WAIKATO RIVER

Hazard Assessments, Behaviours, and Factors that may Encourage Risky Behaviours.

Drowning Prevention Auckland

education • research • advocacy

April 2023

Preface and Acknowledgements

This report is an evaluation of five sites along the Waikato River in the Hamilton City Council catchment area developed by Drowning Prevention Auckland (DPA). It reports on an assessment of hazards, as well as observed and perceived water competence and behaviours from river users at the sites.

This study acknowledges tangata whenua of the Waikato River, and those who have given their time and energy in both a professional and volunteer capacity to promote and improve areas for water safety among the users of the river.

The project was developed by personnel from Drowning Prevention Auckland and Hamilton City Council (HCC). From Drowning Prevention Auckland, the project was led by Ants Lowe, data collection from observations and interviews by Luke Blackwood and Zeta Morgan, managed by Josh Carmine who also completed the assessment of hazards, and research design, data analysis, and report compilation by Dr Teresa Stanley, with input and peer review from Dr Kevin Moran. From Hamilton City Council, key contributors were Steve Webb, Luke Archbold, and Dr Tegan Andrews.

Report prepared by:

Dr Teresa Stanley, Research & Impact Manager, Drowning Prevention Auckland.

Recommended reference:

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Executive Summary

Hamilton City Council (HCC) approached Drowning Prevention Auckland (DPA) to provide mitigation recommendations for reducing drowning risk on the Waikato River.

DPA assessed and reported on hazards and signage at five sites, along the Waikato River: Wellington Street Beach, Hamilton Gardens, Swarbrick Landing, Braithwaite Jetty, Hammond Park Beach. Recommendations for safer environments are included.

An observation study to determine the level of at-risk behaviours at the five nominated sites was completed during January and February 2023. The Duck Island site was added when Braithwaite Jetty was closed to the public. A total of 175 observations were undertaken observing 1,214 visitors, of which one-half (*n* = 627, 52%) were observed being in the water. Almost two-thirds of those entering the water were male (*n* = 398, 63%) or aged under 15 years (*n* = 382, 61%). One-half (*n* = 318, 51%) of those observed who entered the water were seen jumping in from the edge and one third were recorded jumping in from height over 2 m (*n* = 227, 36%). One in ten (*n* = 64, 10%) of all in-water observations recorded people displaying the risky behaviour of river drifting without buoyancy.

A further study with follow up interviews to determine water safety knowledge and attitudes, perceptions of risk, and water competency were conducted with those displaying at-risk behaviours was also completed. Eighty-one interviews were completed with risky river users. Most respondents (*n* = 47, 58%) were frequent users of the site, having visited more than 20 times and most visited the location to either swim or cool off (*n* = 46, 57%) or to perform manus/jumping in (*n* = 25, 31%).

Most respondents reported confidence in their swimming competence to stay safe when swimming in the river (91%), or to rescue others in the river (74%). In terms of risk perception most respondents considered swimming >10m from the bank (82 but less than half (41%) considered jumping in from height(>2m) as high risk.

More than one-half (*n* = 46, 57%) learnt their river safety knowledge from family/whaanau/elders (kaumaatua). Family and whaanau were also the main deliverers for teaching swimming for one-half (*n* = 39, 48%) of participants.

The results suggest that there is a high level of in-water activity on the Waikato River, and a high proclivity for those activities to be at high-risk of drowning. Influencing factors for displaying high-risk behaviours are a likely overestimation of swimming and floating competence, an underestimation of risks, and unsafe attitudes toward their behaviours.

Recommendations to encourage safer behaviours and assist in making the activities safer include:

From the hazard assessments, it is recommended that all sites identified within this report require:

1. **Infrastructure -** Infrastructure improvements including jetties, pontoons, and vegetation to be maintained to ensure user safety.

a) The installation of a fixed water depth gauge.

Hamilton Gardens

b) The installation of a ladder to assist with egress from the wharf should be considered.

c) Sunken debris in the water at this site should be identified and removed to mitigate the risk of injury from collisions or entanglement.

d) The installation of a bombing platform should be considered at this site with an easily accessible egress point downstream from this platform.

e) Scope the merits of providing a delineation mechanism between craft and non-craft users.

Wellington Street Beach

f) Repairs to the jetty should be made to ensure safety of users.
g) Address erosion issues with the unstable bank.
h) Consider a swinging jetty to allow the steps to be usable in both high- and low-flow.

Swarbrick Landing

i) Options around clearing the vegetation to be scoped and implemented.
j) Implement changes to make the retaining wall safer.

Hammond Park Beach

k) Overhanging tree branches that may enable swinging and landing on the shallow sandbar should be trimmed.

Braithwaite Jetty

l) Repair the jetty for safe usage, ensuring ease of egress.

2. **Signage -** Creating on-site river safety advice including installation of compliant signage. HCC should engage with DPA to develop a comprehensive signage plan.

a) Specified warning symbols for each site should be included on the compliant aquatic safety signage.

b) All aquatic signage should be compliant with New Zealand AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas.

c) Hamilton Gardens - Consideration should be given to install a carpark sign. An example of a car park sign is included in Appendix 3.

d) Hammond Park Beach - A narrow access sign should also be installed at the approximate location of Figure 5.

3. Public Rescue Equipment - Installing on-site river bystander rescue equipment

a) PRE should be provided at all assessed sites. The PRE type should be determined by the national PRE guidelines which are currently being developed.

b) HCC should engage with DPA to participate in a trial of PRE in inland water supporting the development of inland water PRE component of the national PRE guidelines.

In addition:

4. Regional Leadership

a) Regional leadership and coordination is explored amongst iwi, statutory agencies, and land managers to identify health and safety responsibilities, as well as developing consistency across all agencies that have a role within communication and management of hazards and risks in, on, and around the river.

5. **SafeSwim Website** – Providing current accessible information for river users

a) All sites assessed in this report should be included on the SafeSwim forum with the hazards listed in this report. Conversations should begin to discuss the process of inclusion of sites.

6. Supervision

a) A comprehensive scoping exercise is recommended to determine the need and possibility of implementing a professional lifeguard service at Hamilton Gardens and Wellington Street Beach.

7. Education

Recommendations to encourage safer behaviours and assist in making the activities safer include:

a) HCC to adopt a co-ordination role to actively promote best-practise river safety education for local communities in collaboration with water safety and river safety experts, and river user or bombing advocates and organisations,

b) Targeting education both to the user demographic and their wider family/ whaanau on the whakapapa of the river, river safety knowledge, how to engage safely, and developing water and river safety competence. This would be especially relevant to the older primary school age group and high school students,

c) Promoting river safety education and advice (via classrooms, workshops, and online) developed in association with water safety experts and river user or bombing advocates for the wider community, and

8. Further Research

a) Undertaking/facilitating further co-designed research to ascertain river safety knowledge, maatauranga, and actual water and river competence of the river users. DPA could provide guidance in this initiative.

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1. Introduction

Background

Hamilton City Council (HCC) approached Drowning Prevention Auckland (DPA) regarding the provision of mitigation recommendations to reduce risk on the Waikato River.

At 425 km, the Waikato River is the longest river in New Zealand. Its catchment covers 14,260 square km or 12 per cent of the area of the North Island. The river starts its journey to the sea from high in the central North Island volcanic zone, before finally flowing into the Tasman Sea at Port Waikato.

The Waikato River is a tupuna (ancestor), a taonga (treasure), and the mauri (life force) of Tainui Waka and Ngāti Tūwharetoa.

In the past ten years (2011 – 2021), 35 drowning fatalities have occurred in rivers in Waikato. As the land managers of the most densely populated area of the largest river, Waikato, Hamilton City Council are seeking expert guidance to steer mitigation strategies.

