating Committee, Gympie, Australia.

South East Queensland Healthy Waterways Partnership 2007, *South East Queensland Healthy Waterways Strategy 2007-2012*, South East Queensland Healthy Waterways, Brisbane.

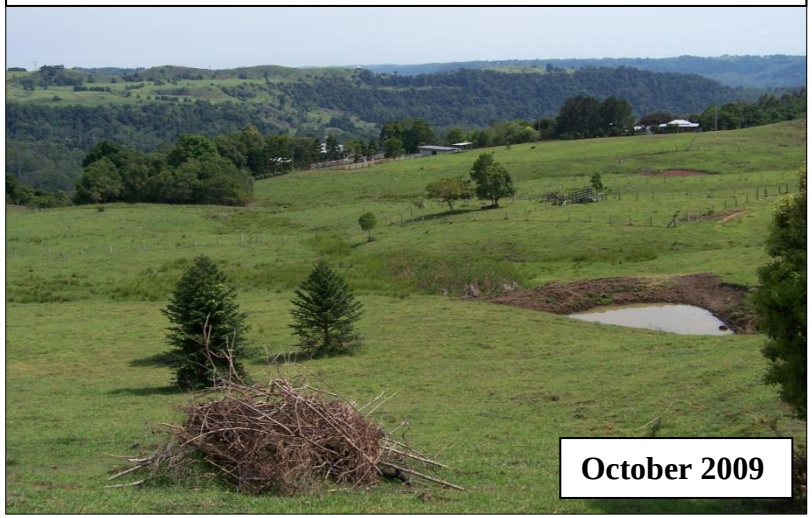
South-east Queensland Regional Water Quality Management Strategy Team, 2001. *Discover the waterways of South-east Queensland: Waterways health and catchment management in South-east Queensland, Australia*, South East Queensland Healthy Waterways, Brisbane.

Sunshine Coast Council 2011, *Sunshine Coast Waterways and Coastal Management Strategy 2011-2021*, Sunshine Coast Council, Nambour, Qld.

Traill, C.B. 2007, *State of the Lake Baroon Catchment, Volume 2: Appendices*, AquaGen Water and Renewable Energy, Palmwoods.

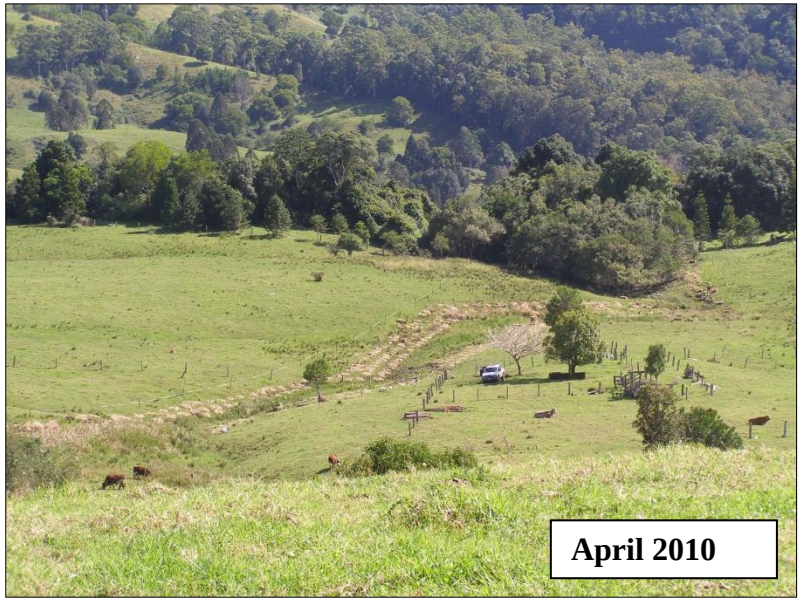
Ziebell, D & Richards, PL 199, *Gully Erosion in South Gippsland*, Landcare Note SC0039, State of Victoria, Department of Natural Resources and Environment.

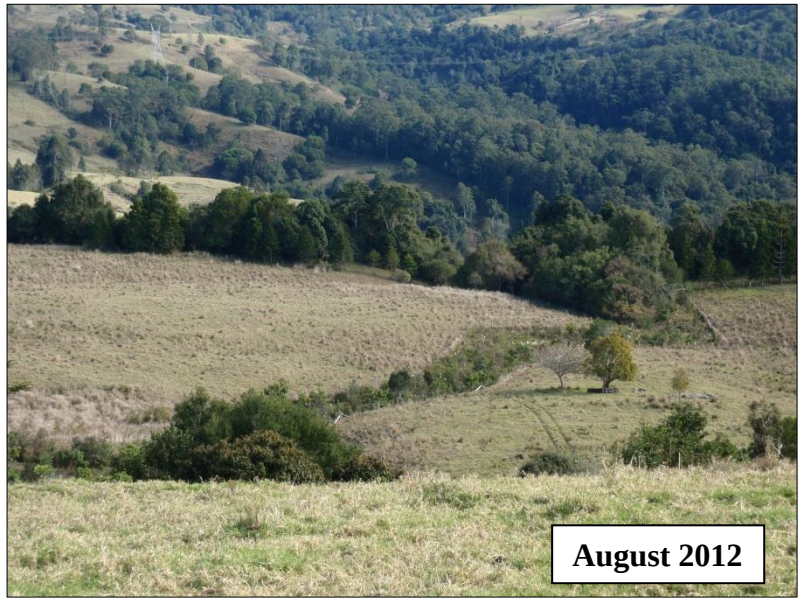
APPENDIX - PROJECT MONITORING



SITE 1

SITE 1 - UPPER





SITE 1 – FROM BRIDGE CREEK RD

SITE 2

3.4 EXTRA ACTIVITIES

Surplus funds were utilised for extra fencing and revegetation to link Site 1 and 2. A landslip immediately below the house was repaired and revegetated at landholders cost.