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Rural Best Management Practices in Moreton Bay Regional Council
An Implementation Framework

June 2013

Moreton Bay Regional Council

Rural Best Management Practices in Moreton Bay Regional Council - An Implementation Framework

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Title :	Rural Best Management Practices in Moreton Bay Regional Council - An Implementation Framework
Authors:	Nina Saxton, Michelle Walker, Tony Weber
Synopsis :	This document outlines the context and options for implementing rural best management practices across the Moreton Bay Regional Council area as part of the assessment of implementation actions arising from the development of the Total Water Cycle Management Plan for MBRC.

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1 INTRODUCTION

Rural lands in the Moreton Bay Regional Council jurisdiction cover approximately 86% of the Council area and are formed of key uses such as horticultural activities, cattle grazing, rural residences, and green space zones. Given this large coverage, it is important that Council understand how their interaction with these rural uses can facilitate better outcomes for the wider community, the local economy and the environment. In many cases, the implementation of specific activities or best management practices may help in alleviating overall impacts.

This report outlines the findings of two stakeholder workshops and further analysis to examine this issue. It provides the background context as to why rural lands should even be considered for active management, outlines approaches used for rural best management practice implementation in other areas across Queensland and discusses potential implementation frameworks and ways forward.

The project was a combined effort of Council, BMT WBM, Curious Minds Co., and Northern Environmental Solutions, plus a range of stakeholders from Council, Unitywater, the Department of Agriculture Fisheries and Forestry, SEQWater, Pine Rivers Catchment Association and SEQ Catchments.

Ultimately, the health of the catchments and waterways within the Moreton Bay Council region is highly dependent upon what happens in the rural lands. Council's involvement in the management of these areas needs to build and continue to seek better methods of implementing rural Best Management Practices. From this study, a list of actions and suggested processes has been developed to assist Council in this process.

2 RURAL BMPS – THE CONTEXT

2.1 Land use

The Moreton Bay region contains a mix of land uses characteristic of an outer suburban/peri-urban region. Included in that mix is a significant area of rural lands. From previous work in developing a catchment model for the Moreton Bay Council region (BMT WBM, 2010), a compilation of the land use areas were derived. Figure 2-1 shows the landuse spread over the Moreton Bay Regional Council area. Tables outlining show the aggregation of the more detailed land use classes into higher level classifications are given in the Appendices.

The land use dataset was supplied by MBRC as part of the catchment modelling project. This was based on the MBRC Digital Cadastral Database (DCDB). Land use within this dataset was grouped into 65 specific categories and aggregated into higher level categories. This dataset was modified to reduce the total number of land uses from 65 down to 13 based on similar hydrological configurations for the region (refer to the Appendices for information on which land use classes were aggregated into the 13 adopted categories).

Where gaps existed in the spatial coverage of the MBRC data, information was sourced from regional catchment models (typically Queensland Land Use Mapping Project – QLUMP, 2005 data).

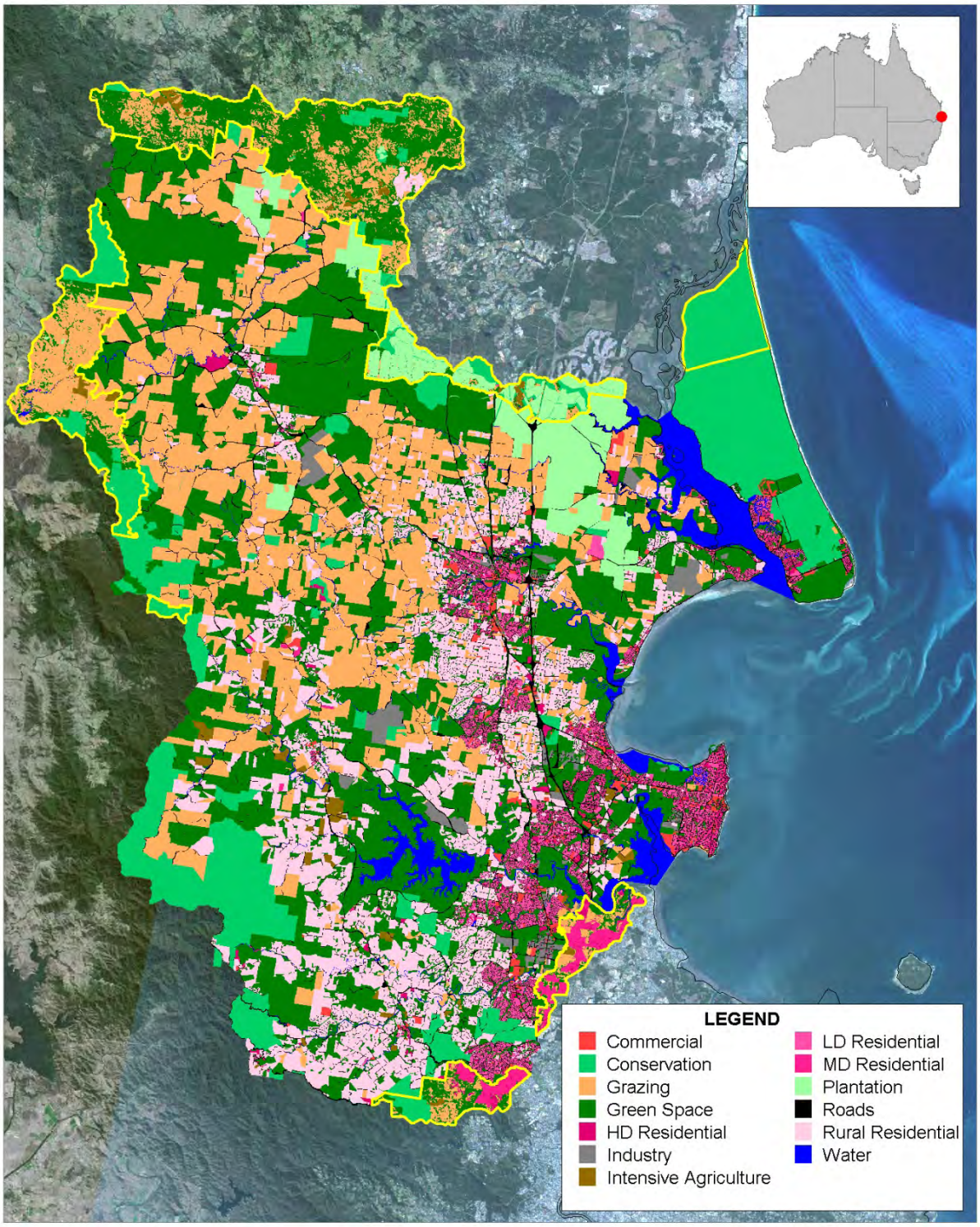


Figure 2-1 Land Use in the MBRC Region

After compiling, the land use information was examined to understand the relative coverage of each land use within the catchment. This is best illustrated in the Figure below.