Drowning Prevention Auckland has history in providing inland water hazard assessment advice with other Councils in New Zealand. It also has a research *pou* with expertise in undertaking observation studies.

Project 1 - Hazard Assessments

Drowning Prevention Auckland (DPA) is the leading drowning prevention organisation in Auckland. DPA has completed comprehensive inland water assessments in the Tāmaki Makaurau and Te Tai Tokerau regions, complementing coastal assessments undertaken by Surf Life Saving New Zealand (SLSNZ).

The purpose of this engagement is for DPA to assess hazards at a pre-determined list of five sites, along the Waikato River.

The five hazard assessment sites chosen:

- Wellington Street Beach
- Hamilton Gardens
- Swarbrick Landing
- Braithwaite Jetty
- Hammond Park Beach

DPA provided information at each site on identification of hazards, assessment of existing aquatic safety signage, and providing recommendations to enhance public safety and knowledge within the specific locations.

Project 2 - Observation and Interview Studies

Hamilton City Council also requested observation study to determine the level of at-risk behaviours at five nominated sites along the Waikato River. Follow up interviews to determine water safety knowledge and attitudes, perceptions of risk, and water competency were conducted with those displaying at-risk behaviours.

The same five observation sites chosen were:

- Wellington Street Beach
- Hamilton Gardens
- Swarbrick Landing
- Braithwaite Jetty
- Hammond Park Beach

Observation Research

The observation study reported on actual behaviours of visitors to Hamilton's Waikato River recreational sites.

Research Question: What are the characteristic behaviours of visitors to Hamilton's Waikato River sites in HCC?

Study Design

The basic design is a cross-sectional observational study of behaviours of visitors to five sites on the Waikato River within the HCC boundary.

Interview Study

The interview asked about attitudes, knowledge, and perceived risk and water competence.

Research Question: What are the drowning risk perceptions of participants who demonstrate at-risk behaviours on the Waikato River?

Study Design

The study was implemented to provide HCC with further information to support the observation study. The design of the study is interviews. It involves one researcher requesting one adult observed displaying at-risk behaviours to be part of an interview about their attitudes and perceptions.

Figure 1. Adults Supervising a Young Child

2. Hazard Assessments

2.1 Introduction

Drowning Prevention Auckland was contracted by Hamilton City Council to perform inland water hazard assessments on five priority aquatic areas within the Hamilton region.

The purpose of these assessments is to:

- Identify hazards within the individual aquatic environments,
- Assess existing aquatic safety signage on site,
- To provide recommendations around new aquatic signage.

Caveat on information: Any information, comments or anecdotal feedback that may have been provided by local residents or landowners is for the sole purpose of contextual reference and should not be published on public forums.

2.2 Methodology

A total of five inland water sites identified by Hamilton Council were visited and assessed.

Activities identified at each site were either confirmed by residents, locals, the site-specific familiarity of the assessor, or a mixture of the three. Hazards identified at each site are those recommended to be added to signage at the location specified. Additional comments within this report include further observations, circumstantial evidence, observations, and anecdotal feedback from locals or residents.

2.3 Limitations

There are no limitations to assessing drowning hazards at the sites within this report. Sites are available to be assessed and hazards are comprehensively documented within this report.

Accurate water depth has not been determined or included. Bathymetric testing of the river could be undertaken to determine depth and topography, however it is expected this would only be accurate until the next flood when the sand bottom would be likely to change as a result of the flooding. Bathymetric testing would not hold much validity in the long-term due to the volume of sediment moved under flooding or high-flow circumstances.

Although not a drowning hazard, water quality is important for the health of river users. The Waikato Regional Council monitors water quality at 117 sites along the Waikato River for inclusion

on the Land Air Water Aotearoa (LAWA) website. Just one of these 117 sites was a site included in this report, Wellington Street Beach. Recent testing, however, had not been completed and testing results had not been updated to the website. Although water quality information was sought from LAWA (n.d.), it was not able to be included within this report. Not knowing the water quality and any contamination levels is identified as a potential limitation. It is recommended that water tests be completed to mitigate this potential limitation.

2.4 Discussion

Hazards

Some hazards are consistent at each of the locations. None of the sites assessed are currently supervised by an experienced or professional lifeguard service. A more thorough risk analysis to determine the need to introducing professional lifeguards would include additional factors such as historical fatal, non-fatal, and rescue data, potential harm, participation data, likelihood of harm occurring, and other potential positive or negative impacts. Another consistent hazard is the reduced buoyancy in inland waters when compared with coastal waters due to the reduced salinity in freshwater. New river users may experience difficulty floating if they are used to being in salt water. Access to strong water currents and deep water are further consistent hazard in all sites, and although some sites may have an eddy area close to shore with less current, all sites have unrestricted access to deep water with strong currents which could cause panic or drowning incidents upon immersion for inexperienced river users. Finally, the murky water of the Waikato River makes it more difficult to check for water depth and submerged objects. In the event of an unintended submersion, it also makes it more difficult to find and retrieve people in the water.

Other hazards have been identified specific to each site.

Recommendations

Recommendations noted within this component of the report have been categorised into infrastructure, signage, public rescue equipment, Safeswim website, and supervision.

Infrastructure – Infrastructure in this report includes improving or installing structural objects to enable safer use of the sites by river users. These include improvements to wharves and jetties, installing new platforms, removing sunken objects, especially in areas of in-water use, trimming or removing vegetation that could harm river users, and repairing unstable or slippery banks or retaining walls. In addition, a fixed water depth gauge would enable river users the knowledge about water depth under various flow-state conditions to give them information to make informed decisions about their activities in the river.

Signage – Signage is an important preventative measure to reduce drowning and water-related injuries. Signage should be clear, concise, and consistent for river users to make informed decisions about their activity. All signage should be compliant with the New Zealand Standard AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas, including carpark and access signs. Signage types and exemplars have been provided within the Appendix section. Any hazards recommended where symbols are not included in the New Zealand AS/NZS 2416.1:2010 signage standards could be added as the 'danger' symbol.

Public rescue equipment (PRE) is recommended at all assessed sites. The specific PRE type provision should be considered subject to the development of the national PRE guidelines for inland water environments. In the last two years, national guidelines for coastal waters have been researched and trialled, with the draft guidelines soon to be released for sector consultation and endorsement. It is recommended that HCC work with DPA and Surf Life Saving New Zealand to continue this development of PRE national guidelines, but for inland waters. This would involve HCC liaising with DPA to trial, monitor, and record use of various PRE at selected sites to identify the appropriate PRE for each location.

Safeswim – Developed by Auckland Council, Safeswim (Safeswim, 2023) provides current information on water quality and swimming conditions at popular sites for in-water use around New Zealand. Originally developed to provide water quality information in Auckland, Safeswim now hosts sites for all popular surf beaches around New Zealand, and a growing number of inland water sites in Auckland and Northland. Safeswim would be the ideal site to host water quality and drowning prevention information at the five sites included in this report. It would complement the information on the Raglan and Bay of Plenty/Coromandel sites already housed on Safeswim.

Supervision – Lifeguard services would provide an additional layer of protection for river users. New Zealand currently has lifeguard qualifications for public community swimming pools and surf beaches. River lifeguards would require additional competencies around the specific river environment. Scoping the feasibility of lifeguard services should be considered and responsible adult supervision of all children needs to be included in all promotion and education. Supervision should include all four components of being ready to respond to emergencies, watching constantly, proximity within arm's reach of young children, and avoiding distractions.

Priorities

The sites have various usage and activities. It is expected a more in-depth risk analysis would prioritise the recommendations to be undertaken on the sites as listed in the priority order below.

1. Hamilton Gardens – It is expected the consequence of things going wrong at this site would be the highest due to the following factors: jumping from heights, no easy access/egress from the water around the jetty area, submerged objects, and strong current wrapping around the bend.

