

Before an Independent Hearings Panel

The Proposed Waikato Regional Plan Change 1

IN THE MATTER OF the Resource Management Act 1991 (**RMA**)

IN THE MATTER OF the Proposed Waikato Regional Plan Change 1, Block 1 hearings,
Topic B5 FMUs, Sub-Catchments and Tables 3.11-1 and 3.11-2

**PRIMARY EVIDENCE OF JUDE ADDENBROOKE
ON BEHALF OF MIRAKA LIMITED**

(Environmental Management)

Dated: 15 February 2019

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1. EXECUTIVE SUMMARY

- 1.1 My full name is Jude Addenbrooke. I am an Environmental Management Consultant.
- 1.2 In relation to Freshwater Management Units and sub-catchments, Miraka Limited seeks an integrated framework with aggregated sub-catchments forming newly-defined Freshwater Management/Sub-catchment Units as the key unit of focus to achieve the outcomes sought in Plan Change 1.
- 1.3 Freshwater Management/Sub-catchment Units should be the basis for identifying and prioritising contaminants of concern, for developing catchment profiles and objectives, for bringing communities together and engaging landowners, for requiring and incentivising practice change, for off-setting and larger scale mitigations, and for monitoring of both actions and water quality.
- 1.4 An aggregated sub-catchment/FMU scale will be more responsive to change, provide better linkage between actions and results, and provide evidence of progress to inform the next stage and the decisions required there.

2. INTRODUCTION

- 2.1 My full name is Jude Addenbrooke. I have over 25 years' experience in environmental management.
- 2.2 I am director of Addenbrooke Advisory Limited, an independent consultancy providing environmental science, resource management, integrated catchment management, farm environmental planning, community engagement and associated services since 2016.
- 2.3 My qualifications include Conjoint Bachelors of Resource Management and Parks and Recreation Management (Earth Sciences Major), and Graduate Diploma in Science (Psychology). I have been a member of the New Zealand Association of Resource Managers since 2003, and am a certified Practising Resource Manager (Experienced Professional).
- 2.4 I have extensive experience working on regional council issues, across land and water policy, sustainable land management, farm environmental planning, conservation projects and integrated catchment management. My most recent council experience was as Manager – West Coast Zone at the Waikato Regional Council. I have also worked in soil and land sciences for both private industry and a Crown Research Institute (Land Resource Inventory and Land Use Capability). I have central government experience at Ministry for the Environment and Ministry for

Primary Industries. These roles included land and water science, policy, programme management and primary sector development governance.

- 2.5 I was engaged by Miraka Limited (**Miraka**) at the beginning of 2017 to assist them with their response to Plan Change 1 and Variation 1 (**Plan Change 1**), including submissions, collaboration with other key parties, technical advice and hearings preparation.
- 2.6 My evidence is given in support of the submission made by Miraka to Plan Change 1.
- 2.7 My evidence should be read alongside that of:
- (a) Grant Jackson;
 - (b) Dr Mark Paine;
 - (c) Dr Gavin Sheath; and
 - (d) Kim Hardy.
- 2.8 I have read the Environment Court's Code of Conduct for Expert Witnesses, and I agree to comply with it. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.
- 2.9 I would be available for expert witness conferencing should that be requested by the panel.

3. SCOPE OF EVIDENCE

- 3.1 My evidence will:
- (a) Describe the problems with the current identification of Freshwater Management Units (**FMUs**) and sub-catchments; and
 - (b) Outline Miraka's requested approach to identify combined FMU and sub-catchments.

4. FRESHWATER MANAGEMENT UNITS AND SUB-CATCHMENT BOUNDARIES

- 4.1 My evidence relates to Topic 'B5. FMUs, Sub-Catchments and Tables 3-11-1 and 3-11-2', and will focus on FMUs and Sub-Catchments. It is in support of Miraka's

original submission on Section 3.11 Waikato and Waipa River Catchments and various further submissions.¹

- 4.2 This topic is specifically addressed in the Section 42A report. I have read the Section 42A report and respond to the analysis and recommendations on the spatial extent of FMUs and of sub-catchments, as relevant.

