Taratahi Water Race
Natural and artificial water race segments' assessment

10 October 2023

Report Prepared for

Greater Wellington Regional Council

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TARATAHI WATER RACE
NATURAL AND ARTIFICIAL WATER RACE SEGMENTS' ASSESSMENT

10 October 2023

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Quality Assurance			
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EXECUTIVE SUMMARY

The Taratahi Water Race is located in the Carterton District and sources water from the Waingawa River. It was established more than a hundred years ago, to provide freshwater for livestock, domestic and irrigation use.

Currently, it is unclear what kind of watercourse water races are under the definitions in Greater Wellington Regional Council's (GWRC) natural resources plan (NRP). Watercourse definition has implications for which rules are applicable, including stock exclusion and watercourse clearance and maintenance (i.e., in the bed of a watercourse).

The purpose of this investigation was to classify the various sections[1] of the Taratahi Water Race network against the Resource Management Act (RMA) and GWRC's NRP classifications for watercourses (i.e., whether an individual Taratahi Race section is a "water race that is or used to be a stream" or an "artificial water race"). To assess whether a section of a water race is or used to be a stream or artificial watercourse we developed assessment criteria based on the definitions of "River" in the RMA and those set out in a GWRC guidance document. The assessment comprised a desktop component that drafted a classification of all sections of the water race, and a field verification component.

The combined findings of the desktop and field assessments with regard to the status of the water race as artificial or a stream are depicted in Figure A. Some key findings were:

- The Taratahi Water Race, apart from the usual functions that water races perform, additionally supports flow permanence in three streams: Booths Creek, Parkvale Stream, and Waikakariki Stream. Thus, the network of waterways related to the water race is much more extensive than the water race network itself.
- The majority of the water race sections are artificial, conveying water that is only sourced from the water take at the Waingawa River.
- In a few places the water race flows into the channels of Booths Creek or Parkvale Stream, before splitting again away from them. While most of the flow in these sections can be assumed to come from the water race, because Parkvale Stream and Booths Creek tend to have very low flows most of the time, these water race sections should be classified as streams.
- Artificial sections of the water race downstream from these 'stream' sections could potentially convey water from the natural sources of these streams.
- There are several water race sections of various lengths that appear to have natural form, even if they are not obviously connected to the above-mentioned streams or other streams that could be supplying them with water. We recommend classifying such sections as "water race that is or used to be a stream".

[1] A section of the water race network is defined as a watercourse flowing between two network nodes (i.e., points where a watercourse splits or two or more watercourses merge).