2. Wellington Street Beach – Wellington Street Beach has the highest number of visitors and in-water river users, therefore the highest risk exposure. In addition, there are submerged objects and a depth change past the jetty which makes this site a high priority.

3. Swarbrick Landing – Dangerous activities include jumping from heights, submerged objects and shallow water.

4. Hammond Park – Risky environments including holes and an eddy.

5. Braithwaite Jetty and Duck Island

2.5 Recommendations

From the hazard assessments, it is recommended that all sites identified within this report require:

1. Infrastructure

a) The installation of a fixed water depth gauge.

Hamilton Gardens

b) The installation of a ladder to assist with egress from the wharf should be considered.

c) Sunken debris in the water at this site should be identified and removed to mitigate the risk of injury from collisions or entanglement.

d) The installation of a bombing platform should be considered at this site with an easily accessible egress point downstream from this platform.

e) Scope the merits of providing a delineation mechanism between craft and non-craft users.

Wellington Street Beach

f) Repairs to the jetty should be made to ensure safety of users.

g) Address erosion issues with the unstable bank.

h) Consider a swinging jetty to allow the steps to be usable in both high- and low-flow.

Swarbrick Landing

i) Options around clearing the vegetation to be scoped and implemented.

j) Implement changes to make the retaining wall safer.

Hammond Park Beach

k) Overhanging tree branches that may enable swinging and landing on the shallow sandbar should be trimmed.

Braithwaite Jetty

l) Repair the jetty for safe usage, ensuring ease of egress.

2. Signage

a) HCC should engage with DPA to develop a comprehensive signage plan.

b) Specified warning symbols for each site should be included on the compliant aquatic safety signage.

c) All aquatic signage should be compliant with New Zealand AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas.

d) Hamilton Gardens - Consideration should be given to install a carpark sign. An example of a car park sign is included in Appendix 3.

e) Hammond Park Beach - A narrow access sign should also be installed at the approximate location of Figure 5.

3. Public Rescue Equipment

a) PRE should be provided at this site. The PRE type should be determined by the national PRE guidelines which are currently being developed.

4. Regional Leadership

a) Regional leadership and coordination is explored amongst iwi, statutory agencies, and land managers to identify health and safety responsibilities, as well as developing consistency across all agencies that have a role within communication and management of hazards and risks in, on, and around the river.

5. SafeSwim Website

a) All sites assessed in this report should be included on the SafeSwim forum with the hazards listed in this report. Conversations should begin to discuss the process of inclusion of sites.

6. Supervision

a) A comprehensive scoping exercise should be undertaken to determine the need and possibility of implementing a professional lifeguard service at Hamilton Gardens and Wellington Street Beach.

Figure 2. Hamilton Gardens Jetty

2.6 Hamilton Gardens

Site name: Hamilton Gardens		**Date assessed:** 06.12.2022
Site type: River	**Site area:** Hamilton East	**Site location:** 37°48’27”S 175°18’16”E

Brief Description:

This site lies next to a large car parking facility for the Hamilton Gardens, with a paved walkway from the car park to the site providing easy access and egress for members of the public to access the site. Above the riverbank and jetty area lies an elevated jumping spot with worn tracks which indicates that this site is a popular jumping and bombing site. This elevated jumping spot is estimated to be a 2.5 – 3 metre jump into the river below. There is also a jetty area that may also be used for jumping / manus. The jetty may be used for the mooring of powered or non-powered craft. The jetty does not have any form of ladder installed which may pose a significant risk as this hinders egress from the water at this site. This site is also host to several seated areas, picnic tables, and rubbish bins that allow for members of the public to recreate around the aquatic environment.

The main concerns of this site relate to the difficult egress from the water as the jetty lies approximately 0.5 metres above the water making it difficult to exit the water onto the jetty, the easiest egress is by swimming to the riverbank. The site also possesses several submerged hazards as seen in Figure 3 such as strainers,[1] vegetation, large quantities of metal debris, and other submerged objects which pose a high entanglement/collision risk to river users.

The worn track combined with anecdotal evidence suggests that the elevated viewing platform above the jetty is used often for recreational activities such as bombing or jumping as seen in Figure 2.

Observations note that powered craft, predominantly jet skis, often travel with excessive speed past this site which also poses a large collision risk for aquatic users. Delineating craft use and non-craft use may provide some safety to non-craft river users.

The main hazards present at this site are the change in water levels due to flooding, submerged objects, sudden drop-off, murky water, shallow water, deep water, difficult/dangerous exit points,

[1] A strainer is created by a manmade or natural obstruction such as a tree, root system, fencing, or guard rails. A strainer allows water to pass through but stops and holds objects such as boats and people.

falls from height, entanglement in structure or vegetation, and a lack of supervision which may result in harm.

Water quality testing:	**Water temperature:**	**Rainfall catchment:**
Unknown	20.8 degrees	Large (One or more tributaries)

Site use: Swimming, wading, diving/bombing, picnic/sightseeing

Signage:

This site has several signs which indicate the potential for a slippery surface, do not enter the water when boats are docked or sighted, strong current, deep water and hidden objects.

All aquatic signage at this location is non-compliant with the New Zealand AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas.

Public rescue equipment on site: No PRE on site

Hazards present:

- Deep water
- Murky water
- Shallow water
- Submerged objects
- Sudden drops
- Entanglement risk in vegetation/debris
- No lifeguard supervision
- Difficult/dangerous entry/exit points
- Falls from height
- Flooding potential
- Reduced buoyancy in freshwater
- Slippery rocks and shoreline
- Water quality/contamination

Additional comments:

Members of the public have stated that there is a submerged vehicle located below the general vicinity of the jumping platform above the jetty. To avoid colliding with the sunken vehicle, jumpers must jump out towards the eastern side of the riverbank which contains the greatest current.

Members of the public have also stated that they wish for a safe bombing station to be installed at this site to ensure safe access and egress at this site. Ladders were also suggested to be installed on the jetty to enable safe egress for intentional and unintentional entry into the water from this site.

Staff at the Hamilton Gardens reception provided anecdotal evidence of a few rescues that have resulted in members of the public running to the site requesting rescue devices and automated external defibrillator during recent incidents at the site.

Recommendations:

1. Infrastructure

a) The installation of a ladder to assist with egress from the wharf should be considered.

b) Sunken debris in the water at this site should be identified and removed to mitigate the risk of injury from collisions or entanglement.

c) The installation of a bombing platform should be considered at this site with an easily accessible egress point downstream from this platform.

d) The installation of a fixed water depth gauge.

e) Scope the merits of providing a delineation mechanism between craft and non-craft users.

2. Signage

a) The following warning symbols should be included on the compliant aquatic safety signage:

- Submerged objects
- Sudden drop off
- Strong current
- Falls from height
- Reduced buoyancy in freshwater
- Supervise children at all times

b) All aquatic signage should be compliant with New Zealand AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas.

c) Consideration should be given to install a carpark sign. An example of a car park sign is included in Appendix 3.

3. Public Rescue Equipment

a) PRE should be provided at this site. The PRE type should be determined by the national PRE guidelines which are currently being developed.

b) The PRE and instructions for use should be installed in the approximate location of Figure 2 on the back of a carpark type aquatic safety sign. An example of this signage is included in Appendix 4.

4. SafeSwim Website

a) Recommended that this site is added to the SafeSwim forum with the hazards listed in this report.

