PATHWAYS TO WATER QUALITY IMPROVEMENTS IN THE MYRTLE CREEK SUB-CATCHMENT PROJECT

2019/2020 WET SEASON - SITE 4 CASE STUDY

SITE DETAILS

BLOCK SIZE: 3.5 ha

SAMPLED AREA: 1,024 m^2

ROW SPACING: 1.6 m

VARIETY: KQ228(l)

CROP CLASS: P

HISTORICAL ANNUAL YIELD: 90 tph

SOIL TYPE:
Slater (sand/loam over sodic clay)

LOCATION IN SUB-CATCHMENT:
Foxdale

NUTRIENT AND PESTICIDE APPLICATION DETAILS

Fertiliser application date: 1 August 2019 plant starter / 12 November 2019 top dressed
Insecticide application date: 12 November (Confidor® Guard) and 18 November (suSCon maxi Intel®)

Treatment 1

- 12 November - Confidor® Guard @ 16 mL / 100 m row (1 L/ha)
  - Total imidacloprid applied: 350 g/ha.

Treatment 2

- 18 November - suSCon maxi Intel® @ 240 g / 100 m row (15 kg/ha)
  - Total imidacloprid applied: 750 g/ha.

* imidacloprid rates should be applied at the 100 m row rate, as this excludes the effect of row spacing. For this site working on the per hectare rate for suSCon maxi Intel® gives an above label rate per 100 m row when converted.

Fertiliser application:

- NKS Plant Starter @ 200 kg/ha before plant + follow up application
  - Total nutrient applied:
    - N – 130 kg/ha
    - P – 20 kg/ha
    - K – 100 kg/ha

- Winched 4 times before first run-off event. 2 irrigations between planting and top dress fertiliser. One irrigation late November prior to chemical application and one irrigation early December, after chemical application. Approximately 30 mm per application. No run-off was generated from these irrigations.

Herbicide applications:

- 2019:
  - 1 August
    - 1.8 L/ha Dual Gold® (1728 g/ha S-metolachlor)
  - 24 November
    - 3.3 L/ha Stomp® Xtra (1501.5 g/ha pendimethalin)
    - 3 kg/ha Atrazine (2700 g/ha)
- 2018 (fallow):
    - Starane Advanced® (fluroxypr)
    - Glyphosate

Tested for:

- Dissolved Inorganic Nitrogen
- Filterable Reactive Phosphorus
- Imidacloprid
- Metolachlor
- Pendimethalin
- Atrazine

RUN-OFF EVENT DATA

EVENT	DATES	DAYS FROM LAST FERTILISER APPLICATION	DAYS FROM PESTICIDE APPLICATION (SUSCON MAXI INTEL® / CONFIDOR®)	DAYS FROM LAST HERBICIDE APPLICATION
1	28 to 30 December 2019	47	47 / 53	35
2	27 to 29 January 2020	77	77 / 83	65
3	12 February 2020	93	93 / 99	81
4	15 to 16 February 2020	96	96 / 102	84
5	22 to 23 February 2020	103	103 / 109	91