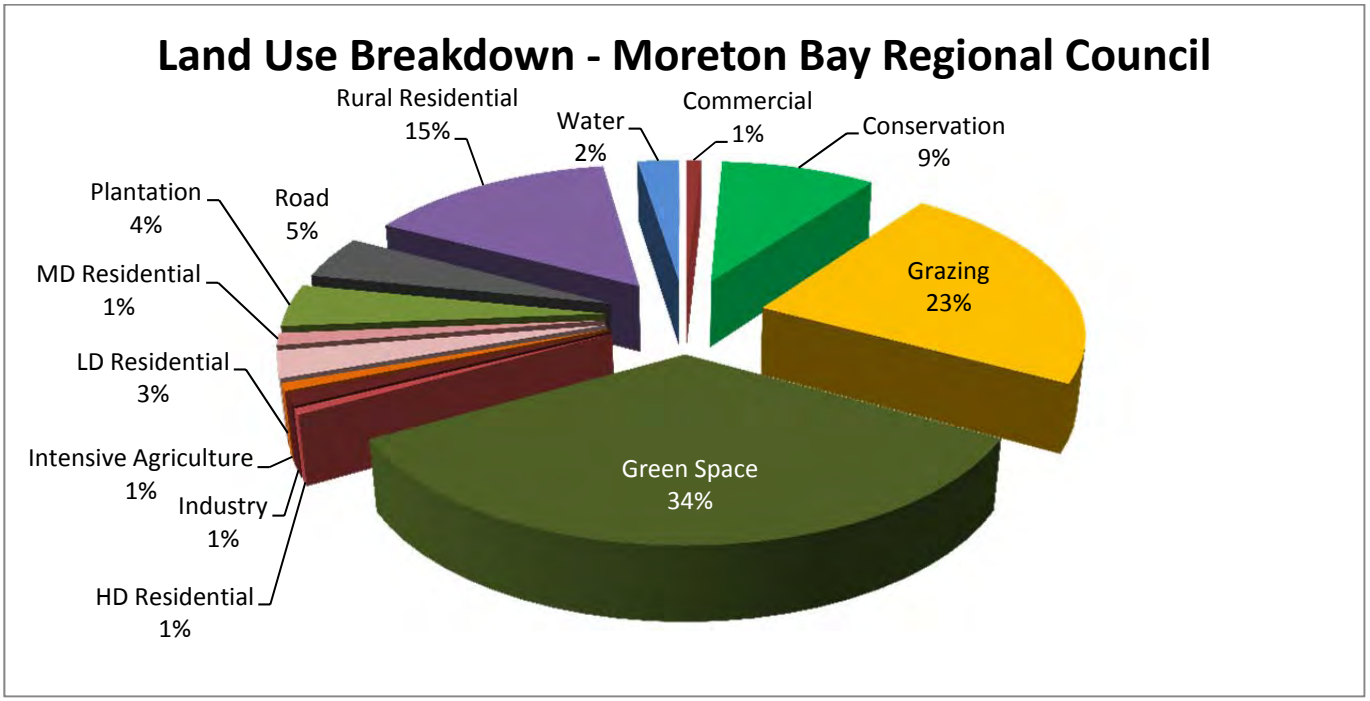


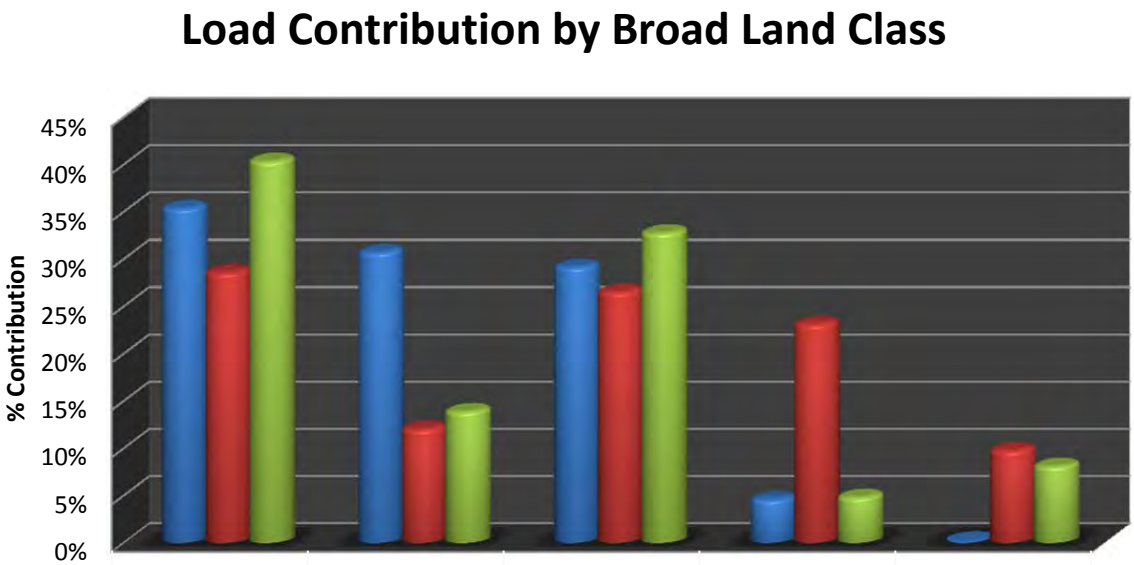
Figure 2-2 Land Use Proportions by Classification – MBRC Region

At a regional level, this shows that green space and grazing lands are the dominant land use areas, however there is also a significant proportion of rural residential land use in the catchment, while urban lands occupy a similar areal coverage. This demonstrates the importance of targeting rural best management practices in the 'peri-urban' sector given the extent of the land use in comparison with urban lands. Further analysis (below) examines how this coverage is related to pollutant load contributions from rural lands.

2.2 Pollutant Load Contributions

The previous MBRC catchment model (BMT WBM, 2010) was run over a 30 year period (1980-2009) to examine the pollutant load contributions from all land use classes in the region, with a focus on those rural land uses as discussed above.

The figures below outline the proportional land use contribution as grouped broad class contributions for each constituent, in addition to individual contributions (averaged over total suspended solids, total nitrogen and total phosphorus) for each land use type.



	Urban	Rural Res	Agriculture	Green Space	Point Source
TSS %	35%	31%	29%	5%	0%
TN %	29%	12%	27%	23%	10%
TP %	40%	14%	33%	5%	8%