Figure 3. Hamilton Gardens - Examples of debris

Figure 4. Hamilton Gardens - River user jumping from height

2.7 Hammond Park Beach

Site name: Hammond Park Beach		**Date assessed:** 06.12.2022
Site type: River	**Site area:** Hamilton East	**Site location:** 37°48’34”S 175°18’48”E

Brief Description:

This site possesses a large, shallow, sandy beach area at the base of a small hill. There is also a playground and picnic table area located nearby. This site has ample flat space near the water’s edge which allows numerous visitors to this site to recreate along the riverbank. The main beach area at this site has a tree overhanging the water's edge which is an enticing jumping spot for members of the public. This tree has a 1.5 – 2 metre jump into the river below. At present, there is a large, shallow, sandbar[2] under the tree which may make this tree jump hazardous for those jumping into the water. There is also a large eddy[3] area in front of the picnic table which shelters swimmers from the strong current in the main body of river water. The eddy area may provide a false sense of security to some river users and entice them to wade further out into stronger currents past the sand bar. Swimmers may wade to the edge of this sandbank and unexpectedly walk off the edge of the bank, into the deep, fast flowing water main body of water in the river resulting in swimmers getting into trouble as they unexpectedly get out of their depth.

Other concerns at this site relate to the sudden drop off from the shallow sand bar into deep water with strong current. There are several individual sand banks at this site with sudden drop-offs. When the water is murky, these holes are unable to be spotted by river users and may pose a substantial risk to swimmers at this site. The overhanging tree, strainers[4], and vegetation on the western side of the site may also pose a large entanglement and collision risk if members of the public drift further down the river or decide to jump from this overhanging tree. Egress from the river on the western side of the site, past the picnic table, will be challenging for swimmers due to the vegetation and strainers near the bank.

The main hazards present at this site include deep water, shallow water, entanglement risk, fast-flowing current, murky water, submerged objects, flooding risk, and sudden drop-off.

[2] A sandbar is a raised segment or section of sand below the surface of the water that is usually caused by currents. Sandbars may move or change in shape over time as current strength and sediment flows change.
[3] An eddy is a section of circular current that tends to flow in the opposite direction from the main river current.

Water quality testing:	**Water temperature:**	**Rainfall catchment:** Large
Unknown	20.8 degrees	(One or more tributaries)

Site use: Swimming, wading, diving/bombing, picnic/sightseeing

Signage: General signage, no water safety signage or hazard signage

All aquatic signage to be installed at this location should be compliant with the New Zealand AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas.

Public rescue equipment on site: No PRE on site

Hazards present:

- Deep water
- Murky water
- Shallow water/ sandbars
- Submerged objects
- Sudden drops
- Strong current
- Difficult/dangerous entry/exit points
- Falls from height
- Flooding potential
- Reduced buoyancy in freshwater
- Water quality/contamination
- No lifeguard supervision

Additional comments:

Members of the public who often visit the site with young children claim that they have never seen the sand bar this shallow, in contrast they also mentioned that the holes and sudden drop off have not been this steep before.

Observations have provided insight into young families who use this site after recreating at the nearby playground, often wearing incorrect swimming attire.

There were several fishermen using the eastern side of the site who were fishing for carp and other river species. These fishermen were wearing inappropriate fishing attire and standing knee deep on the edge of the sand bank at this site. This may pose an entanglement risk for swimmers using the main area of this site.

Recommendations:

1. Infrastructure

m) Overhanging tree branches that may enable swinging and landing on the shallow sandbar should be trimmed.

n) The installation of a fixed water depth gauge.

2. Signage

a) The following warning symbols are recommended to be included on compliant, new aquatic hazard signage:

- Sudden drop off
- Strong current
- Sandbar
- Reduced buoyancy in freshwater
- Supervise children at all times
- No diving/jumping

b) All aquatic signage should be compliant with New Zealand AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas.

c) A narrow access sign should also be installed at the approximate location of Figure 5. An example of this is included in Appendix 2.

3. Public Rescue Equipment

a) PRE should be provided at this site. The PRE type should be determined by the national PRE guidelines which are currently being developed.

b) The PRE and instructions for use should be installed on the back of a carpark type aquatic safety sign from the approximate location of Figure 6. An example of this signage is included in Appendix 4.

Figure 5. Hammond Park Beach - Main site

Figure 6. Hammond Park Beach - Western view of site showing strainers and jump spot from tree

Figure 7. Hammond Park Beach - Sandbars before the strainers and jumping tree

Figure 8. Hammond Park Beach - Existing signage at roadside

2.8 Wellington Street Beach

<table>
<tr><td colspan="2">Site name: Wellington Street Beach</td><td>Date assessed: 06.12.2022</td></tr>
<tr><td>Site type: River</td><td>Site area: Hamilton Central / East</td><td>Site location:
37°47’53”S 175°17’20”E</td></tr>
<tr><td colspan="3">Brief Description:

The Wellington Street Beach site has been created by a natural bend in the river which has allowed for the build-up of sand to occur and form a natural eddy and beach area. This site also hosts a jetty which is primarily used to jump from. The site has a large bank area overlooking the beach that has multiple picnic tables, seating areas and toilets which makes this site very popular. The main concerns at this site include the steep banks which when wet, are very slippery, the clear erosion from the bank to the beach area that poses multiple bank collapse risks, deep water, shallow water, strong current, lack of supervision, and sudden drop-offs. The jetty also poses a substantial risk as there is damage to the structural integrity of this jetty which has been noted from 6 January 2023. Floorboards are missing from the jetty which may pose a major fall or entanglement risk for members of the public. There is also significant debris which has built up on the eastern side of the jetty which, when the water is murky, members of the public may struggle to identify the locations of the submerged debris and may pose a large collision or entanglement risk.

The main hazards present at this site are the change in water levels due to flooding, submerged objects, sudden drop-off, murky water, shallow water, deep water, difficult/dangerous exit points, unstable banks, and a lack of supervision which may result in harm.</td></tr>
<tr><td>Water quality testing:

No recent data (LAWA, n.d.)</td><td>Water temperature:

20.08 degrees</td><td>Rainfall catchment: Large (One or more tributaries)</td></tr>
<tr><td colspan="3">Site use: Swimming, diving/bombing/jumping, picnicking</td></tr>
<tr><td colspan="3">Signage: No water safety or hazard signage on site

All aquatic signage to be installed at this location should be compliant with the New Zealand AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas.</td></tr>
<tr><td colspan="3">Public rescue equipment on site: No PRE on site</td></tr>
</table>

Hazards present: • Flooding potential or evidence of • Difficult/dangerous entry or exits • Unstable banks • Strong current • No lifeguard supervision	• Reduced buoyancy in freshwater • Submerged objects • Deep water • Murky water • Falls from height • Shallow water / sandbars

Additional comments:

A local resident claims that this site is very popular over the summer months and people almost exclusively use this site to swim in the shallows with small children or jump from the jetty which is in place. A local resident has also stated that she has told several parents to supervise their children properly as they were sitting at the top of the bank consuming alcohol while their toddlers were playing in knee-deep water. Observations have shown that youths regularly use this site and climb to the top pillars of the jetty to bomb/jump. This poses significant danger from slips, falls or collisions with submerged objects/debris.

Observations have also noted a large amount of alcohol consumption at this site, anecdotal evidence suggests that parents will typically eat and drink alcohol on the bank while their children swim in the river.

Recommendations:

1. Infrastructure

a) Repairs to the jetty should be made to ensure safety of users.
b) Address erosion issues with the unstable bank.
c) Consider a swinging jetty to allow the steps to be usable in both high- and low-flow.
d) The installation of a fixed water depth gauge.

2. Signage

a) The following warning symbols are recommended to be included on a compliant, new aquatic hazard sign:
    - Unstable banks
    - Strong current
    - Sandbars

- Supervise children at all times
- Sudden drop off
- Reduced buoyancy in fresh water
- Address of the site

b) All aquatic signage should be compliant with New Zealand AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas.

3. Public Rescue Equipment

a) PRE should be provided at this site. The PRE type should be determined by the national PRE guidelines which are currently being developed.

b) The PRE and instructions for use should be installed from the approximate location of Figure 11 on the back of a carpark type aquatic safety sign. An example of this signage is included in Appendix 4.

