



***Assessment of Drinking Water Tanks in Close Proximity to
Intensive Plant Agriculture in the
Coffs Harbour Local Government Area
2017-2019***



COFFS HARBOUR

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Mid North Coast
Local Health District



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1. Executive Summary

Coffs Harbour City Council (CHCC) in collaboration with Mid North Coast Local Health District and with involvement from NSW Environment Protection Authority conducted an assessment of private drinking water tanks in close proximity to intensive plant agriculture operations (IPA). This was in response to increasing complaints from residents alleging pesticide spray drift and concern with potential health issues.

Spray drift is defined by the Australian Pesticides and Veterinary Medicines Authority as the movement of spray droplets of a pesticide outside of the application site during or shortly after application. Pesticides include agricultural chemicals such as herbicides, fungicides, miticides, rodenticides and insecticides.

The study's aim was to determine whether pesticides were detectable in drinking water tanks adjoining IPA operations.

Water from 23 private rainwater tanks was sampled for pesticides between November 2017 and June 2019, with 71 samples collected in total. Samples were collected from drinking water tanks supplied from the roof catchment of dwellings in close proximity to IPA. The sampling followed a defined sample collection protocol with the water samples sent to the NSW Health Forensic and Analytical Science Service laboratory for analysis. All sample sites were in close proximity to operational IPA properties, and ranged from being within 16m to 280m of an active IPA property.

Results of the study:

- Detected six different agricultural pesticides in ten of the 71 rainwater tank samples (14%) from six different rainwater tanks.
- Showed that all levels of detected pesticides were below the Australian Drinking Water Guideline values (or an international equivalent where there was no ADWG guideline value), so all water tested was considered safe for human consumption.
- Detected the presence of pesticides in private rain water tanks which may indicate that off-site movement is occurring. However, further studies would be required to validate the source of the pesticides detected.

In NSW there is no legal obligation for pesticide users on farms to notify neighbours of ground spraying and there is no legal requirement for buffer zones or separation distances from IPA operations and residential neighbours.

Stronger regulations should be considered in relation to land use planning and proximity of IPA to sensitive receptors, such as schools and private dwellings if spray drift from ground spraying is confirmed through further studies.

2. Introduction

Coffs Harbour Local Government Area (Coffs Harbour LGA) in the North Coast region of New South Wales (NSW), Australia, has seen a rapid expansion of intensive plant agriculture (IPA) in recent years. The Australian blueberry industry has doubled its production since 2013 (ABARES 2018), with approximately 80% of Australia's blueberries grown in the Coffs Harbour LGA (CHCC 2018). Along with the blueberry industry growth, hothouse and raspberry horticulture has also increased, replacing bananas in many cases and expanding onto former grazing land within the Coffs Harbour LGA. This rapid industry growth has created some conflict both in rural-zoned areas and at the rural/urban interface, with residents raising concerns about drift from ground-spraying of pesticides from nearby IPA operations.

Spray drift is defined by the Australian Pesticides and Veterinary Medicines Authority (APVMA) as the movement of spray droplets of a pesticide outside of the application site during or shortly after application. It does not encompass off-target movement of a pesticide caused by runoff, volatilisation, erosion, or any other mechanism that occurs after spray droplets reach their intended target (APVMA 2019a).

Pesticides include agricultural chemicals such as herbicides, fungicides, miticides, rodenticides and insecticides.

In NSW, the Environment Protection Authority (EPA) is responsible for regulating pesticide use under the *Pesticides Act 1999*. The APVMA is the Australian government authority responsible for the assessment and registration of all pesticides and veterinary medicines used in Australia. The APVMA's role also includes the approval of all pesticide product labels that provide instructions on the proper use of a pesticide and any warnings or safety requirements.

Coffs Harbour City Council (Council) receives complaints from residents alleging spray drift from neighbouring IPA, which are referred to NSW EPA for follow-up. From April 2017 to October 2018, Council received 73 complaints in relation to IPA operations, with approximately 40% reporting alleged spray drift (CHCC pers comm). The NSW EPA analysis of complaints from this period also showed spray drift reports to be dominant, making up 76% of total complaints for the North Coast region (EPA pers comm).

Pesticide spray drift is an issue in many agricultural and peri-urban settings, with studies showing pesticide impacts on families, workers, water supplies and nearby crops (Harley et al 2019; Parron et al 2014; Pezzoli and Cereda 2013; WHO 2017; ABC 2018). However, there are few studies on spray drift and pesticide contamination of rainwater tanks.

In 2017, Council collaborated with Mid North Coast Local Health District (MNCLHD) and sought advice from NSW EPA to develop a preliminary study to assist Council and NSW EPA to respond to complaints relating to pesticide spray drift from IPA. As Council and MNCLHD provide advice on private drinking water supplies, the testing of private drinking water tanks for the presence of pesticides became the focus of the study.