Figure 2-3 Broad Land Use Contributions

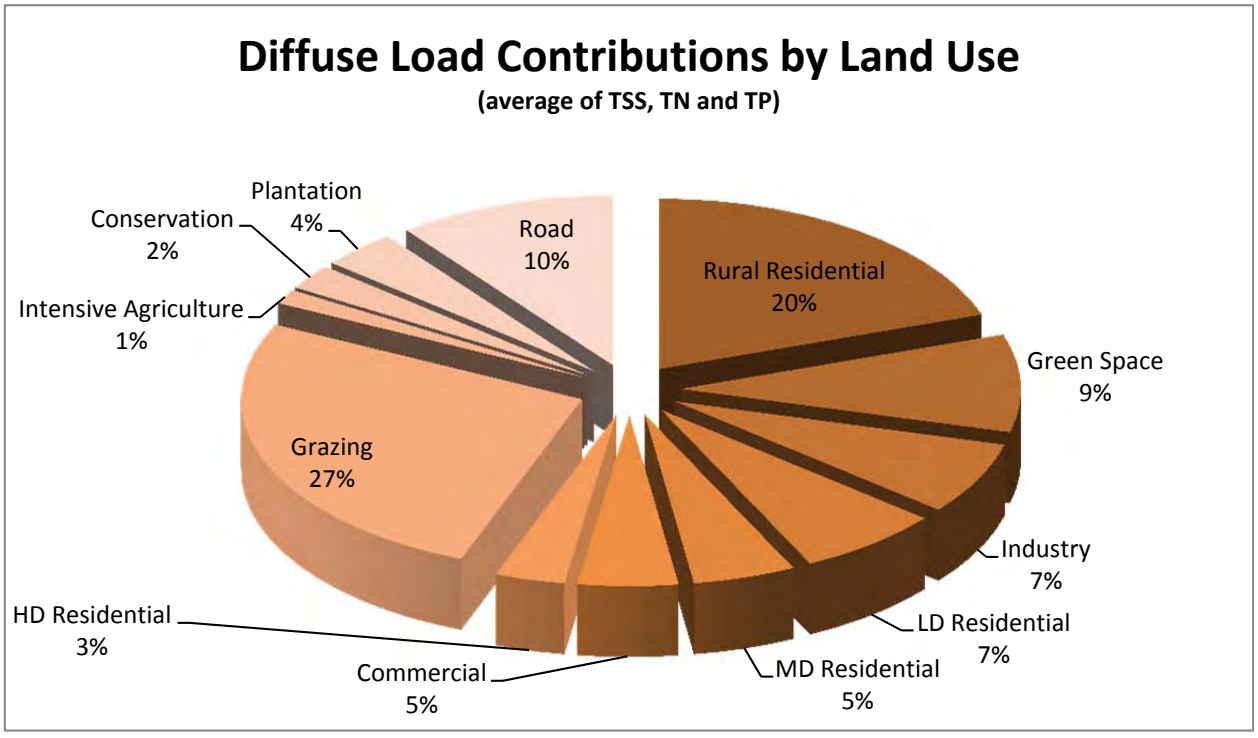


Figure 2-4 Individual Land Use Contributions

In terms of pollutant contributions for the entire region, this shows that urban lands dominate in terms of proportional loads, however the rural lands as considered in this project (rural residential and agriculture) contribute approximately 60% of the sediment loads to receiving waters, and approximately 40% of the nitrogen loads and 50% of the phosphorus loads. Again, this highlights the

need to focus on rural best management practices in order to reduce sediment and nutrient contributions to the receiving waters, but when considered individually, it is particularly interesting to note the extent of the rural residential and grazing land relative contributions to the diffuse source loads with them providing nearly half of the average diffuse load contributions to waterways. The significant proportion that is the rural residential lands suggest they should be considered as important as grazing lands or even urban lands in terms of their overall contribution and priority for management, whereas intensive agriculture (which includes the key horticultural industries such as pineapples and poultry) contribute only minimal loads when considered at the regional scale, though localised effects from such land uses can still be significant to smaller streams and waterways immediately downstream of them.

Key contributors to pollutant loads by land use type

A review of the relevant data shows that urban lands dominate in terms of proportional loads, however rural and rural residential lands are also significant contributors:

1. Agriculture (grazing, plantation and intensive agriculture) – 29% TSS, 27% TN and 33% TP
2. Rural residential – 31% TSS, 12% TN and 14% TP.

The data indicates that grazing and rural residential contribute a combined 47% of the rural diffuse loads to waterways, specifically:

3 REVIEW OF RURAL BMPS AND THEIR ADOPTION

3.1 Applicable BMPs for MBRC

The rural areas within the Moreton Bay Regional Council (MBRC) Local Government Area (LGA) cover 1991 km^2.

Previous extension work in the LGA has focused on specific horticulture farming, e.g. strawberry and pineapple production. However, a large percentage of the area is grazed for beef cattle production, with a small amount of dairying still occurring in the catchments. The change in rural landuse from primary production to peri-urban has also seen an increase in grazing of domestic animals such as horses and goats as well as non-commercial numbers of cattle on small acreage. Poultry farming and turf farms are also important industries in the LGA. Given the complexity of landuses in the rural landscape it is not surprising that the best management practices (BMPs) applicable to the LGA region are numerous. However, there are components of the BMPs that are consistent and relate to the management of soil, nutrients and water movement on and off the property. Previous studies have shown the level of extension and subsequent uptake of the BMPs will differ depending on the landholder demographic and a review of extension for peri-urban landscapes is given below.

The following BMPs are taken from various sources (Qld Government, SEQ Catchments and industry sources) and relate to the Southeast Queensland (SEQ) area:

3.1.1 Summary of key points from BMPs:

1. Grazing land management '1234' practice framework for SEQ

This was developed by the Qld State Government through the FarmFLOW program. The framework details a scale of improvement from high risk (level 4) to cutting edge (level 1) and allows the landholder to determine their current level of land management and how to progress to a more sustainable level, which reduces the risk of resource degradation on the farm. This framework has been designed to incorporate profitable grazing systems as well as soil health and off farm benefits to the region's waterways. Level 2 is described as 'Best Practice' with a low risk to farm health.

The practices undertaken at this level include:

a) Medium stocking rates, adjusted annually to accommodate available dry season feed and carrying capacity;

b) Pasture spelling on a regular basis;

c) Farming to land type and characteristics;

d) Cattle walk 1-2km to permanent water;

e) Weed management plan for the property;

f) Fire management plan for the property;

g) Adequate infrastructure;

h) Riparian areas managed separately;

i) Degraded areas fenced off and managed separately; and

j) Continual monitoring of resource condition and adjustment of grazing to accommodate changes to resource health.

2. Grazing land types and land condition

The FarmFLOW project has drawn on historical knowledge of the SEQ region to define particular land types and defined best management grazing activities for these areas. The project categorises the region into specific grazing land types that are based on the underlying geology and landform and associated vegetation for this area. Pictorial guides allow the landholder to determine their pasture health on an ABCD scale and to gauge relevant carrying capacity for the pasture. Grazing landtypes are available for the MBRC area from the Qld Dept of Agriculture, Fisheries and Forestry (DAFF). Pasture in the A and B categories are considered best management practice for grazing properties.

3. Dairying Better N Better for Tomorrow

This program is an industry developed and led approach to improving natural resource management practices on dairy farms in Queensland. Farmers can access tools and knowledge to undertake a self-assessment of current management practices, identifying priority issues and the development and implementation of management practices to address these priorities. Areas of possible management change include appropriate infrastructure, management of riparian areas, storage of effluent from high use areas, soil, fertilizer and nutrient management and pasture health.

4. Grazing management in riparian zones

Controlled grazing or complete exclusion of cattle from the riparian zone has been shown to deliver benefits to the landholder and catchment through improved water quality, creation of habitat for native flora and fauna and improved stock health where off stream watering is supplied. The main activities include fencing off of the riparian zone (there are many discussions regarding the width of riparian zones for waterway health; Rehabilitating Australian Rivers Rutherfurd, Jerie and Marsh 2001 suggest the height of the creek bank plus 5m for a sufficient buffer width for channel stability); installation of off-stream watering points; suitable creek crossings for stock if required; short infrequent periods of grazing in the zone if required by the landholder; adequate management of weeds in the riparian zone.

