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|---|---|
| *In the matter of:* | Clause of Schedule 1 – Resource Management Act - Submission on publicly notified plan change – Proposed Waikato Regional Plan Change 1 – Waikato and Waipa River Catchments (PC1) |
| *And:* | **Hill Country Farmers Group (HCFG)** |
| *And:* | **Waikato Regional Council (WRC)** |

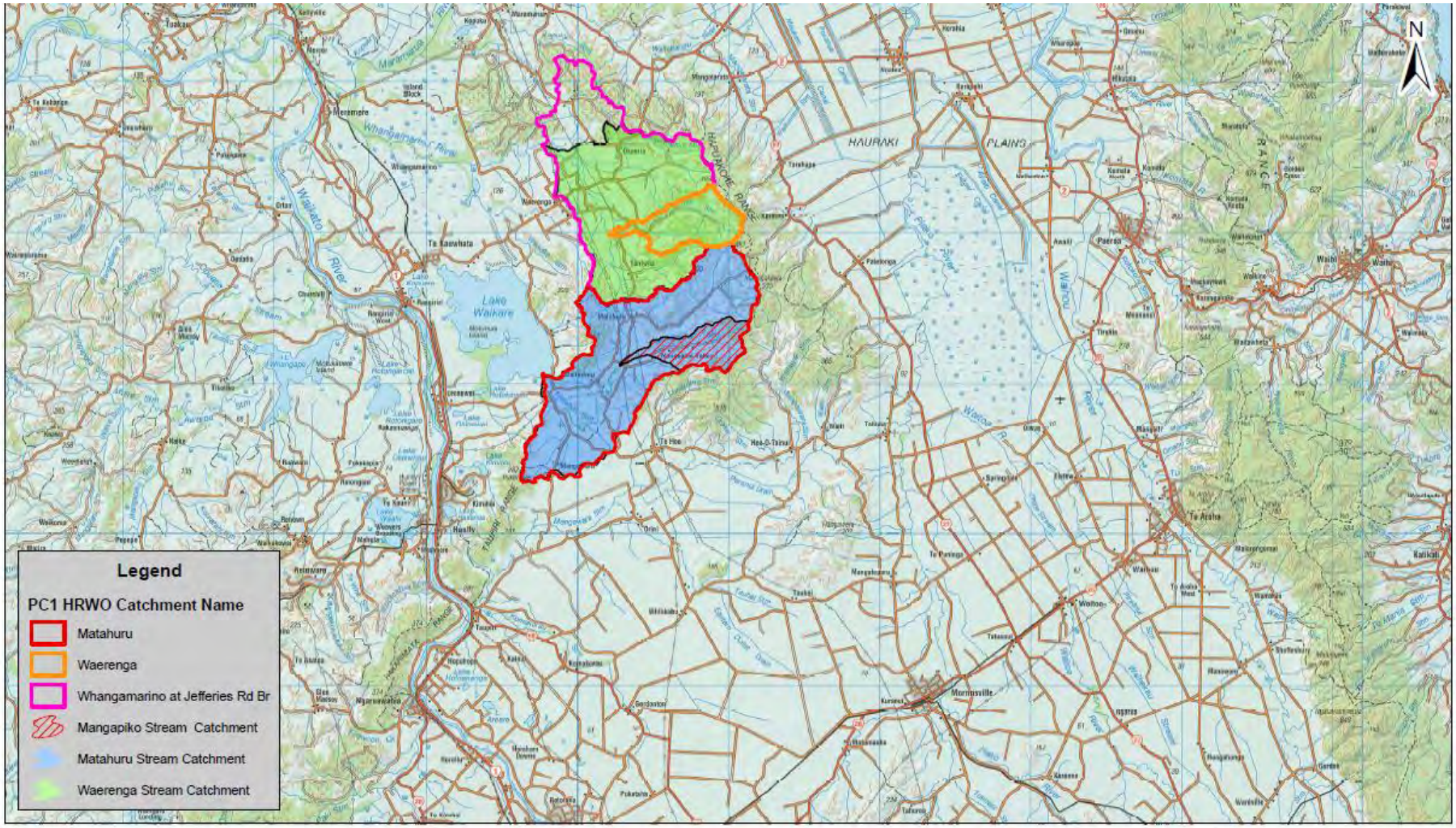
# Water monitoring information relating to the Waerenga, Whangamarino at Jefferies Road Bridge, Matahuru and Mangapiko Sub-Catchments as identified in the Waikato Regional Council Healthy Rivers Proposed Plan Change 1 (PC1)

**Introduction**

1. The Hill Country Farmers Group (HCFG) is comprised of 49 independent farming families who are the collective custodians of over 21,400ha of land area in the Waikato, primarily located within the Waerenga, Whangamarino at Jefferies Road Bridge and Matahuru (including Mangapiko) sub-catchments as identified within the proposed Healthy Rivers Plan Change 1 (PC1). Members of the group collectively have a depth of specialised knowledge and experience within unique hill country systems.