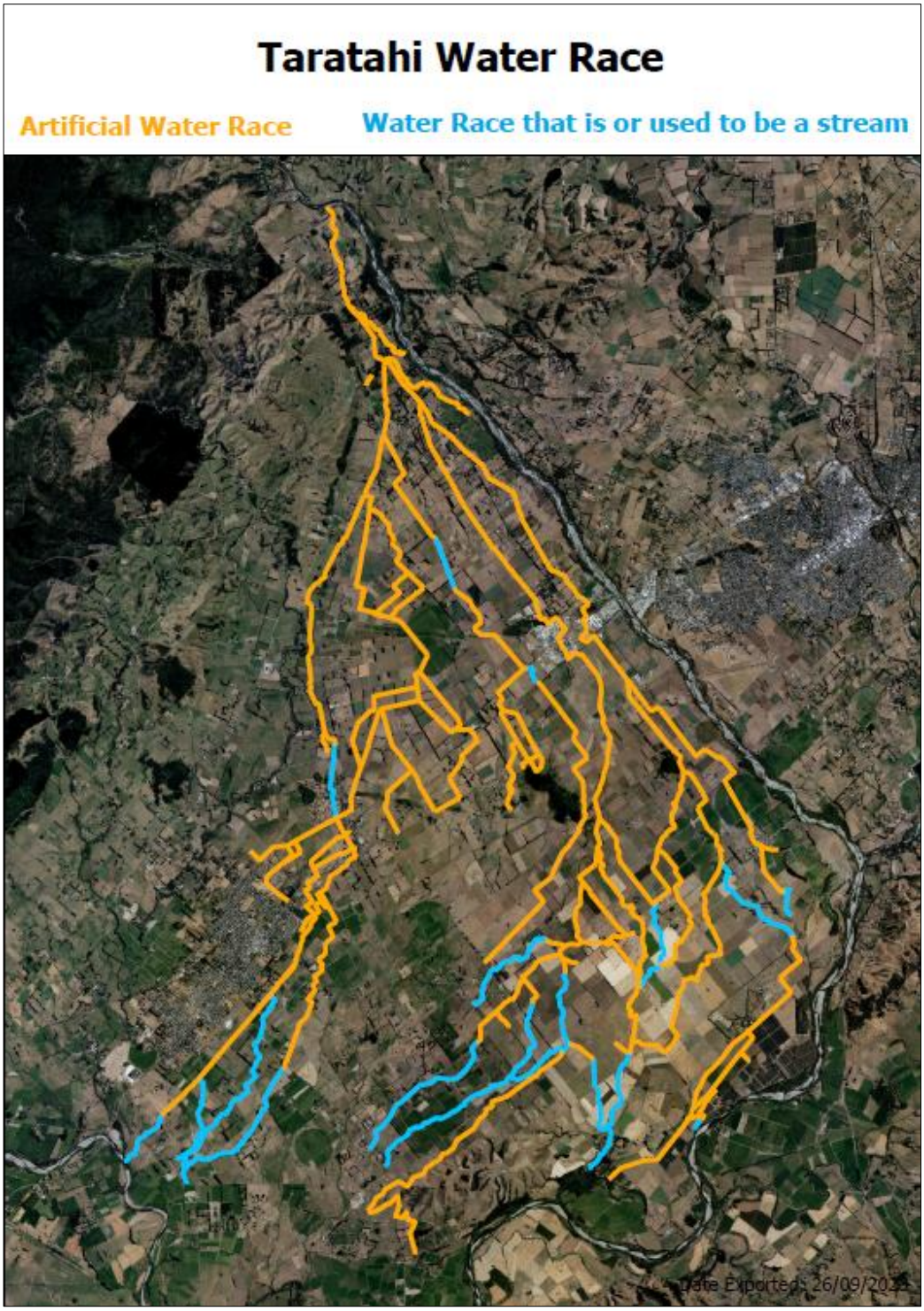

Figure A: Classification of sections of the Taratahi Water Race as water races that are or used to be streams (marked with blue), or artificial water races (marked with red), based on the desktop and field assessments that took place in 2023.

CONTENTS

Table of Contents

Figures

Tables

1 Introduction

1.1 Context

A water race is a constructed (i.e., artificial) water channel designed to convey water from a natural stream/river to be used for farming purposes. Multiple connected water races (i.e., a water race with multiple branches) conveying water from a natural source is referred to as a water race network. The primary function of water race networks is to provide water for domestic needs and livestock, although they do also currently permit a few specified takes for other uses (*e.g. irrigation, frost protection and other industrial purposes*). The overall allocation of water from a water race network is managed through a consenting process; in particular, this is needed for any "other uses" of water race water. Water race networks can also provide an important stormwater management service, helping to manage the flood risk to low lying areas. Moreover, they can support thriving and valuable instream biological communities. Across the Wellington Region water races have been found to support native populations of longfin eels, giant kokopu and brown mudfish, which are all nationally threatened.

The Carterton District Council (CDC) provides and manages two water race networks, the Carrington Water Race network north of Carterton and the Taratahi Water Race network between Masterton and Carterton. The Taratahi Race was established over a hundred years ago and provides drinking water for livestock, domestic use and irrigation. It takes up to 800 litres of water a second from the Waingawa River, depending on the latter's flow levels, and flows for 270 km through the Wairarapa plains (Carterton District Council, 2022). It also supports freshwater ecosystems that do not belong to the water race network, such as Booths Creek, Parkvale Stream and Waikakariki Stream.

Over the last decade water race networks have come under increased scrutiny regarding whether they contain sections of 'rivers' that are not actually 'artificial' watercourses under section 13 of the Resource Management Act (RMA). Watercourse delineation is important as it has implications for how the water contained in the race can be used (i.e., allocation and minimum flow) and the activities that can occur in the watercourse (i.e., activities in the bed of a stream) under the provisions of the RMA. While water races have generally been considered 'artificial' water courses, sections of water races may join and/or follow natural stream channels, while others may receive inputs from natural streams. In these two cases, the water race may be considered a 'River' under the RMA. Delineating water race networks that contain sections of 'Rivers' can be a difficult undertaking, especially in water races that have existed for a long period of time such as the Taratahi Race.

1.2 Aim & Scope

The purpose of this investigation was to classify the various sections[2] of the Taratahi Water Race network against the RMA and Greater Wellington Regional Council's (GWRC) Natural Resources Plan (NRP) classifications for watercourses as water races that are or used to be streams, and as artificial water races. A classification exercise was previously undertaken, in 2012/2013.

Mapping of the Taratahi Water Race took place in February 2023 (desktop assessment) and April 2023 (field assessment), to distinguish "artificial" sections of the water race from "River" sections, i.e., sections that are or used to be streams. The purpose of the field assessment was to ground-truth the results of the initial desktop assessment.

[2] A section of the water race network is defined as a watercourse flowing between two network nodes (i.e., points where a watercourse splits or two or more watercourses merge).

2 Watercourse determination

In 2020 GWRC had guidance developed by Aquanet Consulting Ltd for determining whether a watercourse is a river, a highly modified river or stream, an ephemeral watercourse or an artificial watercourse, as each of these classifications are subject to different rules under the NRP (Greer, 2021).

The following definitions from the RMA and GWRC's NRP need to be considered when classifying watercourses:

RMA

- **river** means a permanently or intermittently flowing body of fresh water, which is subject to RMA section 13, and includes streams and modified watercourses, but does not include artificial watercourses (e.g., irrigation canals, water supply races, canals for the supply of water for electricity power generation, and farm drainage canals).