Figure 9. Wellington Street Beach - Unstable banks and vegetation downstream from jetty

Figure 10. Wellington Street Beach - Debris to east of jetty and sudden drop off

Figure 11. Wellington Street Beach - Submerged jetty during flooding

2.9 Swarbrick Landing

Site name: Swarbrick Landing		**Date assessed:** 06.12.2022
Site type: River	**Site area:** Hamilton Central	**Site location:** 37°45'06"S 175°15'55"E

Brief Description:

This site is host to a jetty, picnic and BBQ areas, a viewing platform, and two stairways which provide access to the river. This site also has ample car parking with toilets/changing facilities. The site is spread out over an approximate distance of 100 metres along the river with the jetty being the eastern boundary and the park benches being the western boundary. The main concerns at this site are the submerged rocks which, when the water is murky, are impossible to spot, the difficult access/egress spots around the riverbank, vegetation, and the sudden drop off from the riverbank. The riverbank drops rapidly into deep, rapidly moving water. If the second set of stairs is missed by members of the public to exit the water, egress may be challenging as the steep riverbank, vegetation, and retaining wall are extremely challenging to negotiate for those trying to exit the water at this site.

The viewing platform has many submerged rocks and a significant quantity of natural debris which may pose a substantial hazard to members of the public using this site for diving/jumping from the elevated spot.

The jetty at the site is also often used for bombing/jumping from. This jetty may be extremely hazardous in times of high flow, as the water beneath is very deep and the current does flow very fast off the end of the jetty. This may catch members of the public unaware and result in members of the public being forced to float downstream to the next safest site to egress, approximately 20 meters downstream. By this time members of the public may be in distress. There is also a large amount of vegetation downstream of the jetty which may pose a major entanglement risk.

The main hazards present at this site are the change in water levels due to flooding, submerged objects, sudden drop-off, murky water, shallow water, deep water, difficult/dangerous exit points, unstable banks, and a lack of supervision which may result in harm.

Water quality testing:	**Water temperature:**	**Rainfall catchment**:
Unknown	20.8 degrees	Large (One or more tributaries)

Site use: Swimming, jumping, wading, and picnic/sightseeing

Signage:

This site has several signs which indicate the potential for a slippery surface, do not enter the water when boats are docked or sighted, strong current, deep water and hidden objects.

All aquatic signage at this location is non-compliant with the New Zealand AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas.

Public rescue equipment on site: None

Hazards present:

- Murky water
- Submerged objects
- Deep water
- Sudden drop
- Strainers
- No lifeguard supervision
- Falls from height
- Slippery rocks/shoreline
- Flooding potential or evidence of
- Water quality/contamination
- Reduced buoyancy in freshwater
- Difficult access/egress

Additional comments:

Anecdotal statements from members of the public have indicated numerous rescues at this site from members of the public jumping from the jetty into the deep, fast flowing current, resulting in swimmers drifting downstream and becoming entangled in the vegetation as panicked swimmers attempt to exit the water.

In times of high flow, members of the public have been observed to jump off the railing of the viewing platform into shallow water. At times of low flow, exposed rocks and sand are below this viewing platform can be seen, which members of the public may not be aware of when jumping at times of high flow. This is cause for great concern as serious harm or injury may occur from this.

Anecdotal statements from members of the public also indicated that any signage or public rescue equipment that may be installed may be either vandalised or stolen.

Recommendations

1. Infrastructure

a) Options around clearing the vegetation to be scoped and implemented.
b) Implement changes to make the retaining wall safer.
c) The installation of a fixed water depth gauge.
2. Signage
a) The following warning symbols are recommended to be included on a compliant, new aquatic hazard sign:
    - Submerged objects
    - No jumping/diving
    - Reduced buoyancy in freshwater
    - Supervise children at all times
    - Sudden drop off
    - Address of the site
b) All aquatic signage should be compliant with New Zealand AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas.

3. Public Rescue Equipment
a) PRE should be provided at this site. The PRE type should be determined by the national PRE guidelines which are currently being developed.
b) The PRE and instructions for use should be installed from the approximate location of figure 14 and 15 on the back of a carpark type aquatic safety sign. An example of this signage is included in Appendix 4.

Figure 12. Swarbrick Landing - View of the access / egress during low flow

Figure 14. Swarbrick Landing - Jetty during high flow showing difficult egress points if stairs are missed

Figure 13. Swarbrick Landing - View of jetty at low flow

2.10 Braithwaite Jetty

Site name: Braithwaite Jetty		**Date assessed**: 06/12/2023
Site type: River	**Site area**: Hamilton Central	**Site location**: 37°44'17"S 175°14'49"E

Brief Description:

This site can be accessed through Braithwaite Park after a 5-minute walk down the concrete footpath. This site is relatively small and compact with one small boardwalk down to the water's edge, a jumping pontoon, and stairs to exit the water.

When assessed on the 6th of January, this site was open to the public for swimming/recreating however, since 8 January, 2023 this site has been closed for public access as an orange industrial barrier has been installed at the site.

The double-hulled jumping pontoon at this site was also observed to be missing from the site from the 8th of January.

At the time of assessment, this floating–double hull pontoon moored to the jetty was being used as a jumping platform, but during times of high flow, the pontoon had mounted the jetty support poles. This resulted in a major hazard, blocking the egress from the site. If the stairs at this site were missed by swimmers, the egress would be extremely challenging and dangerous due to a large amount of vegetation, strainers, deep water, and fast-flowing current at the site. Swimmers may also be unaware of the strength of the current which may also sweep them under the pontoons of the double–hulled jumping platform.

The main hazards present at this site are the change in water levels due to flooding, deep water, strong currents, submerged objects, strainers, sudden drop-off, vegetation – entanglement risk, difficult access/egress, and shallow water.

Water quality testing: Unknown	**Water temperature**: 20.08 degrees	**Rainfall catchment**: Large (One or more tributaries)

Site use: Swimming, bombing

Signage: No water safety or hazard signage on site

All aquatic signage to be installed at this location should be compliant with the New Zealand AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas.

Public rescue equipment on site: None

Hazards present:

- Slippery rocks/shoreline
- Cold water
- Vegetation (entanglement)
- Fast flowing current
- Sudden drop off
- Deep water
- No lifeguard supervision
- Deep water
- Reduced buoyancy (freshwater)
- Submerged objects
- Loose rocks/ground underfoot
- Shallow water
- Flooding potential or evidence of

Additional comments

Site closed – this has not enabled any contact with local users to provide anecdotal evidence for site use or typical behaviours.

Recommendations

1. Infrastructure

a) Repair the jetty for safe usage, ensuring ease of egress.
b) The installation of a fixed water depth gauge.

2. Signage

a) The following warning symbols are recommended to be included on a compliant, new aquatic hazard sign:
    - Fast flowing current
    - Sudden drop off
    - Entanglement risk
    - Submerged objects
    - Reduced buoyancy in freshwater
    - Supervise children at all times

- Address of the site

b) All aquatic signage should be compliant with New Zealand AS/NZS 2416.1:2010 Water safety signs and beach safety flags - Specifications for water safety signs used in workplaces and public areas.

3. Public Rescue Equipment

a) PRE should be provided at this site. The PRE type should be determined by the national PRE guidelines which are currently being developed.

b) The PRE and instructions for use should be installed near Figure 20 or the start of the access on the back of a carpark type aquatic safety sign. An example of this signage is included in Appendix 4.