2. HCFG consider that water quality data available does not provide any specific information or analysis relating to areas that are used for hill country farming and therefore cannot justify the exorbitant costs being imposed upon hill country farmers under the currently proposed rule framework.

3. This specific analysis was undertaken to determine relevant sampling locations and available water quality information held by WRC for the Waerenga, Whangamarino at Jefferies Road Bridge, Matahuru (including Mangapiko) sub-catchments, refer Figure 1 for stream catchments and PC1 adopted sub-catchment locations that form the basis of this investigation.






**Catchment Locations**

0 2 4 6 8 10 12 14 16 18 20 km

Scale at A3 = 1:245,000

Created by: HCE
Date: 12/02/2019
Version: 1
Job No.: REQ140386
File: REQ140386_Hill Country Farmers Mapping Locations Landscape.mxd

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**Figure 1 Stream catchments and PC1 sub-catchment boundaries of investigation area**

## Matahuru Stream Catchment

4. Figure 2 shows the Matahuru Stream (running north to south west) and Mangapiko Stream (running east to west/south west) catchments, both located within the Matahuru sub-catchment defined by PC1. Water quality sampling locations are identified along each of these streams, as provided by Waikato Regional Council (WRC). Of the 16 sampling locations shown along the Matahuru Stream, none have sampling data available. There is one sample location for water quality located on the margin of Lake Waikare to the north west, outside of the sub-catchment area. There are no Regional Ecological Monitoring Sites (REMS) on this stream.

