Fact sheet 3

Improving water quality at the edge of block. A guide to help extension and NRM officers identify edge of block water quality management initiatives and how to implement them.

ON THE FARM: IS THERE AN OPPORTUNITY FOR A WATER QUALITY MANAGEMENT INITIATIVE AT YOUR SITE?

When you are out on a farm and looking for options to improve farm sustainability, both agronomic BMP and edge of block actions should be considered as part of a whole of farming system management approach. Water quality management on farms generally fits into two categories (Figure 1): You should avoid arriving at a farm wanting to install a 'wetland' or a 'bioreactor' as you may overlook better opportunities to improve water quality. Keep an Open Mind!

- 1. Prevention measures, and
- 2. Treatment actions

Constructed and landscape Wetlands Bioreactors Water quality management on farms Prevention actions Constructed and landscape Wetlands Bioreactors Vegetated drains Grass buffer strips Riparian revegetation

When conducting any type of farm visit, there is an opportunity to look for edge of block actions that may complement any existing / planned in-block management practices. A farm mapping/planning process associated with nutrient management plans or BMP programs is the ideal time for this to occur, enabling you to discuss any potential farm constraints (waterlogging, drainage issues) or opportunities for water quality improvement via prevention and/or treatment measures.

When it comes time to discuss and choose which type/s of water quality management action is most appropriate for your site/farm, it's best to have a strong:

- awareness of the farming system,
- understanding of the farming landscape, and
- · idea of the farmers' objectives.

Before a farm visit you should have an:

A farm plan or map of the property and surrounding landscape.

An idea of soil type/s in the landscape.

Understanding of the local catchment, farm management and drainage patterns.

4 Understanding of water quality priorities, hotspots and any issues (flood risk, rising groundwater, salinity, acid sulfate soils). Obtain local water quality monitoring results, if possible. • Understanding the extent of the property and where water moves off and onto the property during high and low flow events.

6 Understand the impact of the intervention on adjacent land uses and practices..

Review of basic relevant state planning layers.

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There is no silver bullet here...no one system fits all situations, or one system that works better than others. They all have advantages and disadvantages, so it's up to you to work with:

the farmer, the site, and then the problem ... to come up with a solution.

Looking for sites where an edge of block water quality improvement project can potentially be installed requires you to look for a range of site indicators or opportunities.

As shown in Figure 2, a successful **water quality management action** requires a thorough understanding of **water flow and groundwater conditions** in the context of the **operation of the farm** and the **soil/topography**. These four factors will control the transport of DIN, pesticides and sediment within and off the farm and thus how you design and implement a water quality management action.

On sugar cane farms, water flows off the farm in a series of drains, which increase in size as they move downstream. The general rule with pollution reduction is to "treat the problem as close to its source as possible" (it's more concentrated). This approach, while not always possible, practical or applicable, will generally require a smaller system that is more easily implemented and managed.



Figure 2: Key components of a successful water quality management actions.

Placing water quality management actions within the farm (refer to Figure 3):

- Constructed wetlands: Creeks and Drain Order 1 & 2
- Bioreactors: Drain Order 3
- Vegetated drains: Drain Orders 3 and 2
- Grass buffer strip: adjacent to Drain Orders 2 and 3
- Riparian revegetation Creeks and Drain Order 1



Figure 3: Possible on farm placement of water quality management action

Diagram title

LEGEND

- **1.** Vegetated drain
- 2. Riparian vegetation
- 3a. Bioreactor agline
- 3b. Bioreactor inline
- 3c. Bioreactor wall
- 4. Wetland
- 5. Turf buffer

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IS THERE AN OPPORTUNITY FOR A WATER QUALITY MANAGEMENT INITIATIVE AT YOUR SITE?



Table 1: Photographs from Nth QLD farms showing common landscape attributes and what they may indicate when assessing water movement across a farming landscape.



Shallow groundwater directed to drains via drainage pipe can provide a good opportunity to treat water directly from the field, at the edge of the block. These pipes typically flow during the wet season only. If the pipe flows year round, its likely tapping into groundwater, which may not need treatment.



Shallow water within drains during the wet season and in-between rainfall events generally indicates farm where water movement is dominated by surface flow i.e. these drains only flow during and immediately after rainfall.



Drains adjoining agriculture blocks provide a good indication of the water table level and the dominant influencing hydrology of the immediate area (surface vs ground). A high water table makes it difficult to build anything other than promoting good drain vegetation. Works should ideally be undertaken in moderate to low water table areas.

high levels of nutrients.



Cloudy water generally indicates fine sediments.

Orange stained water / vegetation is a good indication of the presence of acid sulphate soils in the area which may limit the ability to conduct earthworks



Low lying boggy areas on farms are often located at the edge of block. These areas commonly accept much of the farms runoff and adjoin small artificial creeks or drainage lines. Careful management of these areas can provide a great opportunity for water quality management activities to occur.



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Funded by the Enhanced Extension Coordination project under the Queensland Government Reef Water Quality Program'

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Table 2: Five of the main factors on the farm that may influence the ability to install a water quality management system. Use this table to guide your assessment on farm and decisions on which water quality initiative may be most appropriate.

Farm assessment factor		Description
	Texture Aquitard	Soil texture describes the percentage of sand/silt/clay within the soil. The relative percentage of these three components within the soil affects how water moves and behaves through the farm. Sandy soils provide good drainage but poor water retention. Conversely, soil with a high clay content retains water and prevents drainage. A soil aquitard refers to a layer of soil or rock within the soil profile that has a low permeability. An aquitard prevents the vertical movement of water, creating a seasonal elevated groundwater level.
	Water table height: in wet season in dry season	Soil characteristics, topography and surface water flow conditions will strongly influence groundwater conditions. Flat areas on sandy soils with a clay aquitard will likely have a high-water table in the wet season, which dries out in winter (dry season). Farms on steeper country and/or sandy soil will have a deeper water table. Generally, the deeper the water table the less influenced by rainfall it is. Deeper (>2m deep) groundwaters generally indicate permanent spring water that may not require treatment
	Slope	Building treatment systems on low lying flat land is probably harder than building them on sloping land. Land with little relief (like much of tshe lower floodplain areas) are very sensitive to a rise in water level. The key here is to work with the slope of the land to ensure any rise in drain/creek water levels is within the tolerance of the farmer's crop requirements
	Drains Back flow from creeks / rivers Flooding	Surface drains channel water from the farm paddock to the downstream receiving environment. It's likely that these drains will provide some opportunity for treatment, or be a key component in the system. During high rainfall periods, the movement of water on the farm may change. Creeks can rise and flow in differing directions which can prevent flow from certain areas of a farm or cause widespread flooding. Treatment systems are generally designed to treat small rainfall events and/or shallow groundwater flow – NOT FLOOD EVENTS . Placement of treatment systems so they are not adversely impacted by large flood events or changing catchment flow conditions is a key design factor that requires consideration. Managing high flows in treatment systems often requires the design of high flow bypass channels and key water attenuation zones.
	Access	It is more than likely that large farm machinery will be required to move around any water quality treatment device, so their placement on the farm is critical to their long-term acceptance as a valuable component of farm infrastructure. Maintenance of the edge of block action may be required , thus placing a system within the general operational area of the farm will likely result in a better maintained system.



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