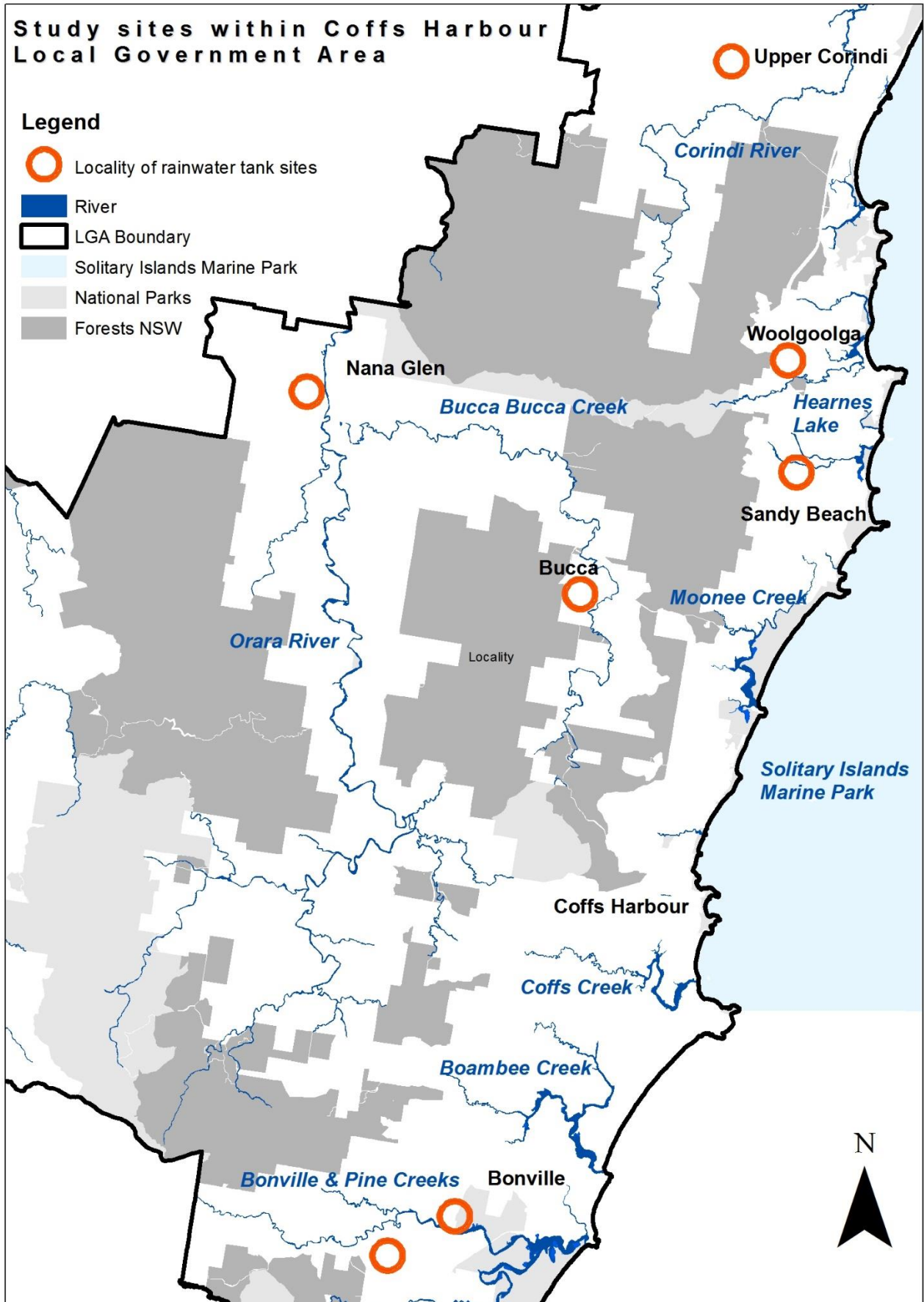
This study's aims were to:

- Assess whether pesticides were detectable in drinking water tanks neighbouring IPA;
- Evaluate any pesticides detected against the Australian Drinking Water Guidelines (ADWG);
- Make recommendations where the study identified areas for further research or management; and
- Communicate the study's findings and recommendations to government and industry.

The study was limited to those properties that had previously lodged a complaint with Council or NSW EPA regarding alleged spray drift, were in close proximity to complainants, or had responded to a letter-box drop.

The study's focus was water in rainwater tanks and so did not sample soil, air or surfaces for pesticides.

Figure 1 - Study Sample Sites



3. Study Methodology

3.1. Site Selection

Sample sites included in the study met one or more of the following selection criteria (Figure 1):

- Were within the Coffs Harbour LGA
- Had made a previous complaint to Council or to NSW EPA regarding alleged spray drift
- Residents accessed drinking water from a rainwater tank located within 100m of an IPA property
- Were more than 100m from IPA and accessed drinking water from a rainwater tank
- Were within 150m of other sites that had reported alleged spray drift

3.2. Site Assessment

Each site was visited by Council Environmental Health staff and assessed for roof, gutter and water storage, tank age and condition, water filtration, first flush diverters and leaf guards, maintenance, surrounding vegetation, typical wind conditions including coastal and land breezes, slope, and proximity of the roof catchment to the nearest IPA operation. Gardening activities at the site were also assessed through interview, observation and a householder survey to identify any use of pesticides (attachment 1).

Participants were asked to report to Council and NSW EPA throughout the study period, any occurrences of alleged spray drift using the provided observations form (attachment 2) to document what was being experienced, as well as reporting any visible spray, odour, wind condition and equipment used.

Council staff obtained details of herbicides used in Council's roadside weed spraying to identify other potential sources of any herbicides detected.