5. Grazing of horses on small acreage (peri-urban)

Workshops for horse owners have increased in the past 10yrs as horse ownership in peri-urban areas has increased. The main areas of management include pasture spelling by rotational grazing, pasture improvement with direct seeding of relevant pasture species, harrowing larger paddocks to spread manure throughout the paddock during the resting period, management plans for water and waste to prevent excess nutrients leaving the paddocks during heavy rainfall, introduction of confinement areas if pasture drops below 70% groundcover to allow the pasture to rest and reseed.

6. Farmflow ABCD for Horticulture

This framework is a benchmarking scheme for horticulture and allows farmers to assess their land management practices against a scale of A-D with level B recognized as the current best practice. Practices detailed in the framework consider sustainable management practices that achieve profitable production systems. The practices at level B include:

a. Cover crop/green manure grown on fallow fields;

b. Reduced tillage;

c. Inter-rows grassed or mulched for plantation crops, eg pineapple;

d. Weed control by mulching and herbicides;

e. Headlands and drains managed as filter strips;

f. Sediment ponds/sumps placed in appropriate areas relative to slope and riparian areas;

g. Structural and biological health of soils is monitored.

7. Managing horticulture and cropping land

A range of BMPs for horticulture and cropping is available that focus on soil and water management and optimizing inputs for production. These include irrigating close to the root zone and as a consequence of soil moisture requirements. Optimising fertilizer input for yield and quality to minimize the nutrient loads leaving the farm and improving soil health to retain moisture and nutrients applied to the cropping area.

8. Best soil, water and nutrient management practices for strawberries

This program was developed by the Qld Department of Primary Industries and Fisheries and is specific to strawberry farming. BMPs developed under this program address soil, water and nutrient input and output from the farm and takes a whole of farm approach. Implementation of these BMPs would be best achieved through the existing extension officers from the Qld Government that have developed this program for farms in the SEQ region.

9. Optimising nitrogen fertilizer use in vegetable cropping

The use of management practices that maximize the efficiency of applied nitrogen can be used to increase the profitability of production by addressing soil requirements, target yields and methods of application. Crop rotation and fertilizer formulation are also management levers to reduce nitrogen application to the farm. Irrigation management, minimization of erosion and correct placement and planning for farm infrastructure are whole of farm practices that can be used to reduce sediment and nutrient loads entering waterways off the farm.

10. Controlled traffic farming (CTF)

CTF refers to maintaining machinery traffic in the same wheel tracks over consecutive crops. Soil and productivity improves as soil compaction is reduced and fuel costs are reduced with efficiencies in machinery movement. GPS guidance is often used on machinery to achieve accuracy and manage farm traffic.

11. Turf Farm BMPs

Farm management systems for the turf industry have been developed by Department of Agriculture, Forestry and Fisheries in conjunction with Turf Queensland. This system addresses soil health, irrigation and nutrient management and is a framework that uses a whole of farm approach. Development of tools and an accreditation system will assist turf farms in identifying and addressing on farm risks in order to achieve environmental and economic outcomes for the producer.

12. Erosion from house sites and driveways

There are several sources of information that local councils have developed for their own areas (eg Sunshine Coast Regional Council, Brisbane City Council, Ipswich Council). The consistent approach for all of these BMPs includes a knowledge of soil type in the area and the management of water flow across bare ground to minimize soil erosion. Using the landscapes natural contours and minimizing any concentration of flow are methods to reduce soil erosion rates. The use of existing and seeded vegetation is also advocated to slow water flows and increase infiltration rates. The installation of a series of water retention basins, ponds or dams can also manage stormwater in high flow events to prevent the concentration of flow along unprotected drainage lines. A reduction in impervious surface where possible and the use of semi-permeable paving can assist in slowing flow and increasing infiltration into the topsoils.

13. Erosion from rural roads

The BMPs associated with the management of unsealed rural roads are similar in principle to erosion from house sites and driveways. The consistent approach is to know the soil types prevalent in the area, slow water flows and prevent the concentration of water along unprotected surfaces. The use of broad flat-bottomed table drains, which are vegetated and site roads and tracks along ridges to help shed water from the surface. Creek crossings should be at right angles to the creek flowline and use speedbumps on steeper gradients to sheet the flow of water onto grassed stable areas.

More specific BMPs within the different frameworks are also available and applicable to the MBRC area, e.g. construction of farm dams, sediment ponds, swales.

3.2 Review of BMP Adoption and Implementation

Several pieces of information were reviewed that discussed the use of networks and extension services to deliver management change in rural landscapes. The first document (Reef Plan Extension and Education Strategy-Pilot Project, Qld Government 2013) was a trial project that was delivered in the Herbert and Johnstone River Catchments in the Northern Tropics over an 18 month period. This approach used a suite of methods to engage rural landholders on an area wide basis using industry, producer groups, community groups, extension officers, science providers and natural resource management groups to enable the networks. Engagement was predominantly through farm visits,

workshops, field tours and producer groups. At least 20% of producers made on-farm changes during the 18 month period and 60-80% of producers surveyed suggested they are better informed to make changes to their farm practices. Reported changes included nutrient and herbicide management with the establishment of legume fallows in cane; use of fallow crops and reduced cultivation in horticulture leading to improved nutrient management; and improved pasture, rotational grazing, better soil management and improved feeding regimes with dairy. Interestingly, the main challenges and barriers identified by producers and stakeholders included:

- The large number of small production enterprises that rely on off-farm income do not have the capital, financial incentive or time to implement a change of practice;
- Agriculture has a large percentage of older growers that do not have a desire to invest in changes that give a long term benefit; and
- External drivers, including market forces and weather events have the largest impact on business and farm management.

Key recommendations from this work include long-term investment programs to develop key networks and retain skilled extension officers in the field. Trust between producers and extension officers requires a period of at least five years to develop and maintain. Extension delivery needs to be tailored to each industry, region and catchment. Time and resources are required to 'up-skill' landholders and their service providers – many grower groups trusted the advice from known industry advisors, e.g. banana grower consultants. Agribusiness advisers should be involved in the extension process so that they increase their awareness of improved land management practices as they have the scope to influence farm management.

Several documents have been released that detail the challenges of land management change in the SEQ region and the difficulties of delivering extension services in the peri-urban region (Stockwell et al, 2010; 2012[1]).

A key project developed and refined the FarmFLOW framework for the Pumicestone Passage region in the MBRC area. This is an adaptive management approach, which is specific for high value but high risk peri-urban agricultural catchments that have a diverse mix of landuse. Over four years, the project achieved a 30% target where producers implemented best management practice for their farms. Upon survey, nearly 80% of producers acknowledged a process of continuous improvement on their farms for at least some new practices to reduce off-farm movement of nutrients of concern.

