

EFFECT OF RANK GRASS BUFFER WIDTHS FOR REDUCING CONTAMINANTS FROM DAIRY FARM LANEWAYS

The Risk



Laneway run-off can be a hot spot for water contamination

The question - how effective are buffers of increasing width?



Cocksfoot, fescue and ryegrass mix was drilled into a levelled and sloped (4%) plot adjacent to the laneway. A 600mm deep drain was constructed to facilitate sampling of overland flow from the laneway

Catching run-off

- 6m lengths of 90mm diameter half-round stormwater pipe was installed at four distances from the laneway in each of five plots. A sixth plot with 0.5m distance was installed close to the cowshed.



- A 400mm wide strip of polythene was glued to the laneway side of the cut pipe edge to ensure run-off was captured.

The Project

- Dairy farm laneways adjacent to open waterways are a potential source of contaminants including nutrients, sediment and bacteria
- Traffic on compacted laneways is likely to mobilise fine sediment for run-off into waterways during rainfall events
- Rank grass often develops between the laneway and waterway but few studies have assessed their effectiveness at reducing contaminants
- A trial comprising six rank grass plots at increasing distances from the cowshed was used to determine the effects of different riparian widths and loading rates

Design Considerations

- Laneway run-off was collected after being filtered through 0.5, 1.5, 2.5 or 3.5 metres of rank vegetation at 25, 115, 220, 445, 715 and 940 metres from the cowshed
- Other studies have shown that cow defecation increases closer to the cowshed
- A key consideration was keeping the laneway straight so as not to impact on cow behaviour
- Dykes were established between each treatment to avoid cross contamination
- The catchment sloped away from the crest of the laneway at 4% to reduce the risk of preferential flow-paths developing and to ensure consistency in lateral overland flow travel time

Installation of graded site



A drainage laser level was used to attain a 4% slope

Example of a plot with four 6m long catchment areas



Arrangement of four catch drains



Transfer pipe to 1st flow sampler

Run-off capture test

On November 23rd, 2018 the run-off capture system was tested. By this time grass and weeds were dense (rank) and about 0.5m high. The lip at the edge of the laneway was removed with the back edge of a tractor loader. The laneway edge was checked and where a lip was still apparent water

escape channels were cut at 1m intervals to allow run-off to run into the catch drains. Small banks of debris were created between catchment zones to prevent lateral flow away from catch drains. Vegetation was removed from above the catch drains and they were flushed with water.

A water tanker was used to provide a simulated rain fall event. Initial calibrations and measurements confirmed the application rate. This was applied to the 0.5 and 1.5m catchments zones at each location along the laneway. First flow samples were inverted before sub-sampling for laboratory analysis

Simulated rain fall event



A water tanker was used to apply a simulated rainfall (80mm/hr)

Sampling First Flow



The first one litre of run-off from the catch-drain fills the sample bottle.

Preliminary findings

Effect of distance

- The laneway run-off capture system worked well for the simulated rainfall event.

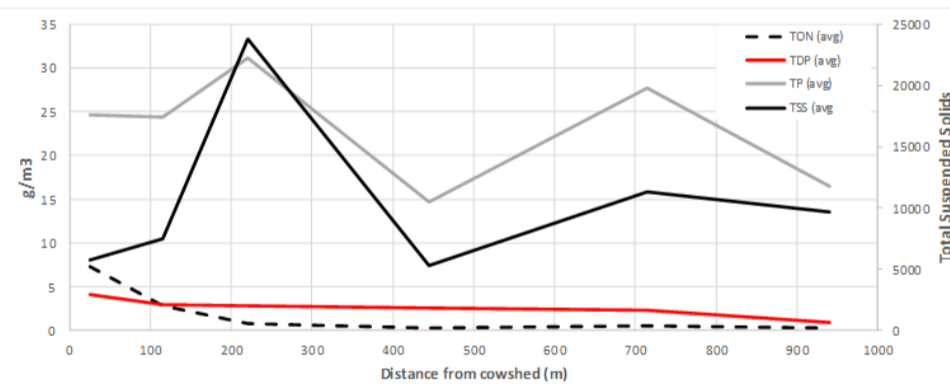
- Total organic nitrogen (TON) and Total dissolved phosphate (TDP) showed the most consistent trend along the laneway indicating lesser loading at greater distance from cowshed.

- Total suspended solids (TSS) and total phosphorus (TP) showed higher intermediary values especially at 220m from the cowshed.

Effect of buffer width

- Increasing buffer width from 0.5 to 1.5m reduced the concentration of TON, TP and TSS in run-off.
- Bacteria (E.coli) concentrations was also measured but was off the scale at all distances.

Effect of Distance from cowshed on contaminants (avg 0.5 and 1.5m)



Location of plots moving away from the dairy shed

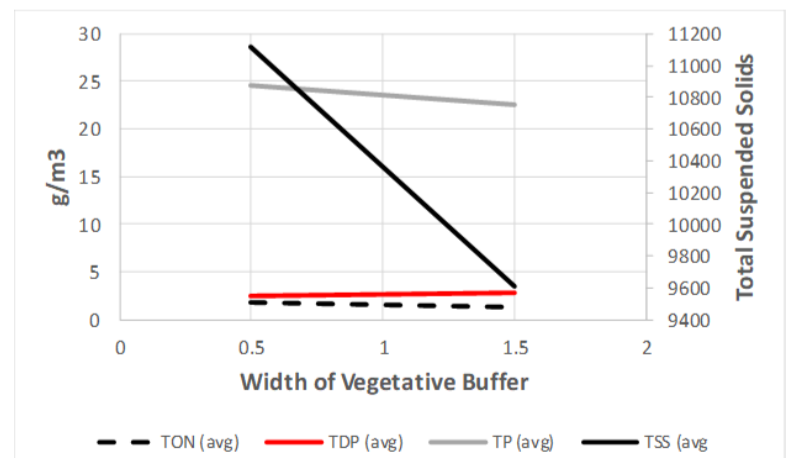


Laneway and waterway configuration

Aspiring Dairy - Moutoa : Trial Points



Comparison of 0.5 and 1.5m vegetative buffer on contaminants



Discussion and Future Work

Since the November rainfall simulation, three natural rainfall events have been captured and sampled. Results are yet to be analysed. Rain shelters have been fitted progressively and now cover a width of 400mm above the catch drains. More trials are planned before June 30, 2019 and it is hoped that the sites will be used in the future to examine the impact of differing vegetation management regimes and types on contaminant filtering from laneway run-off.