Natural Resources Plan

- **highly modified river or stream** means a river or stream that has been modified and channelled for the purpose of land drainage of surface or sub-surface water and has the following characteristics:
    - It has been channelled into a single flow.
    - The channel has been straightened.
    - The channel is mechanically formed with straight or steeply angled banks.
      And
    - It exhibits these characteristics for at least its entire length through the property in which the activity is being carried out.
    - It is not managed as part of a stormwater network and is not a water race.
- **ephemeral flow path** means a river that:
    - has a bed that is predominantly vegetated.
    - only conveys or temporarily retains water during or immediately following heavy rainfall events.
    - does not convey or retain water at other times.

The classification process, then, needs to consider whether:

- the watercourse is a flowing body of freshwater under the RMA.
- the watercourse has a "natural" or "constructed/modified" form.
- flow permanence in the watercourse is ephemeral or permanent/intermittent.
- the watercourse has a natural or artificial source of flow, i.e., whether the watercourse
    - has a natural form (which is a reliable indicator of natural source of flow).
    - has a modified form in the place of a pre-existing water body (e.g., river, lake, wetland).
    - receives its water via a constructed system, and would otherwise not be a watercourse.

These definitions and this process set the criteria that we addressed in order to classify the sections of the Taratahi Water Race as 'water races that are or used to be streams' or 'artificial water races.

3 Water Race assessment criteria

To classify a section of the Taratahi Water Race as a 'water race that is or used to be a stream' or 'artificial water race' under the RMA and NRP we undertook an initial desktop assessment and subsequent field investigation.

The desktop component assessed:

- whether the watercourse has a natural source of flow; this was done through the use of aerial photographs to determine whether:
    - the watercourse intercepts or merges with natural freshwater bodies, or
    - the watercourse intercepts known groundwater sources, such as springs (discussion with GWRC).
- whether the watercourse has a natural or constructed/modified form, i.e.:
    - whether the watercourse has been channelled into a single flow.
    - whether the watercourse has been straightened, lacking any meandering/sinuous natural form that would be expected in a stream or river.

The field component assessed whether the watercourse:

- is a flowing body of freshwater under the RMA.
- has a natural source of flow, e.g.:
    - whether the watercourse intercepts or merges with natural watercourses, or
    - whether the watercourse intercepts other freshwater bodies, e.g., lakes, wetlands, or groundwater sources, such as springs.
- has a natural or constructed/modified form, i.e.:
    - whether the watercourse has been channelled into a single flow.
    - whether the watercourse has been straightened, lacking any meandering/sinuous natural form that would be expected in a stream or river.
    - whether the channel is mechanically formed with straight or steeply angled banks.
- has permanent/intermittent or ephemeral flow, as indicated by:
    - the level of vegetation covering its bed,
    - the retention/conveyance of water at the time of assessment.

The two assessments lead to the classification of the water race sections as:

- water races that are or used to be streams, or
- artificial water races, which were further distinguished into
    - artificial water races potentially conveying water from a natural stream, or
    - artificial water races with no natural inputs.

4 Water Race assessment

4.1 Desktop assessment

The desktop assessment was undertaken on 8 February 2023 by GWRC and Traverse Environmental (formerly Aquanet Consulting) staff. The resulting classification of the various sections of the Taratahi Water Race is presented in Figure 1. Water race sections that required further assessment to identify the type of watercourse were also identified.