Sub-catchments

- 4.3 The statements of Dr Gavin Sheath and Dr Mark Paine outline the importance of practice change in achieving the most effective, efficient and equitable improvements in water quality in Plan Change 1 Stage One. Practice change requires clear targets, community ownership, guiding rules, incentives and monitoring, and is therefore best achieved through management at a sub-catchment scale.
- 4.4 Miraka therefore supports the Plan Change's policy focus on sub-catchments as the appropriate unit for management, planning, coordination, funding, analysis, modelling and other aspects of water quality improvement in the following provisions:
- (a) Policy 1: "...Manage and require reductions in sub-catchment-wide discharges...";
 - (b) Policy 2: "...Manage and require reductions in sub-catchment-wide diffuse discharges...";
 - (c) Policy 4: "...Manage sub-catchment-wide diffuse discharges....";
 - (d) Policy 9: "Sub-catchment (including edge of field) mitigation planning, co-ordination and funding. Take a prioritised and integrated approach to sub-catchment water quality management by undertaking sub-catchment planning...."; and
 - (e) Glossary definition of sub-catchment: "the basic spatial unit for analysis and modelling".
- 4.5 The Plan Change has also identified freshwater attributes (with short and long term water quality targets) and priorities at a sub-catchment scale. Sub-catchments are

¹ (Submission Point ID PC1-8742) primarily, and also submissions on Objective 1 (PC1-8767); Objective 3 (PC1-8775); 3.11.4.5 (PC1-8855); 3.11.4.7 (PC1-8870); 3.11.4.10 (PC1-8887); Schedule 1 (PC1-12465); and 3.11.6 Tables (PC1-8900). It also relates to Miraka's Further Submissions relating to effective scale for management, including on Submission Points PC1-10806 (Fish&Game); PC1-13156, PC1-11146 (Beef+Lamb); PC1-10078, PC1-10162, PC1-10215 (HortNZ); PC1-10273 (Tuwharetoa); PC1-3305 (Waikato & Waipa River Iwi); PC1-11406, PC1-11257 (Wairakei Pastoral); V1PC1-1706 (Beef+Lamb); V1PC1-93, V1PC1-164 (Federated Farmers); and V1PC1-703 (HortNZ).

frequently referred to in the Section 32 Evaluation Report,² and were the basis unit of the modelling analyses presented to the Community Stakeholder Group.³

- 4.6 Miraka supports the use of this sub-catchment scale for policy directives, for objective and limit-setting, and for the effective management of water quality. However, it may not be the most appropriate scale to facilitate Council reporting, and could become overly resource-intensive for the Council when it comes to implementing their role in sub-catchment planning and coordination (e.g. Policy 9). There are many instances where neighbouring sub-catchments have sufficiently similar characteristics as to warrant only one aggregated sub-catchment plan, rather than multiple individual plans and the associated community group coordination.
- 4.7 The Section 42A Report⁴ notes that the boundaries and scale of the sub-catchments were largely delineated on the basis of the existing water quality monitoring sites in the Council's river monitoring network. I understand that many of these sites were established on the basis of ease-of-access and other logistics, and are not reflective of the most appropriate network for monitoring future changes in water quality.
- 4.8 I question the appropriateness of determining sub-catchments for Plan Change 1 water quality management on this basis. Further, the Section 42A Report notes that the Council's monitoring network is being updated to further improve alignment with the sub-catchments. This would be a prime opportunity to establish the most effective sub-catchment scales and boundaries and adjust the monitoring network accordingly to expedite water quality monitoring going forward over the next 80 years.

Freshwater Management Units

- 4.9 Miraka strongly opposes the identification of Freshwater Management Units (**FMUs**) as they are proposed in Plan Change 1, with only four FMUs across the two river systems. These units are too large and heterogeneous in terms of bio-physical attributes and will fail to identify the priority contaminants upon which to focus, or the enterprises which have the most opportunity to improve their practices and thereby improve water quality. Also, the application of this scale for the calculation of the Nitrogen Reference Point (**NRP**) 75th percentiles is both ineffective and inequitable, which the Miraka team will discuss in its evidence for Part C1 Diffuse Discharge Management. If the NRP is to remain, despite the opposition of Miraka and other submitters, smaller FMUs are vital to make that system more efficient and equitable.