Figure 16. Braithwaite Jetty - Displaced pontoon jetty

Figure 15. Braithwaite Jetty - Closed site and damage to support beams

Figure 17. Braithwaite Jetty - Entrapment risk underneath pontoon

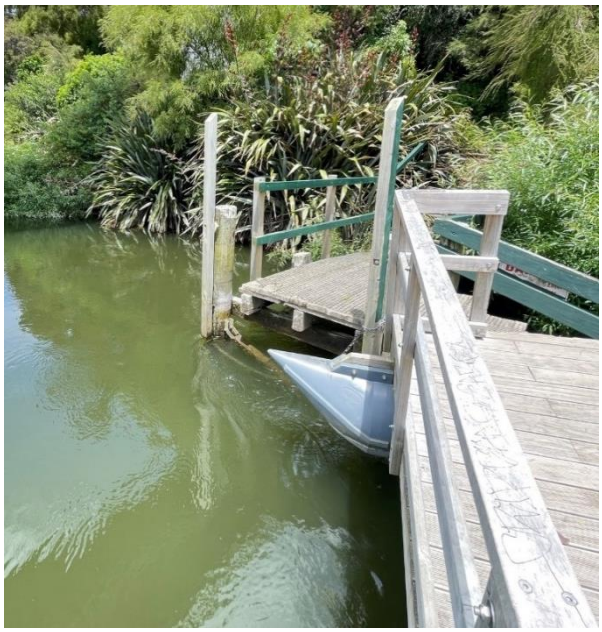


Figure 18. Braithwaite Jetty - Pontoon during high flow

3. Observation and Interview Research

3.1 Methodology

Researchers

Two researchers were on-site Wednesdays to Sundays, from 4 January - 12 February 2023. It was determined that these would be the busiest days, and the warmest time of the day, and thus likely to attract most visitors to the sites.

Prior to commencing the observations and interviews, the researchers undertook off-site development in river drowning prevention education, research, and basic first aid. On-site they completed familiarity of each site and sample data collection.

The two researchers spent two hours at one site per day. The attempted to complete a minimum of three observations and three interviews per site before moving to the next site. Four sites were visited each day, and the sites were rotated during the week to reduce a bias of the same time at each venue.

Observation Study

The six-week data collection period provided for each site to have potential observation data recorded for 72 observations (24 observation days per site x 3 observations per day per site). A total of 360 observations could be undertaken in total across all sites. Each observation was a snapshot at that time, for a period of ten minutes. All observations within the ten minutes were be included in the observation.

One researcher collected data observing visitor behaviours around the river. The researcher remained as covert as possible, to allow them to observe the behaviours of visitors to the sites, and record behaviours.

Research Instrument

Visitor head counts in the area, in-water head counts, visitor at-risk behaviours such as jumping from edge, jumping from height, river drifting with and without buoyancy, and wearing inappropriate swimming attire, as well as some demographics (gender (male) and age (0-14 years, 15-24 years and over 25 years)) were recorded every 30 minutes. Inappropriate swimwear was defined as normal streetwear, that is, oversized clothing, long pants and included those wearing t-shirts rather than rash shirts. Researchers used the following Alchemer link to collate data at each time (see Appendix 1).

https://survey.alchemer.com/s3/7103565/HCC-Waikato-River-Observation-Study-Jan-Feb-2023

Photographs were recorded and posted on a group Facebook chat.

Data was entered into SPSS Version 27 for analysis. Descriptive results have been reported.

Interview Study

Researchers recorded responses of visitors at the designated sites on the Waikato River in Hamilton. Prospective interviewees were chosen for demonstrating at-risk behaviours. At-risk behaviours included jumping from height, pushing others in, egging on others to participate in at-risk behaviours, river drifting, evidence of alcohol/drugs, or lack of appropriate supervision.

A pilot study was planned to be undertaken in December to finalise observation and interview questions, however poor weather at the time meant there were no visitors on-site. The interview questions were shared with HCC and updated accordingly in response to comments received.

During the six-week data collection period, each site had the potential to record data for 72 interviews (24 interview days per site x 3 observations per day per site). A total of 360 interviews could be undertaken in total across all sites.

One researcher (the researcher not collating observation data) recorded data from interviews with visitors to the Waikato River sites about their water safety knowledge, perceptions and attitudes, perceived competency, and risk awareness.

The researcher identified themselves as a researcher on behalf of DPA and HCC and requested individuals to participate. A small incentive was offered for participation in the interview (pen, tattoo, sticker, etc) and participants were offered the opportunity to go into a $500 draw for a prezzy card. Entry to the prezzy card draw was via a QR code. This included terms, conditions, and details regarding the draw.

To randomise the sample, the researcher selected the most recent adult visitor to enter the site area. Their actual behaviours were recorded before requesting the interview.

Researchers used the following Alchemer link to collate data at each time (see Appendix 2).

https://survey.alchemer.com/s3/7115800/HCC-Interview-YE23

Research Instrument

The interview consisted of a mixture of 19 close and open-ended questions. The first three related to demographic detail of age, gender, and ethnicity. Respondents were able to opt for more than one

ethnicity. The following five questions asked participants about how often they have visited the site, their reason for visiting, who they visited with, and their favourite thing about the river. The next two questions asked about their perceived swimming and floating competency. To ascertain their water safety attitudes, a series of six statements using a forced *agree* or *disagree* response was included. Another series of five statements was used to determine perceived risk (*extreme risk, high risk, slight risk, no risk*). Two further questions were asked to determine where they had learnt to swim and their river safety knowledge. Four final questions were asked around local signage, local risks in the river, experience of rescue or drowning incidents, and suggestions to make the site safer for aquatic recreation. Content validity was determined via expert opinion and peer appraisal.

Data was entered into SPSS Version 27 for analysis. Descriptive results for all responses have been reported. Age groups were dichotomised to more closely match the three age brackets of the observation study (0-15 years, 16-24 years, and 25 and over years). Originally those under 16 years were not included in the interview study. It was realised very early in the data collection that this group comprised a large proportion of the at-risk displaying behaviours so another age backet was included. Risk perception responses were also dichotomised (*extreme and high risk, slight or no risk*) for analysis.

Ethical Protocols

An ethics review was deemed to not be required. Ethically, this method is considered to be acceptable if the participants remain anonymous and the behaviour occurs in a public setting where people would not normally have an expectation of privacy. The data collection in this study was completed using the following protocols:

1. Anonymity – behaviours reported will not be identifiable to any one individual.
2. Confidentiality – in the course of recording behaviours, researchers will not disclose behaviours or comments of individual people.
3. Respect for people – all people will be treated with respect.
4. Māori and ethical considerations – Tainui are tangata whenua. Hamilton City Council are the land manager. It was the responsibility of HCC to ensure consent is gained by iwi before the research commences. Iwi were informed by HCC as part of the River Forum. It is understood the iwi representative informed iwi of the initiative.

5. Justice – all people will be included in the observations. There will be no discrimination on the grounds of ethnicity, age, gender, disability or other. A range of ethnicity, age, gender, disability or other will be sought when selecting visitors to participate in the interview.

6. Beneficence and non-maleficence – The risks of a study should be reasonable in the light of the expected benefits. The benefit of having robust data of actual behaviours at the river will assist immensely in the development of future drowning prevention educational initiatives. There are however some risks which need to be addressed:

    - Concern of visitors noting that their behaviour is being monitored. Researchers should be coached in their response to this.

    - Concern from researchers monitoring risky behaviour that could compromise safety of individuals being monitored.

    - Researchers present during a drowning incident.

7. Integrity – The researchers will collect honest and actual data and the information will be analysed in a careful and rigorous manner.

8. Diversity – The researchers will understand, respect, and make allowance for diversity among participants and their communities.

9. Conflict of Interest – Perceived, potential, or actual conflicts of interest will be noted. Any conflict of interest will be minimised.

Figure 19. Swarbrick Landing - Tree jumping during high flow into murky water with unknown depth

3.2 Results

3.2.1 Observations

A total of 175 observations were undertaken at six sites on the Waikato River: Wellington Street Beach, Hamilton Gardens, Swarbrick Landing, Braithwaite Jetty, Hamilton Park Beach, and Duck Island.