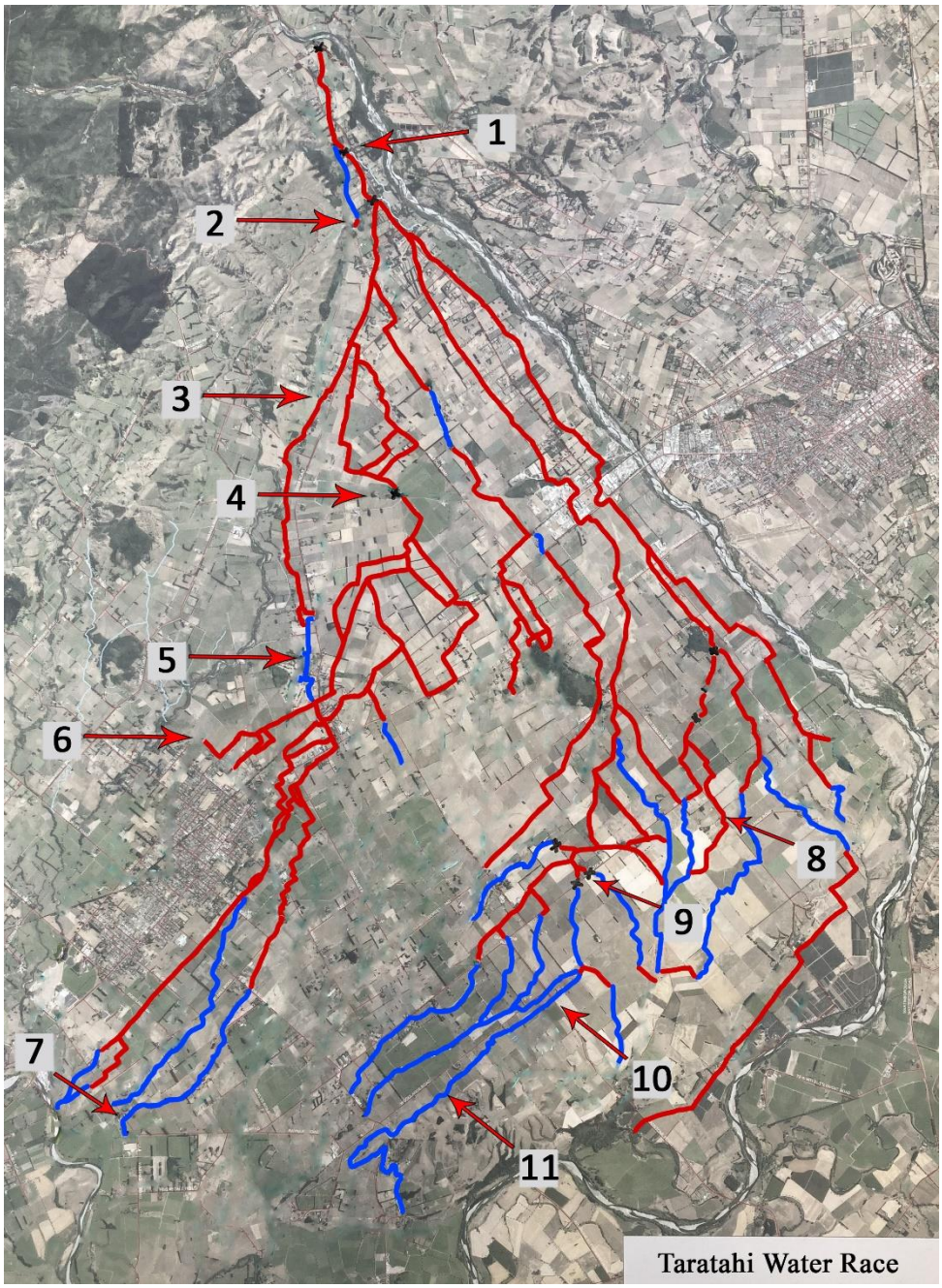

Figure 1: Classification of sections of the Taratahi Water Race as water races that are or used to be streams (marked with blue) or artificial water races (marked with red) through the desktop assessment. Sites that required field assessment are numbered and marked with a black cross.

4.2 Field assessment

The field assessment survey was undertaken on 28 March and 6 April 2023, by Traverse Environmental Ltd., GWRC, and CDC staff. Table 1 lists the sites that were selected during the desktop assessment to be assessed on the ground to confirm their classification, as well as if and how are they connected to natural watercourses that do not belong to the water race network.

Table 1: Sites along the Taratahi Water Race that were assessed on the ground.

Site #	Description	Latitude (NZTM)	Longitude (NZTM)
1	Water race input to Parkvale Stream	5467667.367	1814260.215
2	Water race input to Booths Creek	5466138.650	1814596.614
3	Crossing of Booths Creek	5463062.444	1814080.540
4	Crossing of Parkvale Stream tributary	5461495.302	1815350.444
5	Golf course wetland	5458194.501	1813816.445
6	Water race input into Waikakariki Stream	5457065.243	1812109.709
7	Water race end on Waiheke Road	5451092.038	1811126.361
8	East Taratahi Road crossing	5455949.774	1820832.516
9	Carter's Line junction	5455088.566	1818419.818
10	Gladstone Road crossing	5453005.745	1817989.713
11	Water race channel dug on the side of the hill	5451342.368	1816069.479

4.2.1 Site 1 – Water race input to Parkvale Stream

Parkvale Stream results from the confluence of two smaller, spring-fed tributaries, which flow through paddocks and merge in a pine-tree patch (Figure **2**a-b). About 70 m downstream, water is pumped from the water race into Parkvale Stream (Figure **2**c). However, the stream channel remains entirely outside the water race network, and only receives inputs from the race. Classification of this site is therefore not required (**not applicable**).

4.2.2 Site 2 – Water race/Parkvale input to Booths Creek

Booths Creek at this site is a very small, intermittently flowing (as advised by CDC staff) watercourse, with a channel < 0.5m that cascades on the side of a hill and is intercepted by an artificial watercourse that diverts water from Parkvale Stream, after the latter receives additional water from the water race (see section 4.2.1– Site 1) (Figure **3**). The watercourse providing water from Parkvale Stream to Booths Creek is marked on the map (Figure 11) as a single red section, not connected to the water race. As it's an artificial channel that performs one of the functions of the Taratahi water race, i.e., to support continuous flow in Booths Creek, it is marked as an artificial water race. Even though the water flowing into Booths Creek at any given time might be largely supplied by the water race, the creek itself does not belong to the water race network. Classification of this site is therefore not required (**not applicable**).