3.3. Resident Survey

Residents of each site were surveyed regarding the length of time living at the site, number of residents and their ages, how many days per week were spent at home, establishment year of the neighbouring IPA operation, how often spray drift was an issue, how did they respond when spray drift occurred, was there any form of communication or notification from the farmer, was there any resolution of any issues and if so, what outcome were they aware of.

3.4. Sampling

From November 2017 to May 2019, samples of drinking water were taken from rainwater tank sites either in response to reports to Council of alleged pesticide spray drift, or because the site was one in a cluster of sites where a report of alleged spray drift had been made.

Samples were taken from a tap after any filtration or treatment to obtain a representative sample of the drinking water. Where tanks had no filtration or treatment, samples were taken from an outside tap or directly from the tank when internal access was not possible.

Participants reported to both the NSW EPA Environment Line (131 555) and to Council staff, and participants completed an observations sheet. The drinking water was then sampled by Council Environmental Health staff. Samples were taken within 72 hours of the report if there had been rain or dew to transport potential pesticides into the tank. The presence of rain or dew was estimated from the participants' reports on weather conditions.

In June 2019, a water sample was taken from all sites to ensure that every tank had been sampled at least once during the study. This allowed the study to include previously un-sampled tanks that were part of the study but had not had a spray drift episode to report. These samples did not require a prior report of alleged spray drift nor any rain to have fallen.

Water samples were collected in new, triple-rinsed, 1 litre amber glass bottles as per the NSW Health Forensic and Analytical Science Service (FASS) laboratory protocol for water sample collection for pesticides analysis (attachment 4). The samples were kept cool after collection and stored in a fridge at Council offices until couriered. Samples were packed for transport, kept cool with ice bricks and

couriered overnight with a chain of custody form (attachment 5) to the FASS laboratory arriving by 9:30am the next morning. Any samples unable to be couriered the same day as collection were kept refrigerated until couriered within the following 24 hours.

At the time of sampling, the water was also checked for pH, temperature, odour, colour and sediment with the results recorded on the sampling record sheet (attachment 3). Any other observed activities from neighbouring IPA properties were also recorded at the time of sampling.

3.5. Sample Analysis

Water samples were analysed for 114 pesticides at the NATA-accredited FASS laboratory in Lidcombe, NSW (accreditation number 3588). The laboratory screened the water samples for five groups of pesticides using accredited methods (attachment 6):

- Triazine/Phenylureas herbicides
- Carbamate insecticides
- Organochlorine, Organophosphate & Synthetic Pyrethroid pesticides
- Acidic herbicides
- Glyphosate

The laboratory instrumentation used has a method limit of quantitation (LOQ) which is set for each pesticide. When a pesticide is detected, if pesticide presence is above the LOQ it can be reliably quantified. Anything below the LOQ is reported as “Nil Detected” (ND) on the laboratory report.

As this study was investigating the presence of pesticide in drinking water tanks, the FASS laboratory provided additional remarks on the results indicating pesticide “traces”. Traces are defined by the laboratory as being less than the method reporting LOQ but can be confirmed by the instrumentation used as being present. These traces are not quantified and therefore cannot be reported on as results.

The FASS laboratory specifically developed additional in-house testing methods (not NATA-accredited) for Boscalid, Pyroclostrobin (Pristine fungicide) and Mancozeb fungicide (which degrades in water to ETU – ethylene thiourea and manganese) as they were not on the standard FASS analytes list. These pesticides are required for use on blueberries produced in NSW under an Interstate Certification Assurance arrangement (DPI 2017).

Results of the samples were reported by the FASS laboratory to MNCLHD and Council staff. All detections of pesticides in collected water samples were referred by Council staff to NSW EPA for any necessary further action. Any detections of pesticides in collected water samples were notified to the resident within 24 hours of Council’s receipt. Interpretive advice was also provided.

4. Study Results

4.1. Sample Results

Water from 23 private rainwater tanks was sampled to test for pesticide presence during the period from November 2017 to June 2019. Of the 23 rainwater tanks, ten were sampled once and 13 were sampled twice or more. A total of 71 rainwater tank samples were collected. The sample sites were in close proximity to operational IPA properties and the drinking water roof catchments were between 16m to 280m from the nearest part of the IPA.

Analysis of the water samples detected the presence of six different agricultural pesticides in ten rainwater samples, with one sample containing two detected pesticides. This represents pesticide detection in 14% of all of the rainwater samples tested. The ten samples with pesticide detections were collected from six different rainwater tanks, so 26% of rainwater tanks in the study had water samples with pesticide detections. The six pesticides detected were Boscalid (a fungicide), Carbendazim (a fungicide), Diuron (a herbicide), Metolachlor (a herbicide), Propiconazole (a fungicide) and Terbutryn (a herbicide). See Tables 1 and 2 for results of pesticide detections.

Table 1 - Agricultural pesticides detected in rainwater tanks

Pesticide	Samples with detections *	Roof catchment distance from IPA (m)
Boscalid	1	170
Carbendazim	1	100
Diuron	5	40 and 100
Metolachlor	2	30
Propiconazole	1	225
Terbutryn	1	25

*Two pesticides were detected in one sample – refer to Table 2

The pesticide concentrations measured in the samples were all below the Australian Drinking Water Guideline (ADWG) values, meaning the drinking water was considered safe for residents to consume.