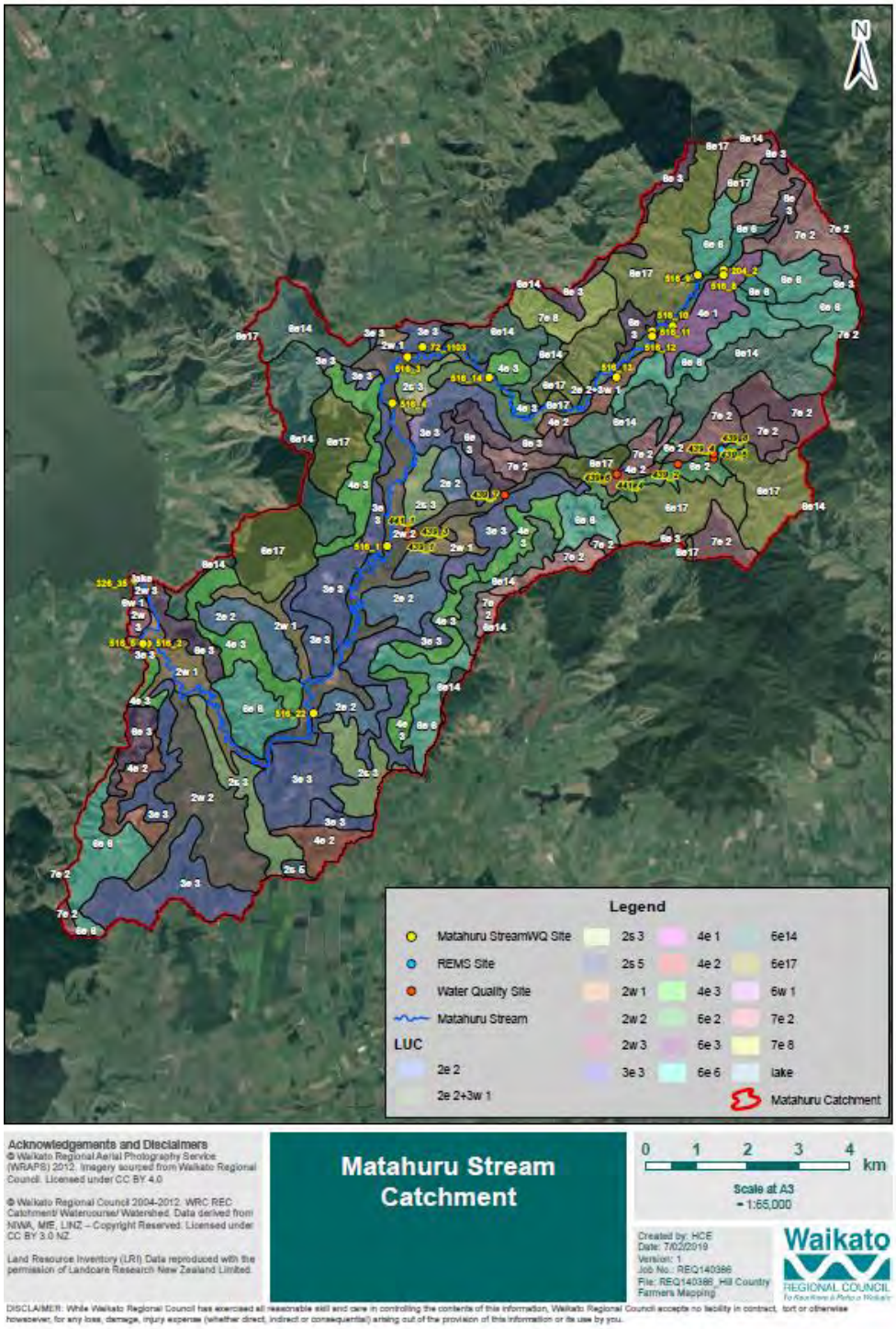


**Figure 2 Matahuru Stream Catchment and Freshwater Management Unit**

5. The Mangapiko Stream, identified in Figure 3, is a soft bottomed stream that runs through a variety of land uses and topography including forestry (7e2); Hill Country Sheep and Beef (7e2; 6e17; 6e14; 6e3; 6e2); dairy farming (including extensive areas of maize within operations) (4e3; 4e2; 3e3; 2w2; 2e2; 2w1; 2s3) (some ground truthing occurred in gathering this information). This stream has ten sampling locations identified by WRC along its length. It was considered that any sampling location with more than five years data would be useful in interpreting trends in a particular location. Only one sample location had sufficient data (please refer to Table 1 and Figure 4 below). This sampling location was a Regional Ecological Monitoring Site (REMS) at the bottom of the Mangapiko stream catchment where sampling for macroinverebrate populations is undertaken in accordance with protocol P2 of Stark et al. 2001[1].