It was evident from the study that traditional extension services would not be effective for the peri-urban environment and the framework was refined to target areas with the greatest potential for adoption and water quality improvement. This involved targeting high risk agricultural sub-catchments on a place scale rather than larger hydrological catchments. The place scale concept acknowledges the social networks of producers in the area and does not assume a constant approach across such an area of diverse landuses. This is particularly relevant if there are a large number of smaller enterprises that derive most of their income from off-farm sources. The development of networks that

[1] Stockwell, B., Layden, I., Nicholls, Z., and Carter, J. (2012). Addressing rural diffuse pollution in peri-urban agricultural catchments using the FarmFLOW framework: a study in the Pumicestone catchment. Aust. J. Environ. Management. 19, No 3, p182-199.

Stockwell, B., Johnston, R., and Page, J. (2010). Benefit-cost analysis of addressing rural diffuse pollution through the FarmFLOW extension framework. Extension Farming Systems Journal. 8, No 1-Research Forum.

increase communication across research, extension, industry groups and natural resource management groups are also advocated in the peri-urban landscape. The delivery of practical and rigorous monitoring and evaluation programs are required in order to show any economic benefits as well as positive environment outcomes as a consequence of land management changes to producers.

Key Findings from BMPs in Action

A review of the relevant extension delivery information for the Reef Plan and FarmFLOW projects in SEQ highlighted several key messages:

1. It takes time to build relationships between extension officers and producers,
2. One-to-one extension delivers the best outcome for land management practice change and should be commodity based,
3. Producer-led action learning groups are required to link area-wide land management and industry-based programs,
4. Communication and knowledge transfer tools are needed that are practical and hands-on responses to sustainable production issues,
5. Use of a multi-industry approach that enhances producer

4 IMPLEMENTING RURAL BMPS – A SUGGESTED ADAPTIVE MANAGEMENT APPROACH

4.1 Learning from doing – an adaptive management approach

Knowledge about the effectiveness of certain interventions or investments to achieve natural resource management outcomes – in this case, reductions in sediment and nutrient loads in waterways of Moreton Bay Regional Council – is incomplete. This is a common issue confronted by natural resource managers. As a result, the concept of adaptive management has been embrace by natural resources managers worldwide and around Australia[2]. This approach involves learning from implementation through a structured iterative process of decision making with the capacity to gradually reduce uncertainty through system monitoring (Figure 4-1).

Adaptive management is 'learning from doing'

Through action, Moreton Bay Regional Council, its communities and partners can develop the understanding of how parts of the catchment and segments of the community will respond to this Report's recommended actions and define for the region, the superior strategies for reducing sediment and nutrient loads in the waterways.

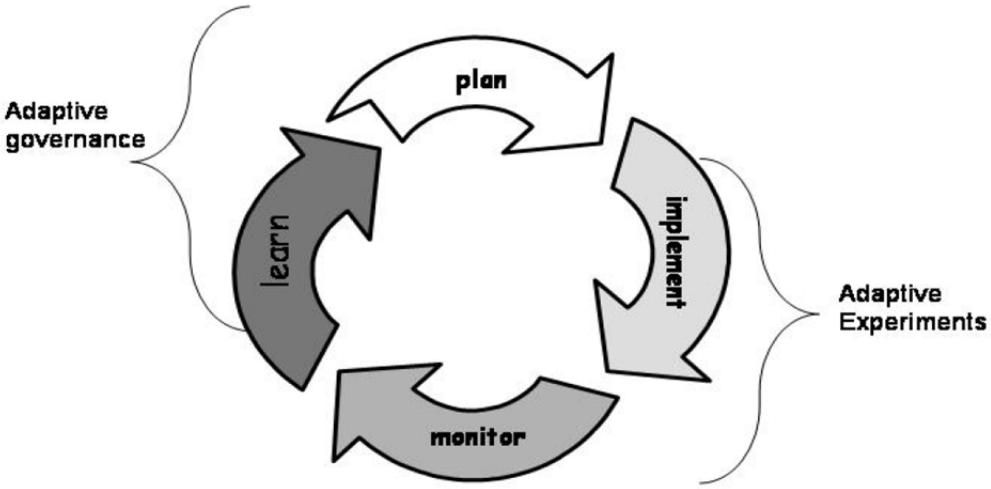


Figure 4-1 Cycle of adaptive management with an emphasis on learning

Evaluation is a central component of the adaptive management cycle and needs to be considered as an integral part of any implementation[3][4]. Within the natural resource management arena in Australia,

[2] Wilson, A.L., Dehaan, R.L., Watts, R.J., Page, K.J., Bowmer, K.H., & Curtis, A. (2007). Proceedings of the 5th Australian Stream Management Conference. Australian rivers: making a difference. Charles Sturt University, Thurgoona, New South Wales.

[3] Allan, C., & Curtis, A. (2003). Regional Scale Adaptive Management: Lessons from the North East Salinity Strategy. *Australasian Journal of Environmental Management,* 10(2), 76-84.

[4] Allan, C., & Curtis, A. (2005). Nipped in the Bud: Why regional scale adaptive management is not blooming. *Environmental Management,* 36(3), 414-425.

a monitoring, evaluation, reporting and improvement (MERI) framework has been accepted by agencies and groups as a useful framework for this purpose.

4.2 Use of program logics and MERI as part of an adaptive management approach

Program logic is an approach that is used to help design, implement and evaluate programs and projects. Developing the logic requires a process, or series of activities, that aim to record the rationale (logical hierarchy) behind the program and the expected cause and effect relationships between actions, intermediate outcomes and long term outcomes. This description of the cause and effect relationships is sometimes referred to as a 'theory of change'.

Program logics express how change is expected to occur

The end result of documenting the program logic is a program logic model, which is:

> 'A systematic and visual way to represent and share your understanding of the relationships among the resources you have to operate your program, the activities you plan to do, and the changes or results you hope to achieve. The most basic logic model is a picture of how you believe your program will work. It uses words and/or pictures to describe the sequence of activities thought to bring about change and how these activities are linked to the results of the program is expected to achieve'. (W. K. Kellogg Foundation 2004, p. 1)[5].

A logic model is not intended to be a 'static' picture of the relationship between required actions and desired change and the theories within the models should be continually be tested and examined. Implementation may not always occur as anticipated and good evaluation practice can help to determine if the program is poorly designed, the underpinning logic was incorrect or actions were inappropriate etc.

Developing a logic model framework is supported by using participatory processes, which accommodates the fact that underpinning knowledge and information often resides with individuals and that people within the community hold different views of how change can occur. A participatory process helps the development of a 'collective' theory of how change occurs as a result of selected actions. The additional benefits of documenting and communicating a program logic model are to:

- Clarify and evaluate the strengths and weaknesses of a program;
- Serve as important background material for staff, stakeholders and funding agencies and demonstrate a sound basis for funding applications;
- Assist the identification and prioritization of evaluation questions;
- Document assumptions and barriers/external factors; and
- Identify gaps in knowledge.

Whilst program logic is not the complete answer to program design for Moreton Bay Regional Council's future actions, it provides a good starting point for ongoing refinement and improvement.