² Waikato Regional Council, 2017, Section 32 Evaluation Report.

³ For example: Doole G., S. Elliott G McDonald (2016) Assessment of first set of scenarios, Report No. HR/TLG/2015-2016/4.1; Doole et al (2016) Simulation of the proposed policy mix for the Healthy Rivers Wai Ora process, Report HR/TLG/2016-17/4.5.

⁴ Section 42A Report, paragraphs 503 and 504.

- 4.10 I acknowledge the Section 42a Report commentary⁵ on the FMU options considered by the Community Stakeholders Group (**CSG**), but the options presented to the CSG⁶ were all of a similar coarse scale with just minor alterations in boundaries to consider. A more refined and appropriate scale is required.
- 4.11 The National Policy Statement for Freshwater Management 2014 (amended 2017) (**NPS-FM**) requires regional councils to determine FMUs at an “appropriate scale for setting freshwater objectives and limits and for freshwater accounting and **management** purposes” (*my emphasis*). The NPS-FM sets FMUs as the basis for objective and limit setting, value identification, descriptions of current and anticipated future states on the basis of resource use, and accountability with regard to contaminant loads and sources, but allows discretion as to scale.
- 4.12 I note that the Section 42A report refers to the NPS-FM requirement regarding appropriate scale in relation only to setting freshwater objective and limits.⁷ However, the NPS-FM requirement also requires FMUs to be set at an appropriate scale for **management** purposes. There did not appear to be any advice given to the CSG or discussion around spatial management scales that would best facilitate the achievement of the Waikato and Waipa catchment water quality targets and aspirations. Dr Paine’s evidence on Practice Change has outlined factors that facilitate community engagement and practice change, and appropriate sub-catchment community level scale is a key factor.

What is the appropriate scale for FMU?

- 4.13 Miraka considers that the appropriate scale for FMUs is at the aggregated sub-catchment level (i.e. smaller than the existing FMUs but larger than the existing sub-catchments). It is at this scale where biophysical attributes are more homogeneous, targets can be more clearly established, community ownership is more likely and monitoring of improvements can more accurately reinforce confidence in the changes being sought. This is in essence supported by the Plan Change 1 focus on sub-catchments.
- 4.14 Miraka's position is that it is illogical, contradictory and ineffective for Plan Change 1 to have two separate scales for the management of contaminants. The FMU scale applies to nitrogen referencing only, while the sub-catchment scale applies to all other

⁵ Section 42A Report, paragraph 486.

⁶ Technical Leaders Group (2014a) Freshwater Management Unit options for consideration by the Collaborative Stakeholder Group. Technical Leaders Group report for discussion at CSG5. Document#3121490.

Technical Leaders Group (2014b) Selecting Freshwater Management Units – a comment from the Chair of the TLG. Report to the Collaborative Stakeholder Group – Agreement and Approval To be received. Document#3194192.

Technical Leaders Group (2014c) Presentation on Freshwater management units. Document#3140266.

⁷ Section 42A Report, paragraph 480.

contaminants and all other actions (freshwater limits, management, planning, coordination, funding, analysis, modelling, etc). It is more appropriate that the two management units be merged, and used as the single conceptual unit for freshwater target setting and management throughout the Plan.

- 4.15 The scale of this single Freshwater Management/Sub- catchment Unit approach needs further consideration. The scale of the current FMUs is too coarse. There is too much biophysical heterogeneity for effective identification of priority contaminants and equitable reduction targets or benchmarks. Also, there is too much socio-geographic spread for effective community ownership and landowner engagement.
- 4.16 On the other hand, the scale of the currently identified 74 sub-catchments within Plan Change 1 may be too fine for effective use of resources by Waikato Regional Council in terms of concentration of monitoring and the number of catchment management groups to be facilitated and plans to be developed.