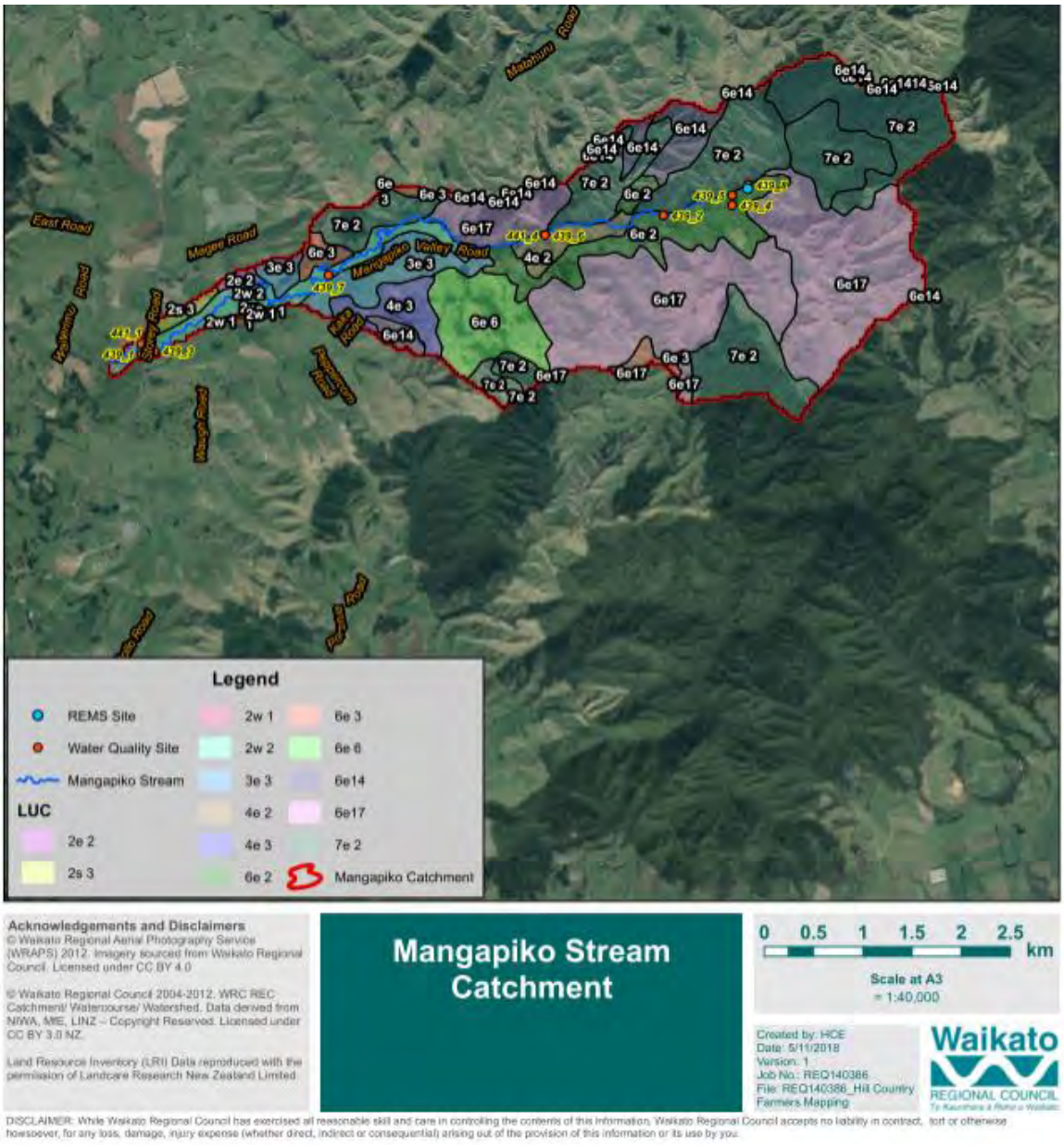


**Figure 3 Mangapiko Stream Catchment, contained within the Matahuru Freshwater Management Unit**

[1] New Zealand Macroinvertebrate Working Group Report No. 1: Protocols for sampling macroinvertebrates in wadeable streams. Stark, J.D.; Boothroyd, I.K.G.; Harding, J.S.; Maxted, J.R.; Scarsbrook, M.R. 2001.

**Table 1 Waikato Regional Council sample references, descriptions and sampling dates for the Mangapiko Stream**

| Location Reference | Description | Dates of Sampling |
|---|---|---|
| 441_1 | Whangamarino Water Quality Site | 1991 |
| 439_1 | Suspended Sediment Monitoring | 2003 |
| 439_3 | Regional Ecological Monitoring Site | 1995; 1998; 1999; 2000; 2002; 2003; 2004; 2005 |
| 439_7 | Suspended Sediment Monitoring | 2003; 2008 |
| 441_4 | Regional Ecological Monitoring Site | 2003 |
| 439_6 | Suspended Sediment Monitoring and Manual Flow Gauging | 2003 |
| 439_2 | Regional Ecological Monitoring Site | No data |
| 439_5 | Suspended Sediment Monitoring and Manual Flow Gauging | 2003 |
| 439_4 | Suspended Sediment Monitoring and Manual Flow Gauging | 2003 |
| 439_8 | Regional Ecological Monitoring Site | 2011; 2014 |

6. Seventy per cent of Mangapiko Stream sampling locations had a single sample undertaken (or less) with no follow up sampling carried out. Only one sample location, 439_3, had over five years of data collected. This is a Regional Ecological Monitoring Site (REMS), addressing MCI. This site is located at the bottom of the sub catchment, adjoining a road, surrounded by dairy farming and maize, with minimal riparian vegetation (refer Figures 4 and 5 below).