The ADWG health-based values include a range of safety factors and always err on the side of safety. The process for determining values for pesticides in the ADWG incorporates the likelihood that people may also be exposed to pesticides from other sources. The process also usually considers the concentration that would be considered safe for long term exposure to the pesticide. As there is no ADWG value for Boscalid, a value was calculated for the purposes of this report, using data from the European Commission Health & Consumer Protection Directorate-General (EU Pesticides database 2019b).

All samples with pesticide detections were taken from almost full water tanks, with tank capacities ranging from 10,000 litres to 40,000 litres. Of the six rainwater tanks where detections were found, one had a first flush diverter, filtration and ultraviolet treatment installed, another tank had filtration and ultraviolet treatment in place, and the other four tanks had no treatment.

Residential pesticide use was not considered to be a potential source of the detections at any of the sample sites, as five of the six pesticides detected are not approved for home or domestic use, are not used in household pest control treatments, there were no observed chemical containers with these products at the sites, and none of the products were described as being used by the residents.

Table 2 - Rainwater tanks and results

Rainwater Tank	Distance from IPA to nearest roof catchment (m)	Number of samples taken	Sampling period	Number of samples with 1 or more pesticides detected	Pesticides detected	Sample analysis result (µg/L)	ADWG value that should not be exceeded in drinking water (µg/L)	Type of filtration in place	Sample taken within 72 hours in response to a spray drift complaint
001	40m (maize) 111m (blueberries) 570m (macadamias)	15	13/11/17 – 03/06/19	2	Metolachlor Metolachlor	0.03 (13/11/17) 0.04 (04/12/17)	300	First flush diverter, filtration and ultraviolet (UV) treatment	Yes
002	25m (blueberries) 180m (maize) 620m (macadamias)	5	13/11/17 – 03/06/19	0				None	Yes
003	17m (blueberries) 180m (maize) 740m (macadamias)	5	13/11/17 – 03/06/19	0				None	Yes
004	70m (blueberries)	1	11/06/19	0				None	No
005	25m (blueberries)	3	21/02/19 – 06/06/19	1	Terbutryn	0.19 (21/02/19)	400	None	Yes
006	40m (blueberries)	4	03/01/18 – 02/06/19	0				None	Yes
007	26m & 80m (berries around dwelling)	2	15/11/17 & 11/01/18	0				None	Yes
008	16m (blueberries)	1	11/06/19	0				None	No
009	95m (blueberries)	5	12/09/18 – 03/06/19	0				Filtration and UV treatment	Yes
010	170m (blueberries)	3	26/09/18 – 03/06/19	0				Filtration and UV treatment	Yes
011	225m (blueberries)	6	12/09/18 – 25/06/19	1	Propiconazole	0.04 (03/06/19)	100	Filtration and UV treatment	Yes
012	170m (blueberries)	6	12/09/18 – 03/06/19	1	Boscalid	0.03 (12/09/18)	150 (EU pesticides database 2019b)	None	Yes
013	580m (blueberries)	1	12/09/18	0				None	Yes

Rainwater Tank	Distance from IPA to nearest roof catchment (m)	Number of samples taken	Sampling period	Number of samples with 1 or more pesticides detected	Pesticides detected	Sample analysis result (µg/L)	ADWG value that should not be exceeded in drinking water (µg/L)	Type of filtration in place	Sample taken within 72 hours in response to a spray drift complaint
014	75m (blueberries)	1	05/06/19	0				None	Yes
015	45m (blueberries)	1	05/06/19	0				None	Yes
016	60m (blueberries)	1	05/06/19	0				None	Yes
017	40m (berries & bananas)	2	26/02/19 & 05/06/19	2	Diuron Diuron	0.14 (26/02/19) 0.12 (05/06/19)	20	None	Yes
018	280m (blueberries)	1	04/10/18	0				None	Yes
019	80m (blueberries)	2	26/02/19 & 03/06/09	0				None	Yes
020	110m (blueberries)	3	26/02/19 – 25/06/19	3	Carbendazim Diuron Diuron Diuron	0.25 (26/02/19) 2.88 (26/02/19) 2.60 (03/06/19) 1.24 (25/06/19)	90 (Carbendazim) 20 (Diuron)	None	Yes
021	25m (blueberries)	1	04/06/19	0				None	Yes
022	260m (blueberries & blueberries)	1	04/06/19	0				None	No
023	253m (blueberries & raspberries)	1	04/06/19	0				None	No
TOTAL		71		10	6				

4.2. Summary of Resident Survey

Participant surveys and completed observation forms from the 20 participating properties containing the 23 rainwater tanks revealed the following commonly reported observations or concerns regarding chemicals and neighbouring IPA operations:

- Acceptance by participants that they live in a rural area and expect tractor noise and normal farming operations, but were upset when affected by neighbouring IPA pesticide use processes
- No notifications from farmers that spraying would occur, but participants desired prior notification of spraying even though it is currently not mandatory in NSW (19 of 20 participants)
- Frequent spraying during perceived inappropriate weather conditions, such as strong winds, just before rain, or during temperature inversions (12 participants)
- Strong odour from spraying and persistence of spray odour for hours inside the house (ten participants)
- Stinging eyes and nose (ten participants)
- A taste in the mouth as though “you are eating chemicals” (three participants)
- The need to abandon an outside activity, go inside and close up the house to escape the spray drift (nine participants)
- Four participants reported having adverse reactions after noticing chemical odour or taste in the air; two participants reported needing medical attention for breathing difficulties and asthma, one participant reported vomiting, and another reported a facial skin reaction lasting three days
- Reports of high spray above the height of the plants resulting in visible spray drift (nine participants). One participant reported that visible drift was reduced significantly once the spray equipment was repositioned.
- Concern regarding the possible impacts of spray drift on their pets and livestock (four participants)
- Expressed difficulties reporting to the NSW Environment Line (five participants)
- One participant reported great satisfaction with the improvements the farmer had made to the pesticide application methods.