4.2.3 Site 3 – Crossing of Booths Creek

After Booths Creek merges with the artificial channel diverting water from Parkvale Stream (section 4.2.2– Site 2), it flows south and eventually crosses the water race, approximately 3 km downstream (Figure **4**). At that point, the main flow from the water race is piped over the creek. There is an additional, smaller pipe next to the main pipe, which discharges part of the water race flow into Booths Creek. Consequently:

- Booths Creek at this site only receives water from the water race and remains outside the water race network, and classification of the creek at this site is not required (**not applicable**).
- The piped section of the water race continues conveying only water artificially taken from the Waingawa River, and thus should be classified as **artificial water race**.

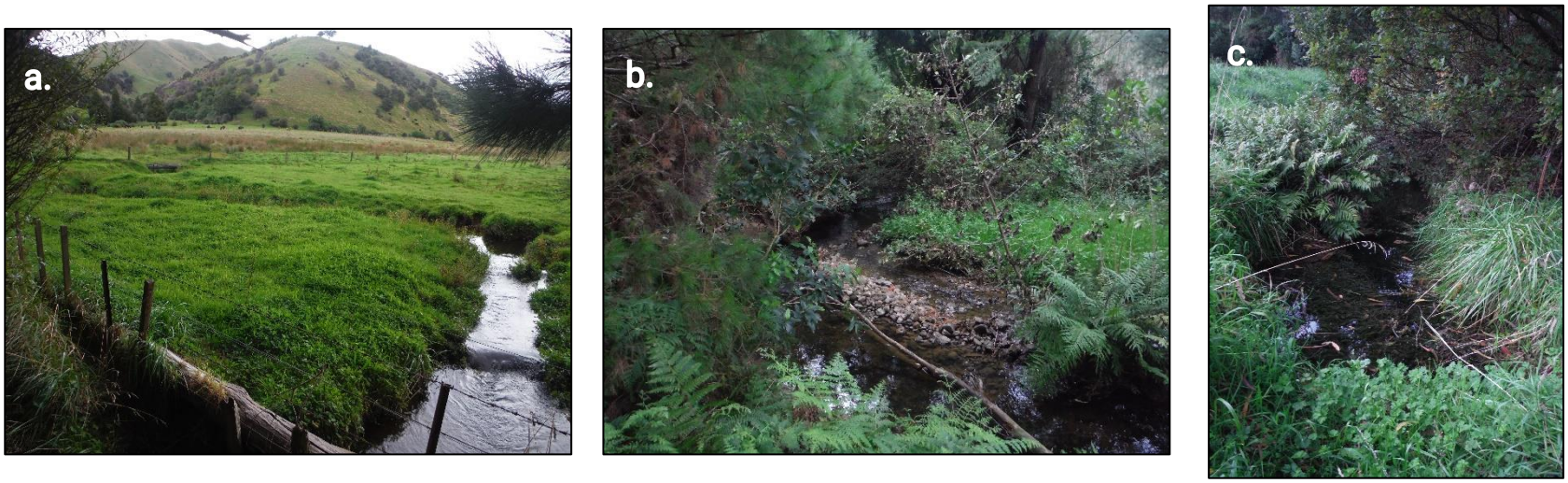

Figure 2: Site 1 – Parkvale Stream, a) true left tributary, b) merge of tributaries, c) pumped input from the Taratahi water race to Parkvale Stream, March 2023.

Figure 3: Site 2 – Booths Creek flowing down the hill and intercepted by an extension of the Taratahi water race, March 2023.

Figure 4: Site 3 – Piped crossing of Booths Creek, a) upstream from the crossing, with Booths Creek on the true right and the water race on the true left, b) Booths Creek downstream from the crossing, c) water race downstream from the crossing, March 2023.

4.2.4 Site 4 – Crossing of Parkvale Stream tributary

This site was not visited, following advice from CDC staff, as the water race at that point is piped and does not come in contact with the tributary of Parkvale Stream. As there are no natural inputs upstream from this site, the piped crossing at Site 4 should be classified as **artificial water race**.

4.2.5 Site 5 – Golf course wetland

- Upstream from the Carterton Golf Club, the westernmost section of the water race merges with Booths Creek and then flows through the golf course and discharges into the wetland (Figure 5). As the water race flows through Booths Creek channel, the water race section from the confluence until the golf course wetland should be classified as **water race that is or used to be a stream**.
- According to advice from CDC staff, additionally to Booths Creek, there is another creek that discharges into the wetland from the west, and an artificial water race section that discharges into the wetland from the southeast.
- The wetland discharges into the continuation of Booths Creek, which continues flowing south, only receiving inputs from tributaries that are supported by the water race, but never again comprising part of the water race network. Classification of those sections is therefore not required (**not applicable**).

4.2.6 Site 6 – Water race input into Waikakariki Stream

This site was not marked during the desktop assessment, so the assessment in this report is based on information from CDC staff.
South from the wetland (section 4.2.5– Site 5) the water race crosses Booths Creek, and water is conveyed through a pipe (which also marks the end of the water race on this side of the network) to a natural stream, and through an artificial split is eventually discharged into Waikakariki Stream, which then merges with Mangatārere Stream. Given the end of the water race network comes at the piped section, the artificial channel that conveys water from the pipe to Waikakariki Stream, along with the stream itself, do not belong to the water race network (**not applicable**).