[5] W. K. Kellogg Foundation (2004) Logic Model development Guide, W. K. Kellogg Foundation, Michigan. Available: http://www.wkkf.org/Pubs/Tools/Evaluation/Pub3669.pdf [accessed 7 January 2009].

The draft program logic below has been developed with consideration of the discussions held at two workshops[6] involving Council and other natural resource managers familiar with the region and following review of relevant literature and reports (Figure 4-2).

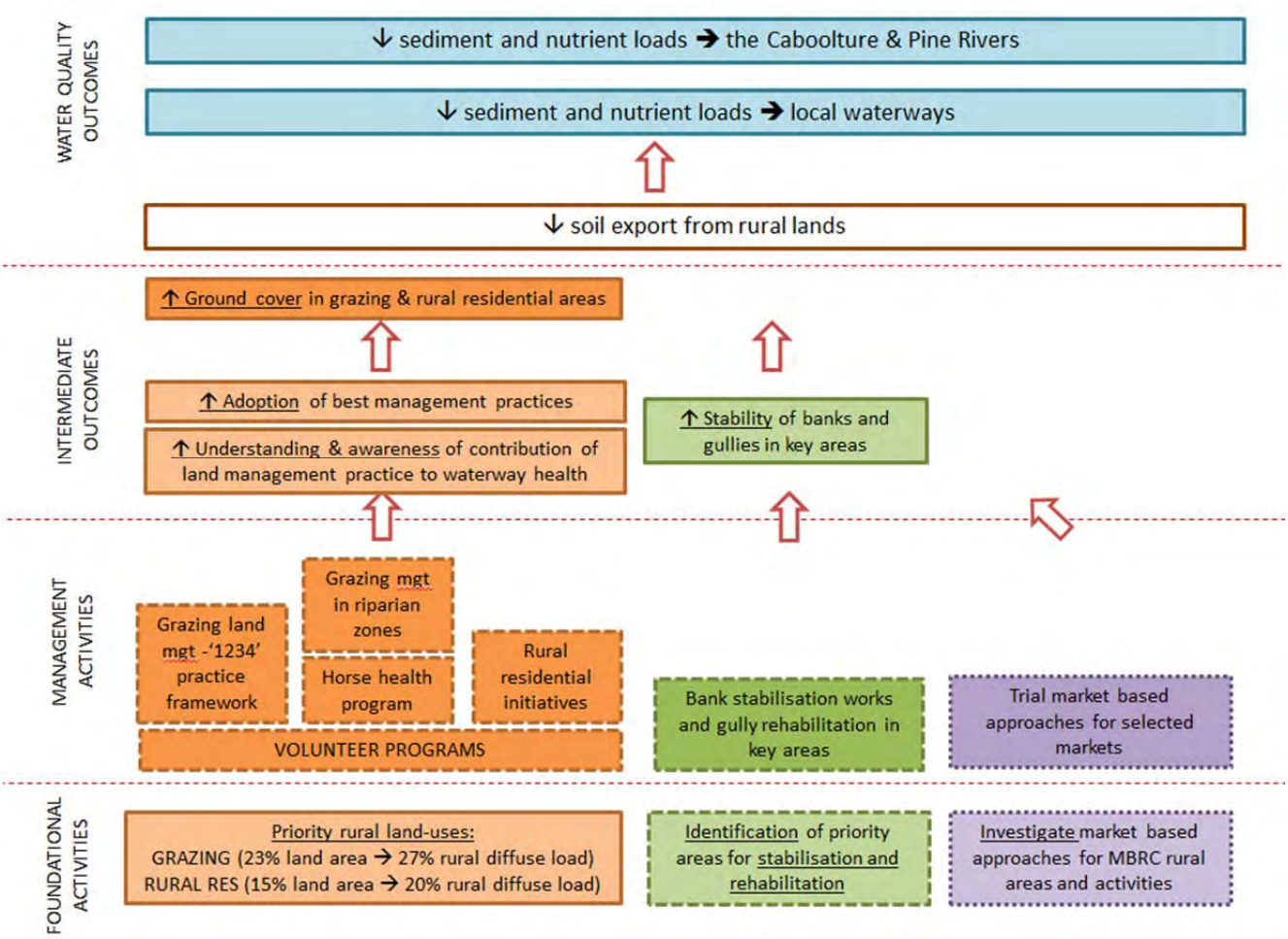


Figure 4-2 draft program logic for the implementation of rural BMPs

Figure 4-2 depicts a theory of change that responds to the known factors of the area – such as relative contributions of different rural and semi-rural land uses to the pollutant loads – as well as incorporating options that 1) have been explored in the region (e.g. volunteer programs involving specific segments of the community and direct rehabilitation works) and 2) were proposed for future consideration (e.g. market based approaches).[7]

According to the draft theory of change above, Council is seeking a reduction in the sediment and nutrient loads reaching the Caboolture and Pine Rivers. This will be achieved by reducing sediment and nutrient loads in local waterways by reducing soil export from rural lands. In turn, this will be

[6] Workshop #1 was held in Brisbane on 15 March 2013 and focused on lessons and learnings from implementation of BMPs throughout SEQ and the implications for Moreton Bay Regional Council area. Workshop #2 was held in Caboolture on 4 April 2013 and focused on identifying current practices in Moreton Bay Regional Council, documenting costs, funding and incentives sources and identifying trial sites.

[7] The program logic depicts a suggested approach for Moreton Bay Regional Council to adopt and can be amended as information is developed and decisions made.

achieved by increasing ground cover in grazing and rural residential areas through increasing understanding and awareness of the contribution of land management practices to waterway health and increasing adoption of best management practices as well as increasing stability of banks and gullies in key areas. Council may invest in a range of initiatives to deliver these outcomes, including 1) volunteer programs (grazing land management '1234' practice framework, grazing land management in riparian zones, horse health programs and rural residential initiatives); 2) bank stabilisation and gully rehabilitation works in key areas and 3) trial market based approaches for selected markets.

5 DISCUSSION AND WAYS FORWARD

From the previous section, the program logic framework provides a process for undertaking key activities to develop an implementation program for rural BMPs and recording the actual (as opposed to expected) outcomes. Within each of these activities, further tasks may be required to develop them into specific projects. This is discussed below in conjunction with specific workshop feedback and key points to provide clarification on some of those program logic elements.

5.1 Discussion

5.1.1 Land Ownership and Engagement

In Section 2, it was identified that the majority of rural lands are occupied by peri-urban (rural residential) and grazing land uses and that these are also the major contributors of loads in the region. In regards to land-owners, they could be categorised into the following:

- Lifestylers/Non-viable agribusinesses – Where the land has been purchased lifestyle purposes (e.g. "tree changers") or where the agribusiness activities are not the primary revenue stream for the land holder; and
- Viable agribusinesses – Where the historic and/or current purposes of the land holder are to derive the primary income from the land.

It was felt that numbers of the latter are likely to be low and on the decrease over time, so targeting key agribusiness sectors such as beef and cattle groups or similar are not likely to bring about significant change due to the low proportions of viable farms in the region. The focus of activities on the Lifestyler/Non-viable Agribusiness sector is therefore more likely to engender widespread activity (simply because the land holders in this category occupy a larger overall area), however their fractured grouping (no representation by an industry body) provide different engagement challenges.