Initially, Braithwaite Jetty was open to the public for swimming/recreating. However, the site was closed to public access (from 8 January) with an orange industrial barrier installed at the site. After consultation with HCC, it was agreed to replace the Braithwaite Jetty site with the Duck Island site.

Table 1. On-site Observation Sessions Completed, Jan - Feb 2023

	n	%
Wellington Street Beach	45	25.7%
Hamilton Gardens	38	21.7%
Swarbrick Landing	35	20.0%
Braithwaite Jetty	13	7.4%
Hammond Park Beach	33	18.9%
Duck Island	11	6.3%
Total	175	100%

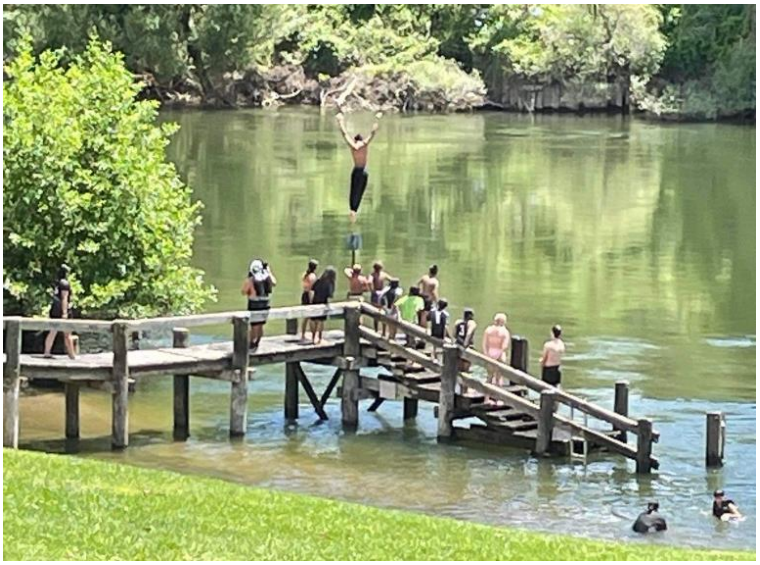


Figure 20. Wellington Street Beach - Unsafe behaviours of river users

Observations were spread throughout the day from 11.00am until 7.00pm. Most observations were recorded at 11.00am (*n* = 18), 1.30pm, 4.00pm, and 6.00pm (all *n* = 16).

Table 2. Time of Observations

	n	%
11 00am	18	10.3%
11 30am	8	4.6%
12 00pm	8	4.6%
12 30pm	9	5.1%
1 00pm	9	5.1%
1 30pm	16	9.1%
2 00pm	10	5.7%
2 30pm	8	4.6%
3 00pm	12	6.9%
3 30pm	9	5.1%
4 00pm	16	9.1%
4 30pm	13	7.4%
5 00pm	7	4.0%
5 30pm	7	4.0%
6 00pm	16	9.1%
6 30pm	6	3.4%
7 00pm	3	1.7%
Total	175	100%

Weather, Temperature, and Water Conditions

The weather conditions were unsettled for much of the observation period. Just under one-quarter of the observations were undertaken in sunny weather (*n* = 41, 23%), more than one-half (*n* = 98, 56%) were cloudy, and 15% (*n* = 26) were rainy. The temperature ranged from 17 to 28 degrees Celsius, but between 22 and 24 degrees Celsius for almost one-half of the observations (48%). Additionally, on days that were deemed too unfavourable, such as during the floods and cyclones, for Health and Safety reasons the researchers were requested by DPA to not be on site.

Figure 21. Weather Conditions at Time of Observation

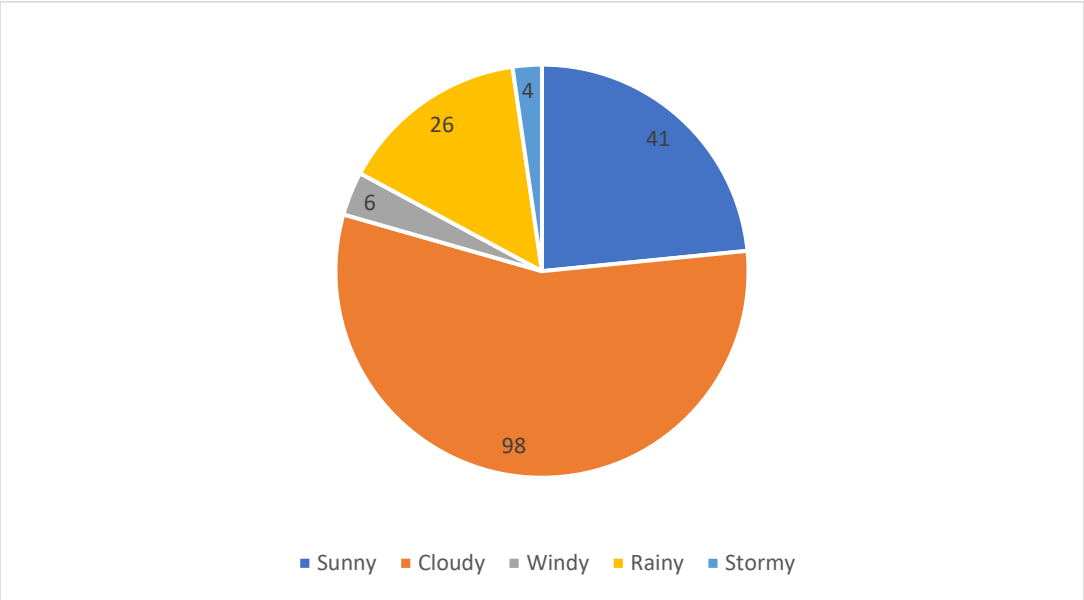
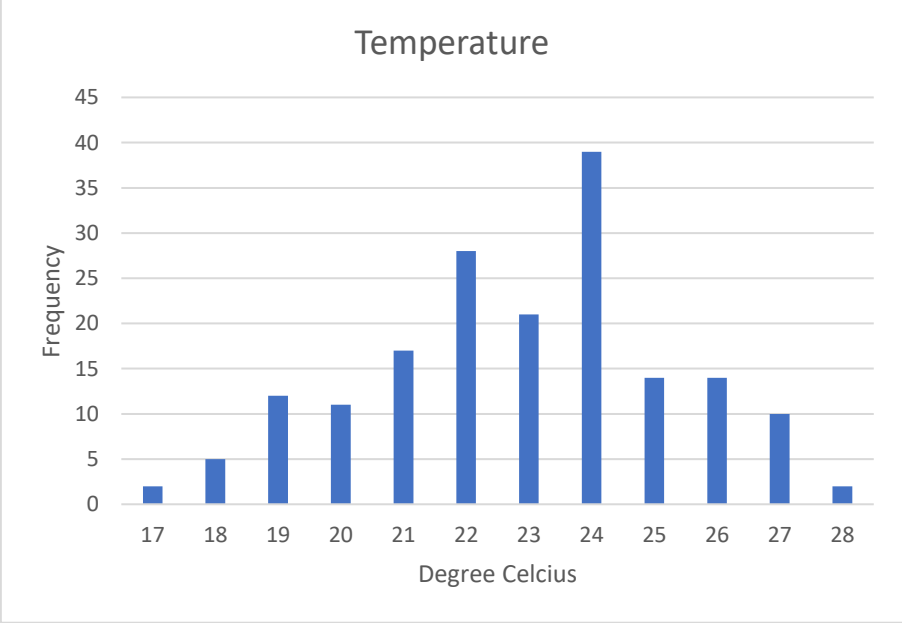
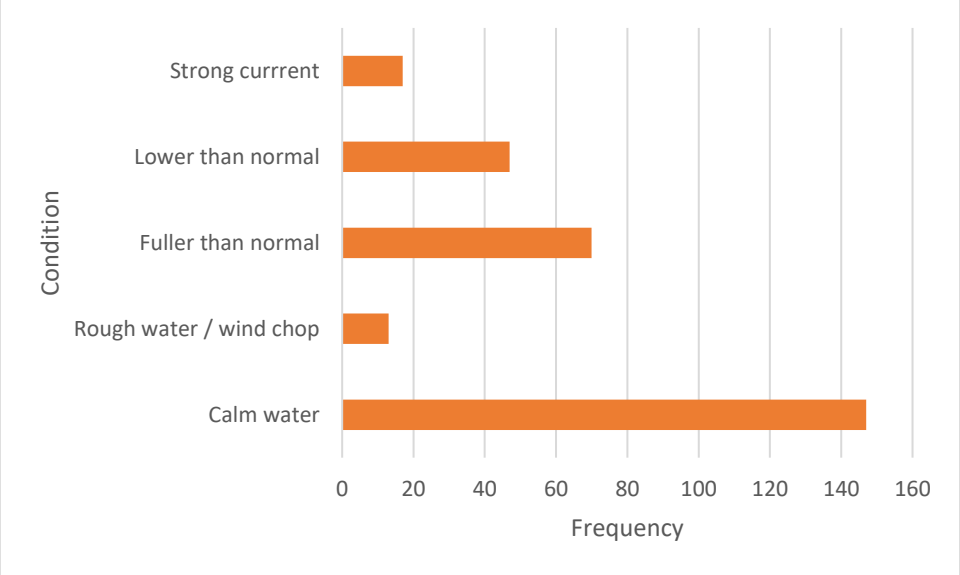