4.2.7 Site 7 – Water race end on Waihakeke Road

Just upstream from the end of the water race on Waihakeke Road, two watercourses merge (Figure 6).

- The last section of the True Left (TL) watercourse is a straight channel that looks like a drain along the edge of a paddock. However, upstream from that paddock, the form of the channel resembles a natural watercourse; consequently, it is assumed that the straight channel is not entirely artificial, but rather a straightened pre-existing channel that would otherwise resemble the upstream segments. Thus, it should be classified as **water race that is or used to be a stream**.
- The True Right (TR) watercourse follows a strongly meandering channel and should also be classified as **water race that is or used to be a stream**.

4.2.8 Site 8 – East Taratahi Road crossing

The water race flows through a series of straight sections that do not resemble naturally formed channels. At the road crossing, the banks upstream are vegetated with grasses, and there are macrophytes within the watercourse, while downstream the race flows through a stand of pine trees and could not be directly observed (Figure 7). As there are no inputs from natural sources, this section should be classified as **artificial water race**.

Figure 5: Site 5 – Golf course wetland (left) and incoming Booths Creek (right), March 2023.

Figure 6: Site 7 – Water race end on Waihakeke Road, a) the true left tributary upstream from the confluence of the two tributaries, before the end of the water race, b) the end of the water race, upstream from Waihakeke Road, c) the receiving channel after the end of the water race, downstream from Waihakeke Road, April 2023.

Figure 7: Site 8 – East Taratahi Road crossing, upstream from the road (left), and the patch of pine trees downstream from the road (right), April 2023.

4.2.9 Site 9 – Carter's Line split

The water race follows a more or less semicircular trajectory, from which several outflow channels convey water to a large part of the southern water race. Upstream of the split, the race flows between paddocks, with its banks vegetated mostly with grasses, and lots of macrophytes covering the main channel (Figure 8). The main water race at this site is obviously an artificial water race, but as it conveys water from ephemeral streams, it should be classified as **artificial water race that potentially conveys water from natural streams**.

- The first (i.e. the TR channel) and the third outflowing channels (splits) have natural form and should thus be classified as **water races that are or used to be streams**.
- The second outflowing channel (split) comprises multiple straight sections, which then flow into naturally formed sections, and should thus be classified, as the race upstream of the split, as an **artificial water race that potentially conveys water from natural streams**.
- The fourth outflowing channel (i.e. the TL channel) flows only for a few meters as part of the water race. The remaining channel is an overland ephemeral watercourse that does not belong to the water race network, which then discharges into the network through a piped section at its southern end (**not applicable**).

4.2.10 Site 10 – Gladstone Road crossing

The water race crosses Gladstone Road, flowing from northeast to southwest. Both upstream and downstream of the road the water race flows through paddocks. The crossing itself is via a culvert running under the road. The watercourse banks are vegetated by blackberry, grasses and reeds (Figure 9). This section is conveying water from ephemeral streams and given its form, it should be classified as an **artificial water race, potentially conveying water from a natural stream**.

4.2.11 Site 11 – Water race channel dug on the side of the hill

This section seems to be following the natural curvature of the hill, but has obviously been dug (Figure 10). It flows from northeast to southwest, downstream from site 10 (section 4.2.10) As it conveys water from ephemeral streams, it should be classified as **artificial water race, potentially conveying water from a natural stream**.

Figure 8: Site 9 – Carter's Line split, upstream from the road (left), and downstream (right), April 2023.

Figure 9: Site 10 – Gladstone Road crossing, upstream from the culvert (left) and downstream (right), April 2023.

Figure 10: Site 11 – Water race channel dug on the side of the hill, April 2023.

5 Key conclusions

The combined findings of the desktop and field assessments with regard to the status of the Taratahi water race sections as artificial or water races that are or used to be streams, are depicted in Table 2 and Figure 11 andFigure **12**. Some key findings were:

- The Taratahi Water Race, apart from the usual functions that water races perform, additionally supports flow permanence in three streams: Booths Creek, Parkvale Stream, and Waikakariki Stream. Thus, the network of waterways related to the water race is much more extensive than the water race network itself.
- The majority of the water race sections are artificial, conveying water that is only sourced from the water take at the Waingawa River.
- In a few places the water race flows into the channels of Booths Creek or Parkvale Stream, before splitting again away from them. While most of the flow in these sections can be assumed to come from the water race, because Parkvale Stream and Booths Creek tend to have very low flows most of the time, these water race sections should be classified as streams.
- Artificial sections of the water race downstream from these 'stream' sections could potentially convey water from the natural sources of these streams.
- There are several water race sections of various lengths that appear to have natural form, even if they are not obviously connected to the above-mentioned streams or other streams that could be supplying them with water. We recommend classifying such sections as "water race that is or used to be a stream".