5.1.2 Planning Issues

There was some discussion regarding the likely intensification of some of these landuses in the future as demand for global food production increases, such that there may need to be specific planning outcomes to ensure land availability is preserved, in conjunction with the implementation of more sustainable farming practices (e.g. FarmFLOW 'ABCD' as discussed in Section 3). Some workshop attendees felt that there may be risks of lot sizes reducing as rural landholders sought to capitalise on urban fringe development, however current state regulatory provisions may provide the necessary regulatory regime to set minimum lot sizes in these areas to restrict this.

5.1.3 Peri-Urban Areas

Current activity in rural BMPs was felt by workshop participants to be lowest in the peri-urban sector, despite some focus on horse-owner properties, voluntary conservation agreements and land for wildlife activities. These activities were not well coordinated across the peri-urban areas. Further

investigation is also needed on the function and impact of on-site sewage treatment plants (STPs) as in some catchments it was identified that their function was not likely to be optimal on a large number of properties and that this can have significant impacts on receiving water quality.

Other discussions regarding the peri-urban lands considered whether regulation was a better approach for these areas, with the corollary that current voluntary approaches have also worked well through Voluntary Conservation Agreements. Council has also trialled a process of purchasing particular properties for conservation purposes, applying conservation agreements and reselling the properties with these agreements in place for perpetuity. Further work in this area is warranted.

5.1.4 Economics and Market Based Approaches

The health of waterways in the Moreton Bay Regional Council area remains a key concern. Regulatory focus on activities impacting on waterways has been directed at point source pollution from waste-water treatment plants. Population growth, ageing treatment infrastructure, declining water quality and higher regulatory standards are placing significant cost pressure on utilities across South East Queensland to deliver services at a reasonable cost.

The Queensland Government is currently working on a water quality offsets policy that will allow nutrient discharge licence holders and developers to meet their overall water quality requirements through a more flexible range of options. Market based instruments have been adopted elsewhere in the world to manage such issues. Workshop participants reported that the United States Environment Protection Authority supports water quality trading between point and non point sources in recognition of the opportunity to deliver greater environmental benefit through nutrient reduction at reduced cost. In Washington State it is estimated that the cost of point source reduction is 65 times higher than non point source reduction. In a major case study of point non-point source water quality trading in the Minnesota River Basin it was found that in terms of cost effectiveness in reducing pollutant loading to the environment, long term structural non-point source pollution control measures such as stream bank stabilisation were substantially more cost effective than further treating point source waste water. It was also found that in addition to cost savings in pollution control, offsets trading projects brought other social benefits to the catchment including a balancing of environmental protection and regional economic growth.

Environmental trading and market-based instruments are likely to emerge as significant opportunities within the Moreton Bay Regional Council area to improve overall waterway health outcomes in rural areas. Utilities and developers may increasingly be willing to invest in rural areas to meet their obligations rather than seeking solutions through traditional built infrastructure solutions.

All markets conform to the basic elements of supply and demand. In this case demand will be driven by the need for utilities to meet their obligations at lowest cost (as indicated in Figure 5-1). Supply will be able to be met through the implementation of best management practices in the rural landscape. Council could play a significant role in brokering these transactions and ensuring that the landscape scale benefit is maximised. Developers requiring offsets to meet urban storm-water standards for areas of high environmental value may also be attracted to purchase water quality offsets created through the adoption of rural best management practice due to the lower overall cost profile.

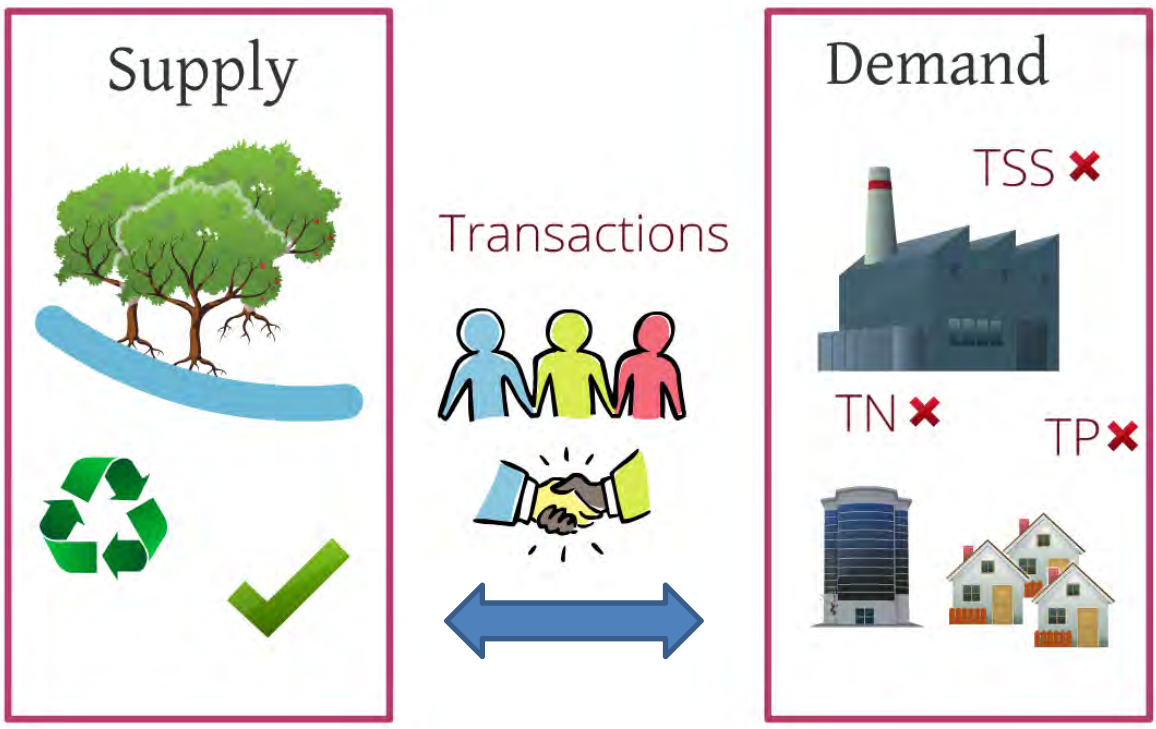


Figure 5-1 Supply and Demand Markets

Rural best management practice adoption is also of significant benefit to other industries with the region. Sediment derived from catchment areas above Seqwater's major storages has a direct impact on the lifespan of storage infrastructure. Major storages are extremely effective at trapping sediment and it has been estimated that each tonne of sediment entering decreases asset value by $3. Sediment and pollution also increase water treatment costs and ultimate end user risk.