5. Discussion

5.1. Off-site movement of pesticides

The detection in private rainwater supplies of six agricultural pesticides from 26% of the 23 sampled rainwater tanks suggests that off-site movement of pesticides may be occurring in the Coffs Harbour LGA. The pesticides detected are predominately for commercial use on farms and crops associated with IPA operations. All pesticide detections were referred to the NSW EPA as the responsible authority for pesticide complaints.

There is little published research on the occurrence of pesticide spray drift impacting the quality of drinking water from rainwater tanks. The few studies conducted have identified pesticides in drinking water from tanks at levels below the ADWG (NHMRC, NRMCC 2011) as was also found in this study.

There are multiple factors that influence whether spray drift occurs. These factors include pesticide application, knowledge and practices, separation distances and barriers, and weather conditions (CSIRO 2002). Sound knowledge of pesticide application and management by IPA operators is critical in mitigating and avoiding pesticide spray drift, with detailed guidance for operators available (CSIRO 2002; APVMA 2019a).

Improved control of spray drift could be achieved through a program of education, compliance monitoring, improved land use planning and adoption of best practice farm operations.

5.2. Pesticides

The six agricultural pesticides detected in drinking water samples from six rainwater tanks were all detected at levels below the ADWG (NHMRC, NRMCC 2011), or an international equivalent (EU pesticides database 2019b) and therefore the water was deemed safe to drink.

The ADWG is endorsed by the NSW Government as it provides a solid foundation for assessing drinking water quality by specifying health-based and aesthetic criteria as well as the philosophy of a "multiple barrier approach" from catchment to tap, to ensure safety of the water. One detected pesticide, Boscalid, has no ADWG value, despite it being an active ingredient in a required fungicide for use on pre-harvest blueberries (DPI 2017).

Of the six pesticides identified in private drinking water supplies, four are not approved by the APVMA for use on the current crop grown at the nearest or adjacent IPA operation to the site at which they were found (APVMA 2019b). Consequently, further investigation as to the source and use of these pesticides is needed.

The NSW Department of Primary Industries provides comprehensive information on the pesticides recommended for use on blueberries and raspberries (DPI 2019), and the APVMA PubCris Database allows users to search for approved pesticides by crop (APVMA 2019b).

5.3. Current Legislative Framework

Council does not require development consent for IPA within the LGA when the IPA is on land that is within zone "RU2 Rural Landscape" under the *Coffs Harbour Local Environmental Plan 2013*. When land is being developed for IPA cultivation, there is no legal requirement for provision of buffer zones or separation distances. NSW Department of Primary Industries (DPI) recommends a 250m separation distance (or buffer zone) between outdoor horticulture, protected cropping (greenhouses) and sensitive receptors (schools, residences, care facilities) in its *Living and Working in Rural Areas Handbook 2007* (DPI 2007), however these distances are not enforceable.

In this study, ten of the 13 IPA properties were described as being established since 2010, converting from grazing land to IPA, however no buffer zones were observed at these properties. All IPA operations were located less than the DPI's recommended 250m separation distance from the sensitive receptor. In the absence of any legally required separation distances or buffer zones in NSW or the Coffs Harbour LGA, IPA can be, and has been, established on rural zoned land in close proximity to dwellings and other sensitive receptors.

The off-site movement of pesticide dust or droplets through the air at the time of application or soon after, to any site other than the target area, may constitute an offence under the *Pesticides Act 1999* if the spray drift is in breach of a label or permit instruction or the drift results in damage to property or harm to a person (EPA pers comm). Proving spray drift is difficult for complainants and enforcers due to the nature of pesticide use. The NSW EPA is the authorised regulatory authority for spray drift investigations.

5.4. Notification of Spraying

In NSW, there is no legal obligation for pesticide users to notify neighbours of ground spraying (EPA 2019). Although notifying neighbours of spraying is recommended by both DPI and NSW EPA, only one resident reported being informed by the neighbouring IPA operator that spraying would occur. When discussing the concerns with study participants, most reiterated that they understood that living in a rural zone meant tolerating tractor noise and other rural activities at times, however they did not feel they should have to deal with pesticide spray drift. Notification by a neighbouring farmer about pesticide spraying was the one thing that participants said would make a major difference to neighbourly relations. If notified of intended spraying, participants suggested they could be prepared and have the house closed up and no outside activities planned, however this suggests the residents believe that spray drift will continue to be a problem.

One participant, who lives near two IPA properties run by different operators reported that one operator would email the day prior to spraying, then text on the day to confirm when the spraying would take place whereas the other operator provided no communication regarding spraying.

Mandatory notification to properties in close proximity prior to pesticide spraying would be an appropriate addition to existing legislation. Notifications could be via a text message or email, not necessarily requiring face to face interaction with the neighbour.