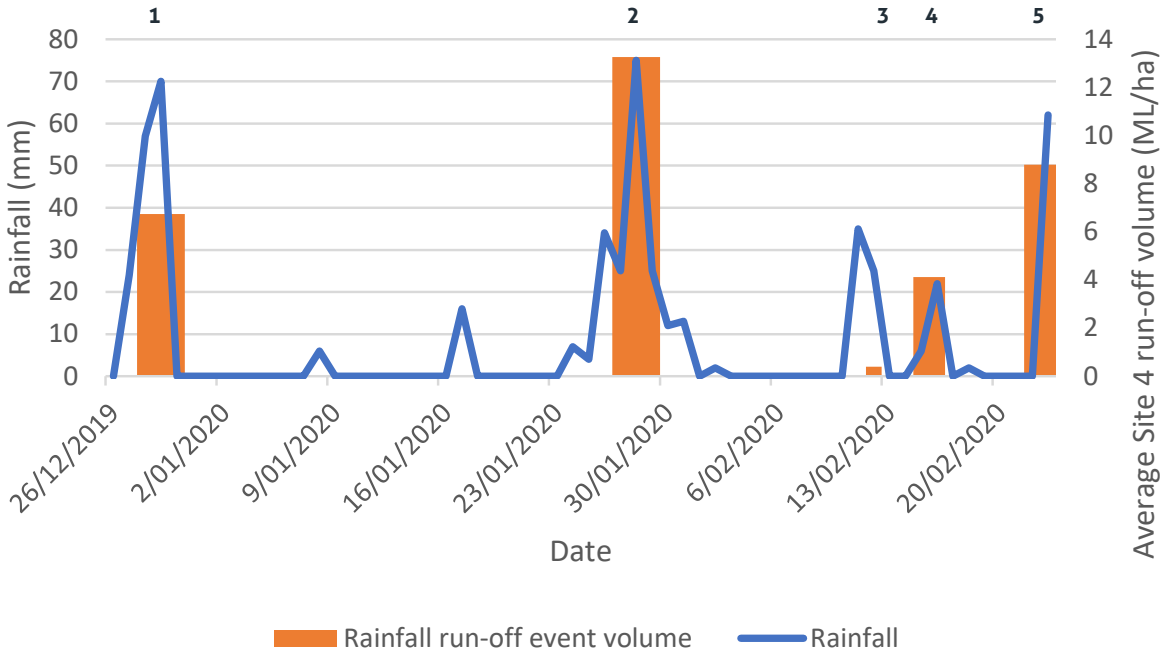

Figure 1 Rainfall data and corresponding volume of runoff events (ML/ha). All events were generated from rainfall. Event 5 resulted in flooding of the site and therefore only the beginning of the event was sampled.

RESULTS

NOTE: Nutrient and pesticide concentrations and pesticide loads are estimates only. Freshwater aquatic ecosystem species protection values cannot be applied to paddock-scale monitoring. These values are referenced only for discussion. Phosphorus (P) concentrations are indicative and actual concentrations are likely to be slightly higher.

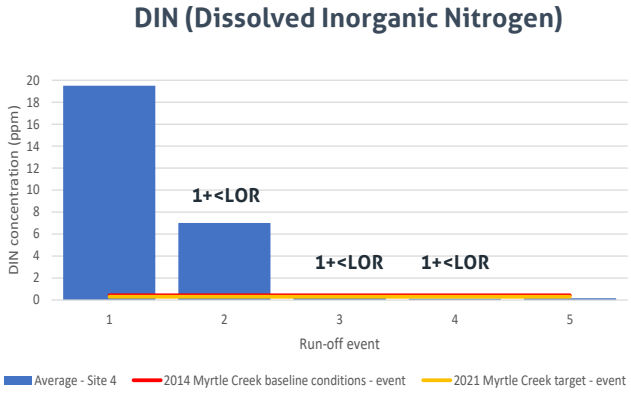

Figure 2 *DIN concentration in run-off (ppm). The Mackay Whitsunday Water Quality Plan's DIN water quality in 2014 event conditions was 0.429 ppm and 2021 event target is 0.300 ppm, both for the Myrtle Creek. Provided for discussion only.*

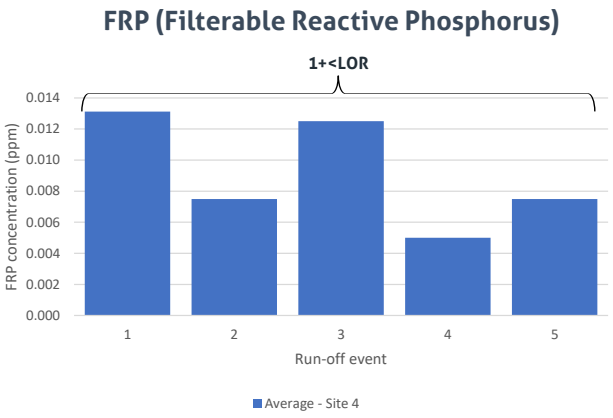

Figure 3: *FRP concentration in run-off (ppm). The Mackay Whitsunday Water Quality Plan's FRP water quality in 2014 event conditions was 0.200 ppm and 2021 event target is 0.193 ppm, both for the Myrtle Creek. Provided for discussion only* (not shown).

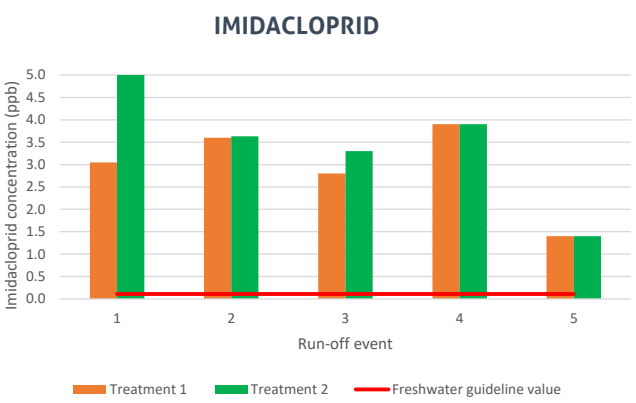

Figure 4: Imidacloprid concentration in run-off (ppb). Freshwater guideline value is the aquatic ecosystem protection guideline value at the 95% species protection level and is applicable only to freshwater systems. Imidacloprid value is 0.11 ppb. Provided here for discussion only.