5. **AMENDED FRESHWATER MANAGEMENT /SUB-CATCHMENT UNIT BOUNDARIES**

- 5.1 Miraka proposes a reconfiguration of the Freshwater Management/Sub-catchment Unit boundaries, with three main criteria:
- (a) Hydrologic connectivity;
 - (b) Biophysical homogeneity; and
 - (c) Socio-cultural identification.
- 5.2 **Hydrologic connectivity** is critical for effective focus on water quality improvements and for water quality monitoring. Hydrologic connectivity is already present within the current configuration of the 74 sub-catchments. This connectivity would be maintained if adjoining upstream/downstream sub-catchments are simply merged into larger groupings. Reconfigurations are also possible, through the use of a model such as the River Environments Classification (REC2), currently used by Waikato Regional Council. REC2 consists of hydrologically contiguous surface waterway reaches and associated watersheds (upstream catchments). For the Waikato region there are about 60,000 reaches with associated watersheds, with an average area of about 50 hectares each. REC2 provides the spatial framework for analyses, with spatial datasets able to be overlain and interrogated. It is the finest spatial base for aggregation, and data outputs for all watersheds and reaches can be aggregated or grouped at any scale. Flexibility of scale is present and accessible.

5.3 **Biophysical homogeneity** can be achieved by overlaying spatial datasets such as rainfall, soil type, drainage class and slope, with numerical bands to guide the aggregation. Rainfall, drainage class and slope were used to refine land classifications in the economic modelling during the CSG process,⁸ and could be used here to refine catchment boundaries. While the original datasets (such as LCR Fundamental Soil Layer) would be accessed to inform the actual reconfiguration we propose, the diagrams copied from the Wadhwa & Elliott⁹ report provide a visual representation in Figure 1 below.

Figure 1: Mapped representation of biophysical datasets

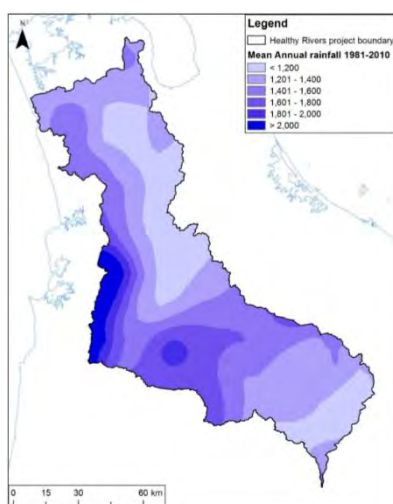


Figure 2-4: Mean annual rainfall.

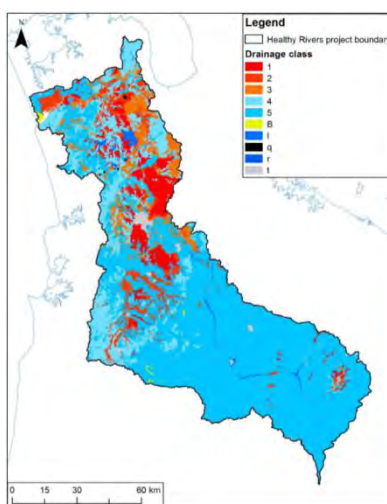


Figure 2-3: Drainage class. The drainage classes are as described in the Fundamental Soil Layer, lower numbers having poor drainage.

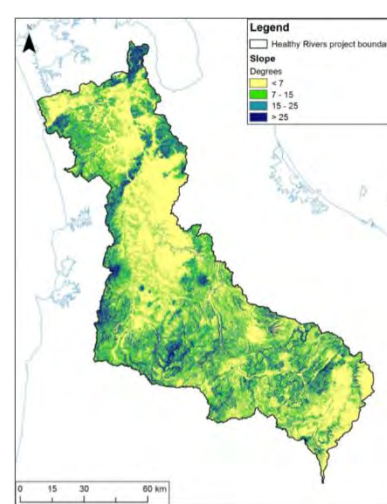


Figure 2-6: Slope in degrees - created using the DTM.