5.5. Participants' Concerns

The residents of the participating properties have reported that concerns about spray drift are impacting their lives as they have abandoned outdoor activities due to spray drift and odour. A key concern of residents is the potential health risk associated with airborne pesticide droplets and mist, with residents reporting inhalation of the spray being associated with breathing difficulties or the triggering of asthma and vomiting, and skin reactions causing facial redness and inflammation. Pesticide residues on play equipment and in surface dust are also reported concerns of participating residents.

5.6. Provision of Mitigation Measures

To reduce airborne pesticides entering household rainwater tanks, first flush diverters can be installed prior to rainwater tank inlets. First flush diverters are a simple piping construction that redirects the first 2mm to 5mm of rain which is shown to contain most contaminants, with subsequent roof run-off meeting ADWG standards (Kus et al 2010; Martinson and Thomas 2003). NSW Health also recommends that rainwater tanks should have tightly sealed access covers, and that tanks are cleaned every two to three years (NSW Health 2018).

Vegetation, artificial spray drift barriers (>50 % shade cloth) and separation distances may all reduce pesticide spray drift. Research indicates that a 20m vegetated barrier comprised of tall trees with needle shaped leaves, such as casuarinas, and a mid-storey of hedging shrubs such as native lilly pillys, with a drop zone either side of the barrier, can reduce spray drift by up to 90%. Artificial spray drift barriers of shade cloth (rated between 50% and 70% density) are also effective in reducing drift as long as the height of the shade cloth is 1.5 times the crop height (Hewitt et al 2009).

Many of the properties in the study did not have the space for such vegetated barriers, or had power line easements preventing vegetative barriers. Artificial barriers work well when spraying close to the barrier, but may not be as effective on slopes, as the wind can carry spray drift over the tops of the barriers. This indicates multiple methods of spray drift mitigation may need to be incorporated into overall farm management.

Further investigation is needed to determine the source of pesticides in rainwater tanks and mitigation methods.

5.7. Study Limitations

There are a number of limitations to this study:

i. Study participants

The study was limited to a small number of participants who were already known to Council and NSW EPA, who had responded to a letter-box drop, or were within a particular cluster of properties surrounding IPA, so excludes those residents who were either unaware of the study or who had not reported spray drift episodes.

ii. Sampling frequency and timing

Not all sites were sampled at the same time as sampling was in response to spray drift reports. Some sites were only sampled once and were not in response to a report. There were also occasions where sampling could not take place as there had been no rain or dew to transport potential pesticides the tank.

iii. Pesticide detection limitations

The FASS laboratory provided additional information on traces of pesticides identified in 31 of the 71 rainwater samples taken during the study. These 31 samples contained traces of two of the pesticides that also had reportable detections and a further five pesticides – Atrazine, Chlorpyrifos ethyl, Endrin, Ethylene Thionurea (ETU – a derivative of the fungicide Mancozeb), and Glyphosate. Although these traces are not quantifiable and are therefore not reported in the results of this report, they were identified in multiple samples across nine sites. One rainwater tank had traces of six

different pesticides in six different samples. The pesticides identified as traces include two approved for household use (Glyphosate and Mancozeb), four routinely used in IPA (Boscalid, Chlorpyrifos ethyl, Mancozeb and Glyphosate), a pre-emergent herbicide (Atrazine), and one currently banned substance (Endrin) which is a known persistent organic pollutant that has not been approved for use since 1987 (DEE, 2019). Endrin traces were in seven samples taken from six separate water tanks during the final June 2019 sampling.

5.8. Further Research

The study showed that water sampled from all drinking water supplies was safe to consume. If relevant standards exist, additional assessments of pesticide residues on surfaces of residential properties and of airborne spray particles may provide a greater understanding of the breadth and source of spray drift and potential exposure routes.

6. Recommendations

The following recommendations are made in relation to the study:

1. That Council inform and provide a copy of the study to NSW government agencies who have an interest in pesticide use and its potential impact relevant to their area of oversight and responsibility.
2. That NSW DPIE investigate options for enhanced land-use planning controls to minimise the potential impacts from IPA pesticide operations upon unintended receivers.
3. That Council investigate options for enhanced land-use planning controls to minimise the potential impacts from IPA pesticide operations upon unintended receivers.
4. That Council inform and provide a copy of the study to the NHMRC for consideration of establishing ADWG fact sheets for additional agricultural pesticides.
5. That Council and MNCLHD promote that residents reliant on rainwater tanks for drinking water consider the NSW Health recommendations for managing their drinking water, as available on NSW Health website
6. That Council discuss with NSW government agencies the need to undertake further research into the use of pesticides by IPA and their potential impacts upon unintended receivers.

7. Acknowledgements

Thanks to the study participants who allowed their rainwater tank to be sampled, to Council and NSW Health for funding the study, to MNCLHD and NSW EPA for their guidance, and to the staff at the NSW Health FASS laboratory for their expertise, advice and for expanding their assessments to include additional pesticides. Thanks also to Southern Cross University for their involvement in reviewing this report.