Table 2: Classification of sections of interest along the Taratahi Water Race, as assessed on the ground, March 2023.

Site #	Description	Assessment	Notes
1	Water race input to Parkvale Stream	N/A	
2	Water race input to Booths Creek	N/A	
3	Crossing of Booths Creek a. Booths Creek b. Water race	 N/A Artificial water race	
4	Crossing of Parkvale Stream tributary	Artificial water race	
5	Golf course wetland a. Upstream from the wetland b. Downstream from the wetland	 Water race that is or used to be a stream N/A	
6	Water race input into Waikakariki Stream	N/A	
7	Confluence of two watercourses at the water race's end a. True Left watercourse b. True Right watercourse	 Water race that is or used to be a stream Water race that is or used to be a stream	
8	East Taratahi Road crossing	Artificial water race	
9	Carter's Line split 1st outflow channel 2nd outflow channel 3rd outflow channel 4th outflow channel	Artificial water race Water race that is or used to be a stream Artificial water race Water race that is or used to be a stream N/A	potentially conveying water from a natural stream potentially conveying water from a natural stream

Site #	Description	Assessment	Notes
10	Gladstone Road crossing	Artificial water race	
11	Water race channel dug on the side of the hill	Artificial water race	

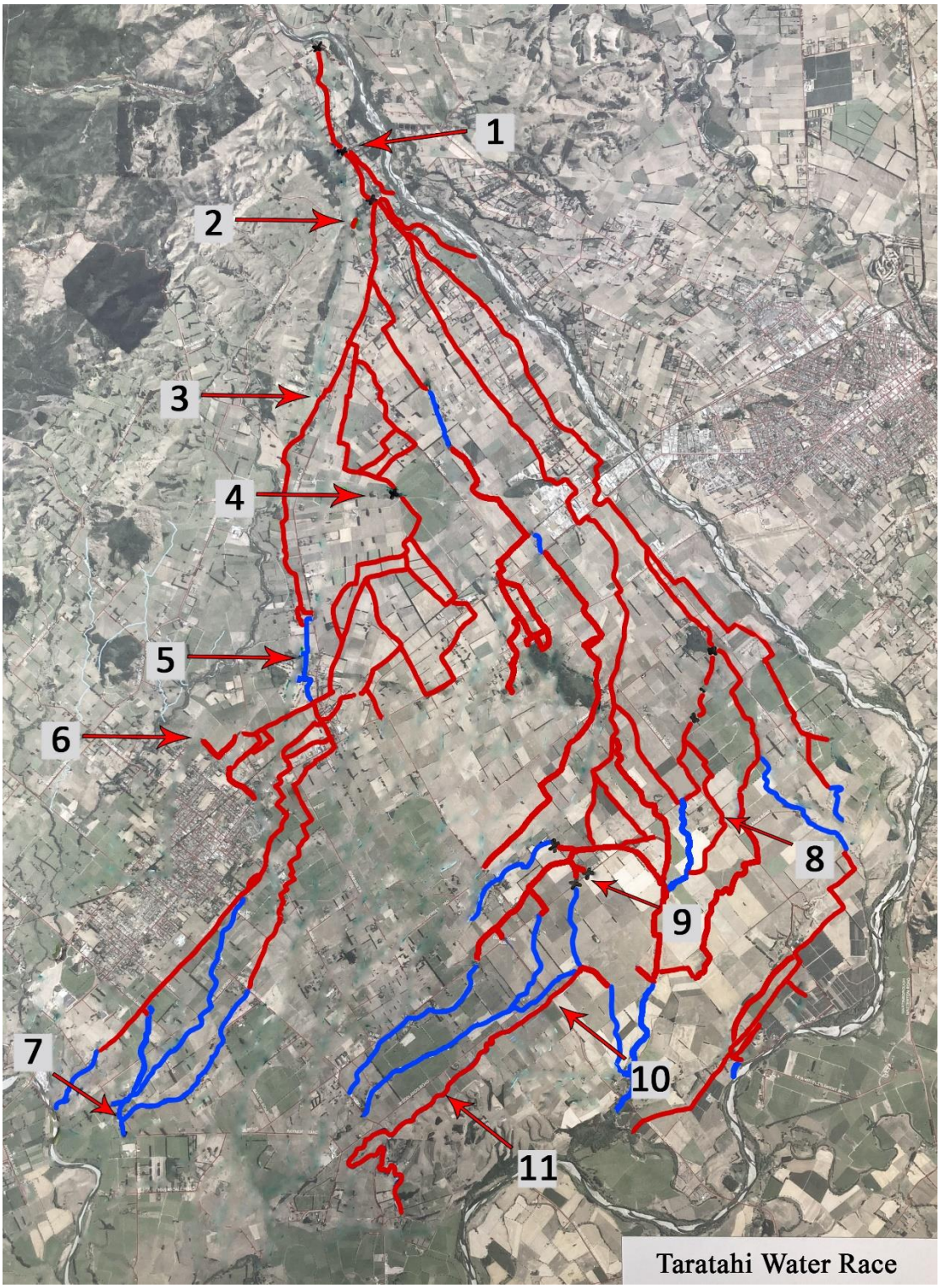

Figure 11: Classification of sections of the Taratahi Water Race as water races that are or used to be streams (marked with blue), or artificial water races (marked with red), based on the desktop and field assessments that took place in 2023. Sites that required ground assessment are numbered and marked with a black cross.