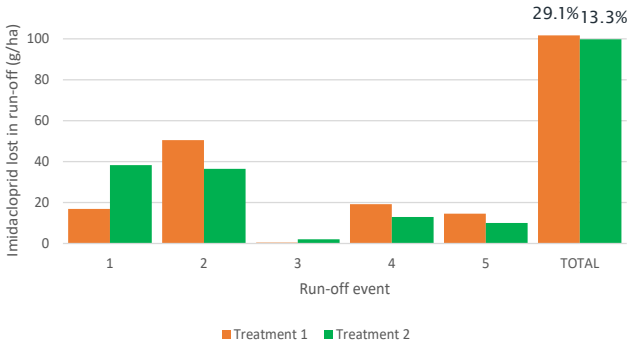

Figure 5: Estimated imidacloprid in run-off (g/ha) calculated using estimated flow values. Percentage presented above the TOTAL bars provide an estimate of the percentage of imidacloprid applied lost in run-off.

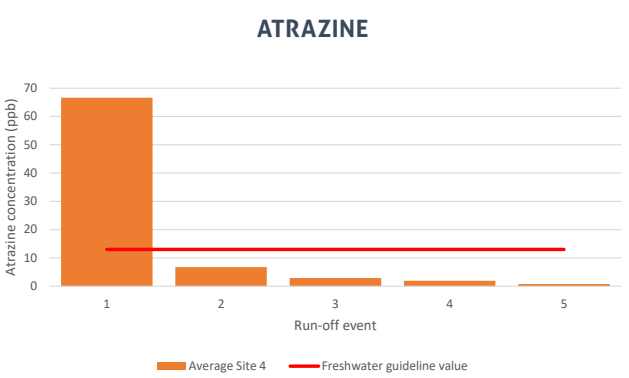

Figure 6: Atrazine concentration in run-off (ppb) from Treatment 1. Freshwater guideline value is the aquatic ecosystem protection guideline value at the 95% species protection level and is applicable only to freshwater systems. Atrazine value is 13 ppb. Provided here for discussion only.

Figure 7: Estimated atrazine in run-off (g/ha) calculated using estimated flow values. Percentage presented above the TOTAL bars provide an estimate of the percentage of atrazine applied lost in run-off.

<LOR - please note in this event concentrations were below the lowest observable reading (LOR) of the laboratory equipment. Concentration is provided as half the LOR.

1+<LOR - please note in this event one or more sample concentrations were below the lowest observable reading (LOR) of the laboratory equipment.

PENDIMETHALIN

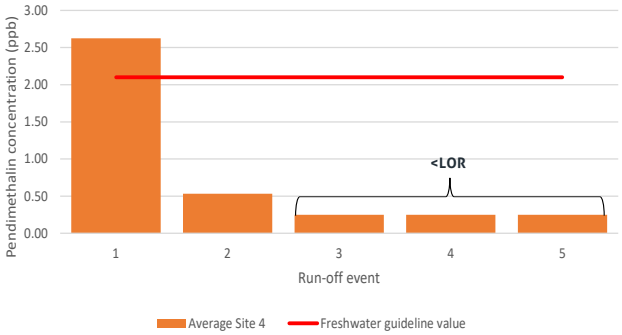

Figure 8: Pendimethalin concentration in run-off (ppb). Freshwater guideline value is the aquatic ecosystem protection guideline value at the 95% species protection level and is applicable only to freshwater systems. Pendimethalin value is 2.1 ppb. Provided here for discussion only.

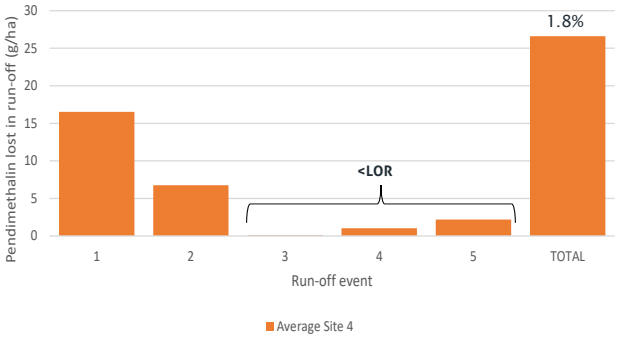

Figure 9: Estimated Pendimethalin in run-off (g/ha) calculated using estimated flow values. Percentage presented above the TOTAL bar provide an estimate of the percentage of pendimethalin applied lost in run-off.