8. Abbreviations

ADWG	Australian Drinking Water Guidelines
APVMA	Australian Pesticides and Veterinary Medicines Authority
CHCC	Coffs Harbour City Council
DPI	NSW Department of Primary Industries
DPIE	NSW Department of Planning, Industry and Environment
EPA	NSW Environment Protection Authority
ETU	Ethylene thiourea (a derivative of Mancozeb)
FASS	NSW Health Forensic and Analytical Science Services
ICA	Interstate Certification Assurance

IPA	Intensive Plant Agriculture (includes horticulture, viticulture, turf farming, irrigated non-fodder crops)
LGA	Local Government Area
LOQ	Limit of Quantitation
MNCLHD	Mid North Coast Local Health District
ND	Nil Detected
NHMRC	National Health and Medical Research Council

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Attachment 1 – Assessment and Survey Forms



Assessment of domestic rainwater tank

Assessor: _____ **Date:** _____

Property Address: _____

Resident Name: _____

Do you own the property? Yes / No

Infrastructure Assessment

Tank

Location on property: _____

Above ground / below ground / roof top

Material: Concrete Plastic Galvanised steel Colourbond Fibreglass

Age: _____

Condition: _____

Tanks Inlet screened: Yes / No Condition: _____

Tank Outlet Screened: Yes / No Condition: _____

Capacity of tank: _____

Current water level: < ¼ ¼ ½ ¾ full

Water source: _____

Pump Type: _____ Location: _____

Filters installed at pump: Yes / No

Pipes

Material: _____

Condition: _____

Number of pipes connected to the water tank: _____

First Flush Diverter connected: Yes / No Condition: _____

Roof

Material: _____

Condition: _____

Painted: Yes / No Condition: _____

Flashing material: _____

Chimney: Yes / No

Gutter Guard present: Yes / No Condition: _____

Gutter condition: _____

Area of roof catchment: _____

Evidence of vegetation debris on roof/gutters: Yes / No

Evidence of animal droppings on roof/gutters: Yes / No

Aspect

Distance from nearest berries: _____

Slope of the land from berries to tank: _____

Prevailing wind direction: _____

Natural or built spray drift buffers present: Yes / No

Describe if yes: _____

Access to water for sampling

Internal: _____

External: _____

Photograph Log

Tank

Roof

Pipes

Filters/diverters

Nearest berries



Householder survey

Assessor: _____ **Date:** _____

Property Address: _____

Resident Name: _____

Email: _____

Best phone number: _____ **Do you own the property?** Yes / No

Resident information

Number _____ of _____ years _____ residing _____ at
address: _____

Number of people usually residing : _____ Number of children 5-15: _____ under 5: _____

Number of elderly (>70): _____

Do you live here all year round (except when away): _____

How many days spent at home each week: _____ For how many residents: _____

Water supply information

Main water supply source: _____

Drinking water supply/source: _____

Any other water supply eg Dam/bore: _____

Do you have water pumps: _____ How many: _____

What age is the tank if known: _____

What age is the house if known: _____ Age of guttering/roofing: _____

When was the tank last desludged: _____

When were the gutters last cleaned? _____

When were pumps last checked? _____

Are filters installed on water supplying internal taps: Yes / No

What type: _____

How often are filters changed: _____

Do you use any chlorine or other water treatment on drinking water? _____

How do you rate the water quality for drinking: Very good Good OK Poor Very poor

Why? _____

Any past issues with drinking water quality? _____

Other information

If chimney present – how often do you have fires? _____

Do you recall what month/year the blueberry farm started operating? _____

How often do you notice spraying occurring? _____

How often is spray drift an issue for you? _____

What do you do if spray drift occurs? _____

Does the farmer let you know when spraying will happen? _____

Have you spoken to the farmer at all? _____

Have you spoken to the farmer about any issues you have? _____

What response or arrangement did you come to? _____

Do you have any other concerns/issues/questions? _____

Attachment 2 – Record of Observations



Record of observations of agricultural spraying and spray drift
September 2017-December 2018

Address:

Please notify Council immediately if spray drift occurs - 0407 849 439 (leave a message or send a text)

Also notify the EPA Environment Line – 131 555

	Example	1	2	3
Date	1/01/2017			
Time start	5:10 PM			
Time finish	7:30 PM			
Activity observed	spraying blueberries			
Evidence of spray drift?	yes or no			
Location/area that appeared sprayed (see map)	area 2, 3 and 4			

Equipment observed	tractor with tank and spray arm			
Address of property conducting spraying	street address or description of location eg: the property directly north of our house			
Describe observations	spray coming off nozzle and carried in wind - droplets can be seen			
Any odour/smell?	none/weak/moderate/strong			
Spray droplets visible	yes or no - if yes, where?			
Photographs taken of spraying/drift/droplets	yes or no			
Estimated wind speed and direction	gentle southerly/strong wind from the north			
Other weather details (screen shot of weather app)	screen shot taken or describe weather - cloudy, windy, clear			
Any rain that day or dew on the roof?	No			
Name of person completing record	John Smith			

Council notified?	eg: Yes - text at 6:30pm			
How many people at home when spraying occurred?	3			
Were you notified by the farmer of the spraying operations?	Yes			
Photo of this form texted to Council?	Yes at 7:30pm			
Environment Line called 131 555	Yes at 6:30			
Other comments				

Attachment 3 – Sample Collection Sheet



Property code: _____

Sample #: _____

Sample collection sheet

Assessor: _____ **Date:** _____

Property Address: _____

Contact by household re: spray drift? Yes / No **When:** _____

What was reported: _____

Sampling procedure

Water access point

- Rinse 1 litre pesticides bottle twice
- Fill 1 litre brown pesticides bottle
- Seal bottle with white lid and foil
- Place in esky with ice bricks immediately
- Half-fill white bucket