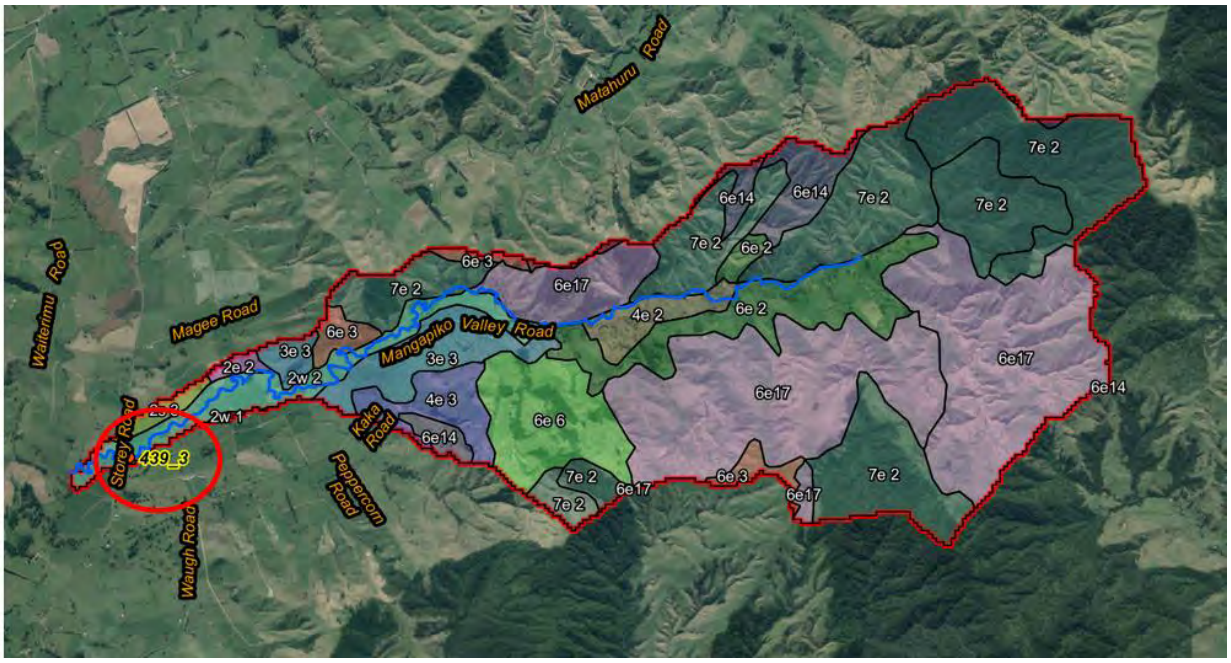


**Figure 4 Location of sampling point 439_3 in Mangapiko Stream, at bottom of sub-catchment**


**Figure 5 Location of sampling point 439_3 on the Mangapiko Stream, image courtesy of Google Earth**

7. The sampling undertaken in this location may provide an indication as to the state of water leaving this sub-catchment, however, it is considered that this particular location is likely to be heavily influenced by local factors.

## Waerenga Stream Catchment

8. The Waerenga Stream catchment includes both the Waerenga and Whangamarino at Jefferies Road Bridge sub-catchments, as depicted in PC1. This area is located directly north of, and adjoining, the Matahuru sub-catchment. Please refer to Figure 1 for location map and to Figure 6 for a map of the Waerenga Stream Catchment showing all WRC sampling locations.