METOLACHLOR*

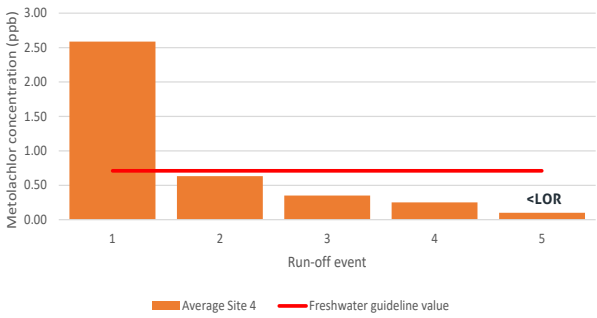

Figure 10: Metolachlor concentration in run-off (ppb). Freshwater guideline value is the aquatic ecosystem protection guideline value at the 95% species protection level and is applicable only to freshwater systems. Metolachlor value is 0.71 ppb. Provided here for discussion only.

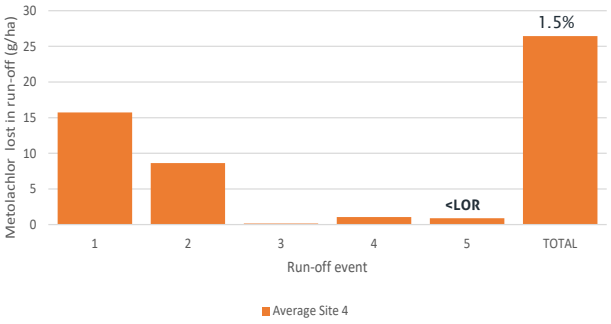

Figure 11: Estimated metolachlor in run-off (g/ha) calculated using estimated flow values. Percentage presented above the TOTAL bar provide an estimate of the percentage of metolachlor applied lost in run-off.

<LOR - please note in this event concentrations were below the lowest observable reading (LOR) of the laboratory equipment. Concentration is provided as half the LOR.

1+<LOR - please note in this event one or more sample concentrations were below the lowest observable reading (LOR) of the laboratory equipment.

****includes metolachlor and S-metolachlor***

DISCUSSION

Please note that all concentrations are estimates only. This is not a replicated research trial. Due to equipment limitations, water samples were unable to be collected for the entire events. This may result in actual concentrations being higher or lower than the estimates provided. The information is provided as a guide for comparison between treatments at this site only.

Due to equipment limitations, suSCon maxi Intel® was applied by hand. This may have resulted in suboptimal application. This may have caused the suSCon maxi Intel® to not be applied deep enough after hilling up, resulting in higher losses than expected. Combined with the high solubility of imidacloprid and periods of water backing up at this site, the high losses of imidacloprid from both treatments may be explained. This demonstrates the importance of placement. Previous research has shown suSCon maxi Intel® to have less loss than Confidor® Guard (Tech Note suSCon maxi Intel).

Pendimethalin and Metolachlor had significantly lower concentrations in run-off compared to atrazine and imidacloprid. Pendimethalin has very low run-off losses compared to most other herbicides due to the ability to bind to soil particles/lower solubility (see The Herbicide Risk Matrix). Metolachlor likely has lower run-off losses due to being applied earlier than atrazine and imidacloprid, allowing more time for incorporation and breakdown. This suggests that timing is a major influence on losses.

Previous research shows losses of 13% of many applied herbicides if run-off occurs after 48 hours or so (this excludes pendimethalin and flumioxazin which have significantly lower losses see: The Pesticide Risk Matrix). This suggests that application rate is the major influence on losses.

Higher DIN losses were demonstrated at this site, compared to the other sites this season. However, DIN concentrations exceed the Mackay Whitsunday Water Quality Plan's DIN current conditions for the Myrtle Creek (2014 conditions) only in the first two events. It is expected that paddock-scale run-off would be of higher concentration than in-creek concentrations due to scale and dilution. As this is a plant cane block, the ground has been worked significantly more than other sites. This causes increased mineralisation of nitrogen which may explain the higher concentration of DIN in the first events.

FRP concentrations are very low and do not exceed the Mackay Whitsunday Water Quality Plan's FRP 2021 target for the Myrtle Creek. Whilst paddock-scale run-off cannot be directly compared, this indicates a positive result.

REFERENCES / FURTHER INFORMATION

The Pesticide Risk Matrix - Attachment 1

Runoff Loads Compared to Application Rate. Fillols, E. 2018.

Mackay Whitsunday Water Quality Improvement Plan 2014-2021. Folkers, A., Rhode, K., Delaney, K. & Flett, I. 2014.

Tech Note suSCon maxi Intel - 2016 Reduced Imidacloprid Run-off

FOR FURTHER INFORMATION PLEASE CONTACT

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