Sediment and other forms of pollution that decrease waterway health also directly affect other industries. Moreton Bay as the ultimate receiving water area supports valuable fishing and tourism industries that provide extensive recreational and commercial opportunities for residents of the Council area. More than 75% of commercial fisheries production species depend directly on the estuarine environment for at least one stage of their life cycle. Should the life cycle stages be interrupted because of poor water quality population impacts can be very significant and the volumes and values of catch can diminish significantly. Moreton Bay supports both commercial and recreational fishing activity. The value of the commercial fishery in Moreton Bay is estimated at approximately 24 million dollars per-annum. Recreational fishing in Moreton Bay is a key economic activity in the region. 37% of Queensland's recreational fishers operate in the region and target whiting, bream, tailor, flathead, crab. Total expenditure related to recreational fishing in the region is estimated to be approximately $150 million per annum .

Recognition of the relationship between management of rural lands and the adoption of improved management practices and the economic impacts of declining water quality will ultimately see other markets emerge. Understanding the emerging markets presented and the Council's opportunities and role in facilitating and profiting both economically and environmentally is a key activity that should be undertaken.

The supply side of the market is created by those who are able to provide reductions in the key pollutants requiring offsetting, such as nutrients and sediment, through implementation of specific BMPs such as riparian revegetation, stream bank stabilisation, recycled wastewater irrigation, organic farming and similar activities. Each of these would require a value commensurate with the reduction provided, that could then be purchased by those who are creating the demand for reduction, the "polluters" such as wastewater treatment plants, urban developers and industry dischargers, but also other players such as those requiring carbon sequestration, biodiversity maintenance, floodplain storage and the like. These are enabled through a transaction space where the suppliers and demanders are brought together to provide the offset. There are significant opportunities for Council to be active within this market, both as creators of supply (e.g. riparian revegetation activities, conservation agreements etc.), but also within the transaction space, as holders of the "banking" elements and funding requirements.

These markets are likely to also have significant value, for example it was estimated that for 40cm of sediment deposited in a water supply reservoir, the value of storage lost (if provided by a new storage) was equivalent to $300M. Similarly, wastewater treatment plant upgrades to further reduce nutrient discharges into waterways are likely to be in range of $10M-$100M per treatment plant to go beyond current technology.

These factors strongly suggest that further work investigating the opportunities in market based approaches is warranted.

5.2 Ways Forward

Several key activities will need to be undertaken to further explore rural BMP implementation with the Moreton Bay region. These are set out in the table Table 5-1 below:

Table 5-1 Actions Table

Activity	Timeframe	Responsibility/Key Agencies	Costs
Primary - Develop Program Logic Framework for Rural BMP Implementation – including coordination of rural land management activities within one responsibility area within MBRC	July – November 2013	Council, DAFF	$25,000
Foundational - Investigate Market Based Approaches – Offsets, Supply/Demand, Transactional Opportunities	August – November 2013	Council, DEHP, Unitywater	$30,000
Foundational - Assess Compliance of on-site STPs in Peri-Urban Areas	October 2013 – March 2014	Unitywater, Council	$50,000
Foundational - Develop coordinated engagement approaches in peri-urban (e.g. horse owners) and Non-viable agribusiness areas (e.g. small scale grazing) for focussing of voluntary BMP implementation.	January – June 2014	SEQ Catchments, Council, DAFF	$30,000
Foundational - Identify and document key gully rehabilitation and bank stabilisation areas across the MBRC rural lands.	March– June 2014	Council	$50,000
Management - Investigate practicality of focussed implementation of the Grazing land management '1234' practice framework	June – November 2014	DAFF, Council	$30,000
Management - Determine suitability of planning controls for management of rural land minimum lot sizes to protect for future rural production.	March– June 2014	Council	$20,000
Management - Coordinate the ongoing land purchase and implementation of conservation agreements with other rural BMP approaches (such as gully rehab and bank stabilisation)	October 2013 - Ongoing	Council	$40,000

5.3 Conclusions

This report has been developed to show how rural BMPs may best be implemented within the Moreton Bay Council region. It was not intended that this document be an in-depth analysis of the issue, but provide Council with an overview of the key strategies and processes that may be suitable for facilitating rural BMP implementation, based on expert knowledge, discussion and stakeholder interactions.

The processes and actions are provided as indicative approaches, however further work will be required in this area to ensure that the process of implementation is well coordinated across the region and across the range of agencies, landholders and other stakeholders to ensure delivery. There are also significant learnings to be understood from approaches in neighbouring areas and as part of the Reef Plan work. From this, Council can become more actively engaged in rural activities in the region, especially given their importance in terms of both area and impacts on the economics and health of the Moreton Bay Council region.

APPENDIX A: LANDUSE CLASSIFICATION TABLES

Table A-1 MBRC Land Use Categories – High Level Classification

Functional Unit	MBRC Categories	
	Strategic Infrastructure Planning Description	Land Use Description
Commercial	Low Density Commercial	Child Care excl K/garten
		Funeral Parlours
		Library
		Nurseries (Plants)
		Professional Offices
		Sports Clubs / Facilities
	Mixed Use (HD)	Drive In Shopping Centre
	Retail	Retail Warehouse
		Sales Area Outdoors (Dealers, boats, cars etc)
		Shops
	High Density Commercial	Car Parks
		Hotel / Tavern
		Licensed Club
		Other Clubs (Non Business)
		Religious
		Restaurant
		Service Station
		Special Tourist Attraction
	Hospital	Hospitals, conv, homes (Medical Care - Private)
		Public Hospital
Grazing	Grazing	Cattle Breeding
		Cattle Breeding & Fattening
		Cattle Fattening
		Milk - No Quota
		Milk - Quota
		Outbuildings
Green Space	Conservation	-
	Open Space	Cemeteries (Incl Crematoria)
		Marina
		Parks, Gardens
		Show Ground / Race Course / Airfield
	Vacant	Vacant Land
	High Density Commercial	Marina

Table A-1 MBRC Land Use Categories – High Level Classification (cont)

Functional Unit	MBRC Categories	
	Strategic Infrastructure Planning Description	Land Use Description
HD Residential	High Density Residential	Caravan Parks
		Community Protection Centre
		Guest House / Private Hotel
		Motel
		Multi Unit Dwelling (flats)
		Residential CTS Properties
		Residential Institution (Non Medical Care)
		Residential Units - BUP (per Unit)
		Welfare Home / Institution
Industry	Extractive Industry/Construction	Extractive
	Industry	Builders Yard, Contractors
		General Industry
		Light Industry
		Light Industry 51 - 500m2 gross fl area
		Noxious / Offensive Industry (Incl Abattoir)
		Oil Depot & Refinery
		Transport Terminal
		Warehouse & Bulk Stores
	Open Space	Telco/Transformer sites
Intensive Agriculture	Intensive Agriculture	Animal Special
		Horses
		Orchards
		Pigs
		Pineapples
		Poultry
		Small Crops & Fodder Irrig
		Tropical Fruits
		Turf Farms
		Vineyards
LD Residential	Low Density Res	Single Unit Dwelling
	Education	Educational Including K/garten
MD Residential	Medium Density Residential	Bed & Breakfasts
		Single Unit Dwelling
Plantation	Plantation Forest	Forestry & Logs
Rural Residential	Rural Residential	Single Unit Dwelling
Water	Water	Reservoir / Dam / Bores
		Marina
	MBRC - DCDB Waterways	
Roads	MBRC - DCDB Road Reserves	

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