Check bucket sample for:

Colour: _____

Odour: None Mild Moderate Strong // Musty Rotting Sulphurous

Sediment: None small particles larvae noticeable sediment
other: _____

pH from probe: _____

Temperature from probe: _____

Photograph sample: Yes/No

Swab sample:

- Open EPA swab kit
- Take swab as per protocol
- Store swab as per protocol

Swab taken from: window pane door pane other surface _____

Residue visible? Yes / No Where: _____

Note:

Distance from reported spray zone: _____

Any obvious activity current on residential property eg gardening – describe _____

Any obvious activity current on neighbouring agriculture property – describe _____

Current weather conditions: _____

Any obvious signs of rain or dew since reported spraying? _____

Attachment 4 – NSW Health FASS Laboratory Protocols and Methods



Forensic & Analytical
Science Service



How do I collect a PESTICIDES sample?

Sample Container

- ◆ Use a brown glass bottle capable of holding at least 1 L of sample, together with a plastic screw-top cap lined with aluminium foil.
- ◆ Container must be clean and free from contaminants.



Label

- ◆ Write sample details on the project label supplied and attach it to the bottle.
- ◆ A sample submission form is not required.

Collecting the Sample

- ◆ Before sampling, rinse the container and aluminium foil with the water to be collected at least once.
- ◆ Fill the bottle with the sample.

Transporting Samples to the Laboratory

- ◆ Pack the samples into an insulated container together with sufficient freezer bricks to keep the samples cool (2-10°C) during transportation.
- ◆ Attach a copy of the FASS address label to the insulated container.
- ◆ Dispatch the samples to FASS as soon as possible.



NSW Health Pathology

ABN 49 382 586 535

NSW Forensic & Analytical Science Service

Joseph Street (Weeroona Road entrance), Lidcombe

PO Box 162, Lidcombe NSW 2141

Tel (02) 9646 0222 Fax (02) 9646 0333

Attachment 5 – Chain of Custody Form



NSW FORENSIC & ANALYTICAL SCIENCE SERVICE WATER ANALYSIS SAMPLE SUBMISSION FORM

FOR: Microbiological Analysis Chemical Analysis Pesticides Other _____

Submitting Authority: _____ Sampling Officer: _____

Authorised Signature: _____ Telephone no: _____

Date Collected: _____ Fax No: _____

Time Collected: _____ am / pm

If sample(s) are being taken by a Water Utility on behalf of a PHU, the PHU is _____

Sample Type: Drinking Swimming Pool/ Spa Surface Water Tidal Recycled water
 Other _____

Treatment: Untreated Chlorinated Filtered UV Fluoridated

REASON FOR SUBMISSION		
Category	Details	Comments
<input type="checkbox"/> Public Health Investigation *	<input type="checkbox"/> Gastrointestinal Illness <input type="checkbox"/> Skin Infection/Rash <input type="checkbox"/> Suspected Contamination <input type="checkbox"/> Incident Investigation <input type="checkbox"/> Follow up to Complaint <input type="checkbox"/> Other	
<input type="checkbox"/> PHU Allocated *	Reason for Analysis:	
<input type="checkbox"/> Request for Non-Routine Test	Tests Required:	
<input type="checkbox"/> Private #	Tests Required:	
	Address for Results:	

* Public Health Unit Use Only

Results for private supplies serving the public that do not comply with the ADWG will be notified to the relevant PHU.

SAMPLE DETAILS			
Sample Marked	Town/Location	Sampling Site	Laboratory Number
1			
2			
3			
4			
5			
6			

LABORATORY USE ONLY: Date/Time Received:

Western Sydney Local Health District
 ABN 48 702 394 764
 NSW Forensic & Analytical Science Service
 Joseph Street (Weeroona Road entrance), Lidcombe
 PO Box 162, Lidcombe NSW 2141
 Tel (02) 9646 0222 Fax (02) 9646 0333

Attachment 6 – Certificate of Analysis



Clinical & Environmental Toxicology Interim Certificate of Analysis

Analysis required :	Method No:
ACIDIC HERBICIDES	CET8B
ORGANOCHLORINE & ORGANOPHOSPHORUS BY LCMSMS	CET43A
ORGANOCHLORINE, ORGANOPHOSPHORUS & SYNTHETIC PYRETHROID PESTICIDES BY GCMSMS	CET7D*
TRIAZINES/PHENYLUREAS & CARBAMATES	CET19C
ETU	CET 49*

Samples were tested for the above pesticides and the following quantitative results obtained:

SAMPLE ID	CLIENT ID.	SAMPLE INFO.	SAMPLING DATE/TIME	SAMPLE REMARKS	PESTICIDES	RESULT $\mu\text{g/L}$
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Note: ND = Not Detected, below LOQ. (LOQ = Method Limit of Quantitation)

*NATA accreditation does not cover the performance of this service

REMARKS: Coffs Harbour pesticide monitoring.

Disclaimer: The results of analysis contained in this report relate only to the sample(s) tested.

Analyst Signature : _____

Analyst Name : _____

Date : _____



NATA Accreditation Number : 3588
Accredited for compliance with ISO/IEC 17025 - Testing.
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