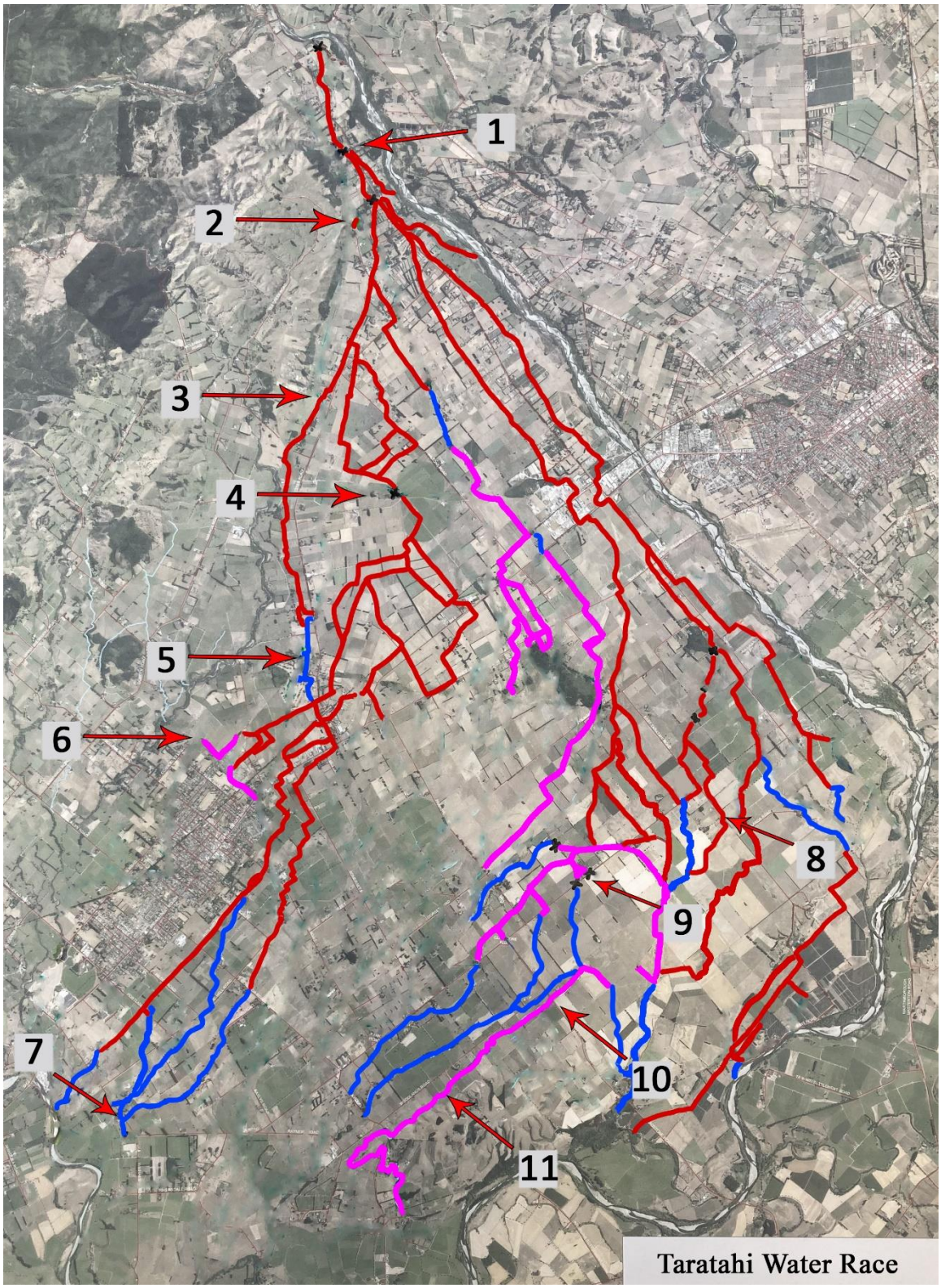

Figure 12: Classification of sections of the Taratahi Water Race as water races that are or used to be streams (marked with blue), artificial water races with no inputs from natural sources (marked with red), and artificial water races with inputs from natural sources (marked with purple) based on the desktop and field assessments that took place in 2023. Sites that required ground assessment are numbered and marked with a black cross.

REFERENCES

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APPENDIX

Classification of sections of the Taratahi Water Race as water races that are or used to be streams, (marked with blue), artificial water races with no inputs from natural watercourses (marked with red), and artificial water races with inputs from natural sources (marked with purple) based on the desktop and field assessments that took place in 2023. Natural waterbodies that do not belong to the water race network but are connected to the water race are marked with cyan. Sites that required field assessment are numbered and marked with a black cross.