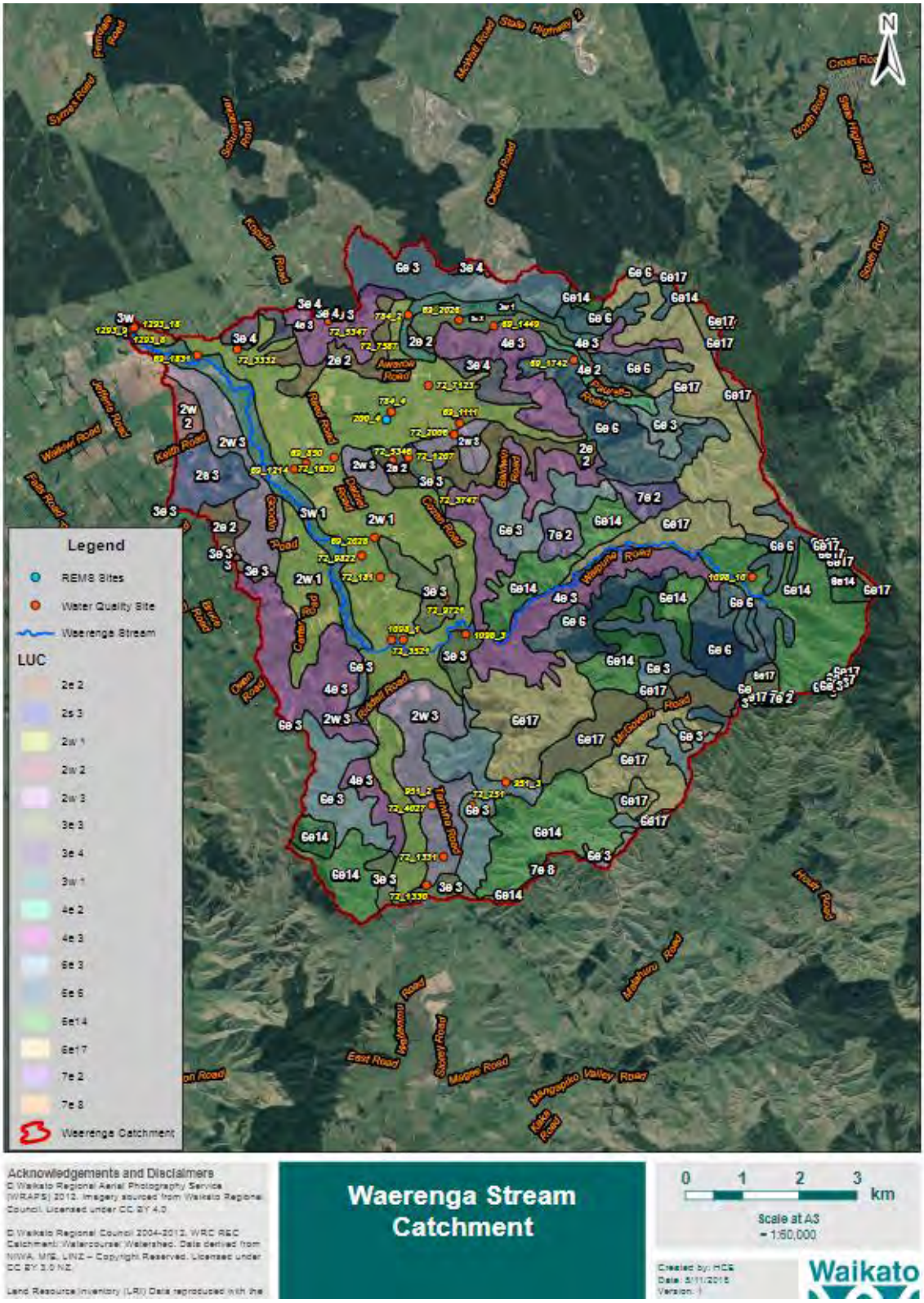

**Figure 6 Waerenga Stream Catchment showing all WRC identified sampling locations**

9. The Waerenga Stream catchment has 36 Sampling Locations recorded by WRC along this stream. Three of these sampling locations have over five years data. All are located on class 2 or 3 land in the lowest reaches of their relevant sub-catchment and are surrounded by dairy farming. Refer Table 2 and Figure 7 below.

**Table 2 Waikato Regional Council sample references, descriptions and sampling dates for the Waerenga Stream**

| Location Reference | Description | Dates of Sampling |
|---|---|---|
| 1098_1 | Surface Water Quality | 1993; 1994; 1995; 1996; 1997; 1998; 1999; 2000; 2001; 2002; 2003; 2004; 2005; 2006; 2007; 2008; 2009; 2010; 2011; 2012; 2013; 2014; 2015; 2016; 2017; 2018 |
| 1098_10 | Water Quality | No data available |
| 1098_3 | Regional Ecological Monitoring Site | 1995 |
| 1293_18 | Water Quality | No data available |
| 1293_8 | Regional Ecological Monitoring Site | 1995; 1998; 1999; 2000; 2002; 2003; 2004; 2005; 2006; 2007; 2008 |
| 1293_9 | Surface Water Quality | 1993; 1994; 1995; 1996; 1997; 1998; 1999; 2000; 2001; 2002; 2003; 2004; 2005; 2006; 2007; 2008; 2009; 2010; 2011; 2012; 2013; 2014; 2015; 2016; 2017; 2018 |
| 200_4 | Regional Ecological Monitoring Site | 2009; 2012; 2015; 2018 |
| 69_1111 | Water Quality | No data available |
| 69_1214 | Water Quality | No data available |
| 69_1449 | Water Quality | No data available |
| 69_1742 | Water Quality | No data available |
| 69_1831 | Water Quality | No data available |
| 69_2026 | Water Quality | No data available |
| 69_2028 | Water Quality | No data available |
| 69_850 | Water Quality | No data available |
| 72_1207 | Water Quality | No data available |
| 72_1330 | Water Quality | No data available |
| 72_1331 | Water Quality | No data available |
| 72_1639 | Water Quality | No data available |
| 72_181 | Water Quality | No data available |
| 72_2006 | Water Quality | No data available |
| 72_251 | Water Quality | No data available |
| 72_3332 | Water Quality | No data available |
| 72_3521 | Water Quality | No data available |
| 72_3747 | Water Quality | No data available |
| 72_4027 | Water Quality | No data available |
| 72_5346 | Water Quality | No data available |
| 72_5347 | Water Quality | No data available |
| 72_7123 | Water Quality | No data available |
| 72_7587 | Water Quality | No data available |
| 72_9721 | Water Quality | No data available |
| 72_9822 | Water Quality | No data available |
| 784_2 | Regional Ecological Monitoring Site | 1995 |
| 784_4 | Water Quality | No data available |
| 951_2 | Water Quality | No data available |
| 951_3 | Regional Ecological Monitoring Site | 1995 |