5.4 Determination of biophysically homogenous Freshwater Management/Sub-catchment Units will enable more equitable and effective introduction of changes to achieve water quality improvements, by facilitating the identification of those priority contaminants that tend to be associated with specific biophysical factors and ensuring that any benchmarking compares like with like and thereby highlights gaps in practice change where the greatest improvements can be made in a short time.

5.5 Research undertaken by AgResearch across three farming scenarios in the Upper Waikato indicate that for every 100mm of extra rainfall, there is an additional 7-8kg of nitrogen leached, as estimated by Overseer, given similar soil, drainage and farming characteristics.¹⁰ Similar types of relationships have been investigated with regard to slope and sediment or phosphorous translocation. Miraka suggests an initial overlay of spatial datasets with rainfall bands at 200mm intervals and drainage classes as

⁸ Wadhwa S, Elliott S (2015) Refined classification of land characteristics to assist economic modelling. WRC Report No. HR/TLG/2015-2016/2.7. Doc#3650549.

⁹ *ibid.*

¹⁰ Shepherd M. et al (2015) Overseer sensitivity testing to support WMI farm systems re-design. Confidential report prepared for Wairapa Moana Incorporation.

grouped in six classes as in the Shepherd paper.¹¹ Once this is analysed against the REC2 for homogenous groupings of linked reaches and associated watersheds, the resultant number and size of sub-catchments can be reviewed. This may then be further refined through adjustment of the biophysical bands and by consideration of socio-cultural factors.

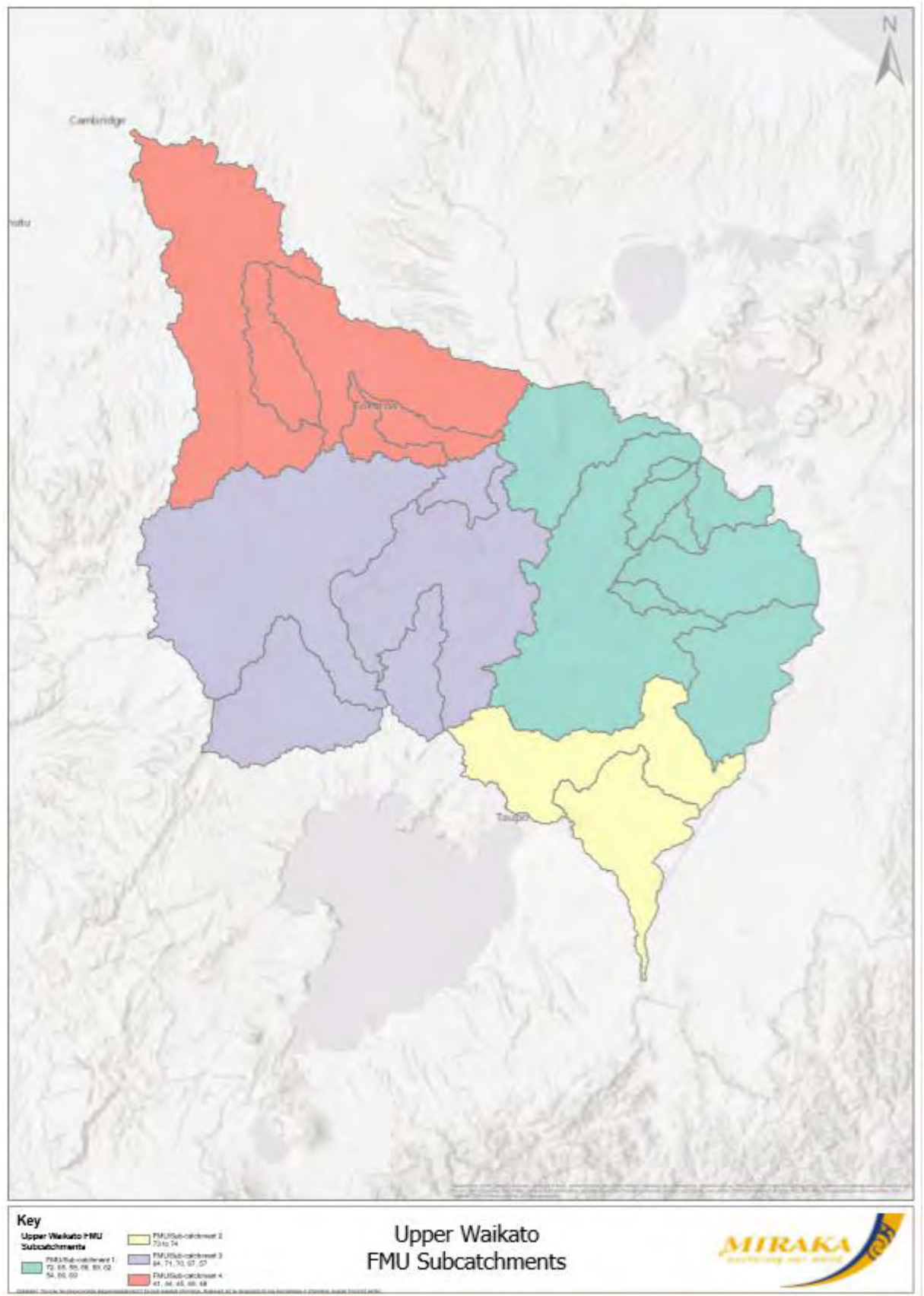
- 5.6 **Socio-cultural identification** occurs as communities live together over periods of time, and can be used to refine the Freshwater Management/Sub-catchment Unit scales and boundaries. Key socio-cultural factors include iwi and hapu rohe and names, school catchments, community names, sports teams, rural discussion groups and other voluntary ways that people identify with a location. Aligning Plan Change 1 Freshwater Management/Sub-catchment Units with existing identifications will enhance practice change as it underpins engagement and community ownership. This cohesion will be very important where different land use types exist in the catchment, where different support systems are available and where trust must be built between the various stakeholders. This prerequisite is expanded on in the evidence on Practice Change presented by Dr Paine.