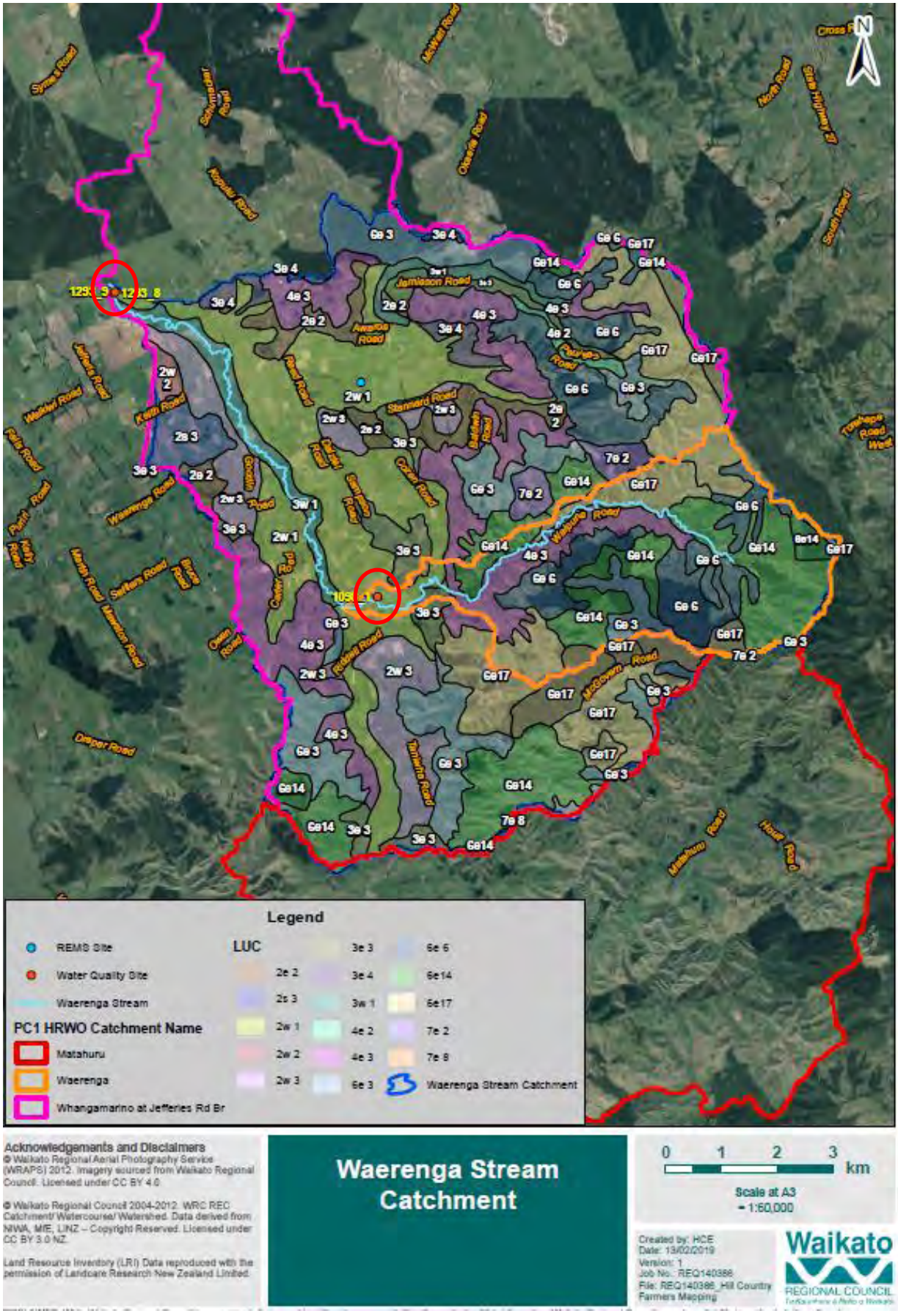


**Figure 7 Sampling locations with over five years data available within the Waerenga Stream Catchment.**

10. Sampling point 1098_1 is located on the Waerenga Stream at Taniwha Road. The location traverses Class 2 land, is surrounded by dairy farming with minimal riparian vegetation and is located at the bottom of the Waerenga sub-catchment as defined in PC1, bounding the Whangamarino at Jefferies Road Bridge sub-catchment (refer Figure 8 below).


**Figure 8 Taniwha Road sampling location, sample reference 1098_1**

11. Water quality in this location meets the attribute threshold in PC1 for annual median Ammonia (short and long term) and no significant trend was detected for ammonia 1993-2017 in this location[2]. Technical Report 2018/30 identified no significant trend for E.coli in this location. Turbidity and visual water clarity results however, both displayed a significant deterioration over time[2].

12. Ground truthing undertaken in relation to sampling point 1098_1 identified Koi Carp (*Cyprinus carpio*) on both sides of the stream surrounding the testing location. The landowner who bounds the stream indicated that Koi Carp have continued to erode the banks at the stream edge leading to significant slumping and sediment in the water column. He advised that his fencing was previously 1m from the stream edge, it is now only approximately half a metre (refer Photographs 1, 2, 3 below).

[2] Waikato Regional Council Technical Report 2018/30: Trends in river water quality in the Waikato Region, released January 2019.

**Photograph 1 Numerous Koi Carp visible in stream in close proximity to Taniwha Road sampling location, 1098_1**

**Photograph 2 Stream bank slumping reported by landowner to be caused by Koi Carp eroding the sediment beneath**

Photograph 3 Severely eroded stream bank location in relation to existing fence

13. On average a female Koi Carp can produce 300,000 – 400,000 eggs during spawning and as they gather for spawning or feeding in the shallow margins of the Waikato river and tributaries, Koi biomass can reach 4000 kg/ha[3]. A study by Waikato University undertaken in October 2015 concluded that a biomass of 374 kg/ha of Koi Carp, could suspend 14.5 tonnes of sediment per day[4]. Research has confirmed that deposited fine sediment strongly affects river ecosystem health and it is considered likely that Koi Carp in these lower tributaries is a major contributor to the decline in visual clarity and turbidity.

14. 1293_8 is REMS data (MCI) taken on a tributary on private land at Jefferies Road Bridge and again is at the bottom of the sub-catchment, surrounded by dairy farming. The location has minimal riparian vegetation (refer Figure 9).

15. 1293_9 is taken in the same location at 1293_8 and is surface water quality monitoring (refer Figure 9).


**Figure 9 Whangamarino at Jefferies Road Bridge sampling locations, 1293_8 and 129 3_9**

16. Water quality in this location showed significant improvement in Ammonia 1993-2017 (Technical Report 2018/30). No trend was reported in relation to E.coli[5]. Turbidity and visual clarity in this location both showed significant deterioration over time[4].

17. These sampling locations are again likely to be affected by local influences. There are significant numbers of koi carp noted in this location.

[3] www.science learn.org.nz

[4] Waikato University Invasive Fish and Nutrients – Fact sheet, October 2015

[5] Waikato Regional Council Technical Report 2018/30: Trends in river water quality in the Waikato Region, released January 2019.

**Water quality data relating to hill country farming**

18. A member of the HCFG is the Farm Manager for Lochiel Station a hill country farm located directly to the north of the Whangamarino at Jefferies Bridge Road sub-catchment in the Mercer Bridge sub-catchment, as defined by PC1. About two-thirds of the 3500ha property near Glen Murray drains into the Mangatia Stream, which drains into the Opuatia and on to the Waikato

19. The NRP on this farm is 13 and they are running 11.6 stock units per hectare. Some waterways are fenced, and critical source areas have been identified and mitigated as a part of ongoing farm management practices.

20. Since 2007 22, surface water samples have been taken from an upstream and a downstream location on the station. One at the stream's source within the property and the other on the property's northern boundary where the Mangatia meets the Opuatia Stream which drains into the Waikato River (refer Figure 10).

21. Data while preliminary only, meet short term and long-term attribute levels in PC1 for Phosphorous; show no notable difference between upstream and downstream data over a ten year period (2007-2017) and do not increase over time.

22. Nitrate levels on Lochiel Station meet PC1 short- and long-term targets and excluding one outlier, show no difference in concentration upstream vs downstream over time.


**Figure 10 Map of Lochiel Station, yellow dots indicate sampling locations**

## Conclusions

23. The sampling locations with long term data available in relation to the Waerenga, Whangamarino at Jefferies Road Bridge and Matahuru (including Mangapiko) sub-catchments relate to water quality in the lower reaches of the relevant sub-catchment and are considered likely to be influenced by local factors, in particular, Koi Carp in relation to the decline in visual clarity and turbidity.

24. It is understood that effects on water quality are likely to be cumulative and that all landowners/users have to play a part, but the cost associated with this should be sustainable and should have relevance to the benefits to be gained.

25. The water quality information available within the sub-catchments provides no basis for the excessive compliance costs being imposed upon Hill Country farmers through the rules proposed in PC1. Economic implications to be discussed elsewhere in Block 1.

26. Preliminary results from Lochiel Station, an example of a hill country farming system with data available to assess water quality, shows no notable difference between upstream and downstream levels for Nitrates or Phosphorous (which meet PC1 thresholds) over a ten year period. Farm management in relation to water quality on this farm is primarily focussed on addressing critical source areas and fencing up to 15 degrees for stock management.

27. Our members are willing to take reasonable, affordable and sustainable steps to mitigate any effects that may result from their operations and to assist in improving water quality. Steps however, should be affordable, sustainable and relevant to contribution.