Example of Freshwater Management/Sub-catchment Unit reconfiguration

- 5.7 Miraka has developed an example of reconfiguration of the Freshwater Management/Sub-catchment Unit boundaries within the Upper Waikato (Figure 2 below). This example illustrates how current Plan Change 1 sub-catchments can be aggregated to result in an effective scale for identification of issues, targets, management, monitoring and reporting, and gives an indication of the total likely number of management units that the Council would be dealing with. In this example, the four new Freshwater Management/Sub-catchment units aggregated 5, 5, 2 and 9 sub-catchments (21 in total across the four).
- 5.8 I acknowledge that this reconfiguration needs refinement. It utilised all three criteria for reconfiguration of the Unit boundaries: hydrologic connectivity, biophysical homogeneity and socio-cultural identification. The analysis was, however, done at a coarse level with only two biophysical characteristics considered, and only a rough refinement based on community identification.
- 5.9 I am willing to participate in any expert conferencing or future analysis work by the Council to reconfigure boundaries.

¹¹ Shepherd M. et al (2015) Overseer sensitivity testing to support WMI farm systems re-design. Confidential report prepared for Wairarapa Moana Incorporation.

Figure 2: Reconfiguration example of new Freshwater Management/Sub-catchment Units in the Upper Waikato



- 5.10 In summary, Miraka considers that smaller, relatively homogenous FMUs (aggregated sub-catchments) will provide the most effective basis for improving water quality in the short term and importantly for preparing for longer term reductions in contaminant discharges. Such Freshwater Management/Sub-catchment Units are the most appropriate unit for identifying freshwater attributes and water quality targets, for managing the four contaminants through identification of key issues and prioritisations, and for monitoring and accounting, and therefore are best able to meet the requirements of an FMU according to the NPS-FM.
- 5.11 The specific amendments to the plan change needed to implement the changes sought by Miraka are outlined in Ms Hardy's evidence.

Jude Addenbrooke

15 February 2019