Figure 22. Temperature at Time of Observation



The water conditions were calm during most of the observations (*n* = 147, 84%), although the river was fuller than normal during the time the observations took place quite often (*n* = 70, 40%).

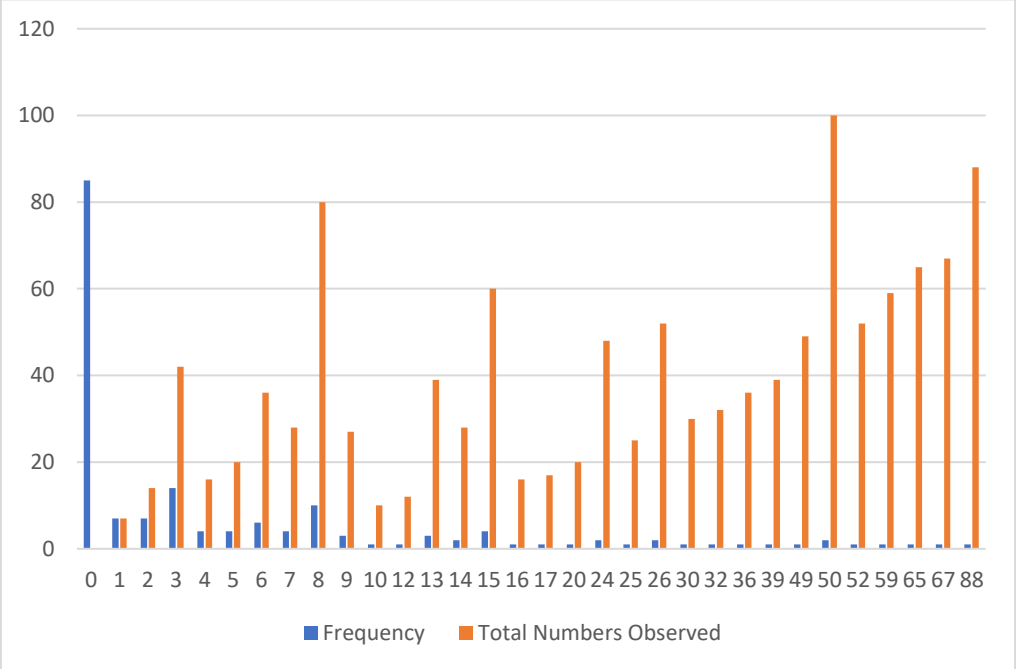
Figure 23. Water Conditions at Time of Observation



Observation Numbers

A total of 1,214 visitors were observed in the area at the six sites during the 175 observations, however, visitors were not necessarily in the water. One-half (*n* = 85, 49%) of the observations were undertaken with no visitors present. Large groups of more than 20 visitors per site were recorded on over one-fifth (*n* = 19, 21%) of the observations when visitors were present, but accounting for almost two-thirds (*n* = 762, 63%) of the visitors.

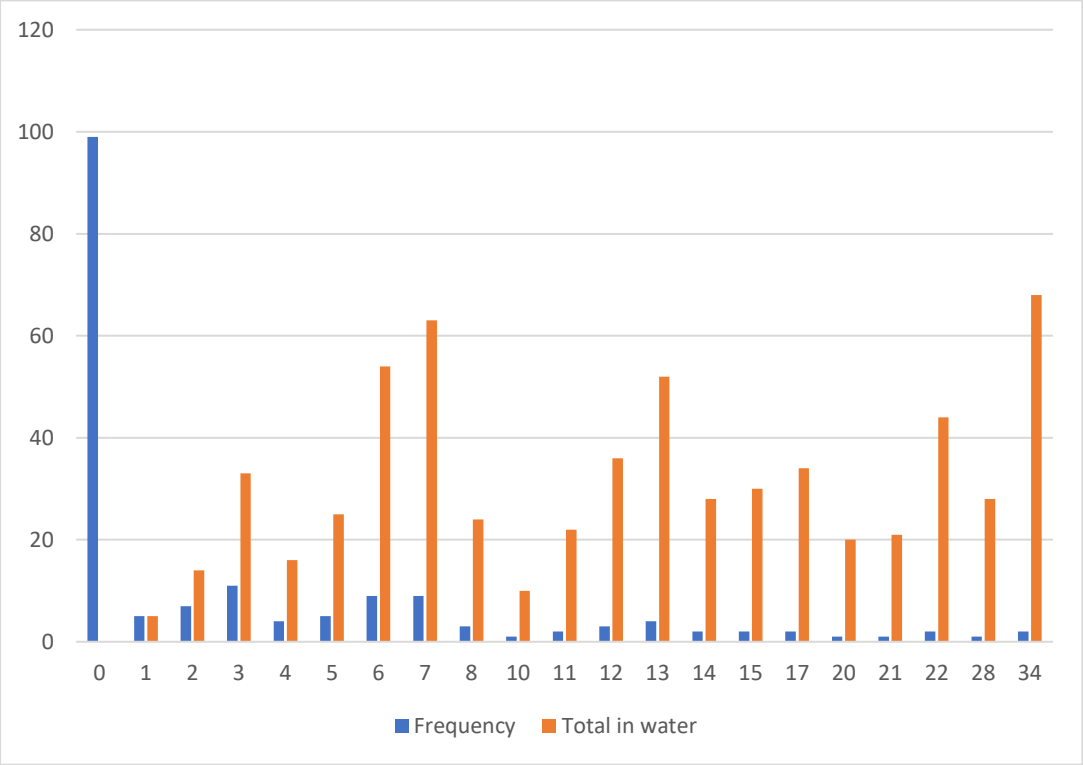
Figure 24. Number of Visitors Observed



In-water Observations

One-half (*n* = 627, 52%) of all river visitors were observed being in the water. Groups in size from three to seven accounted for one-half (*n* = 38, 50%) of the in-water observations, and almost one-third (*n* = 191, 30%) of the in-water river users.

Figure 25. Visitors Observed in Water



Behaviours Observed

Almost two-thirds of those entering the water were male (*n* = 398, 63%) or aged under 15 years (*n* = 382, 61%). One-half (*n* = 318, 51%) of those observed who entered the water were seen jumping in from the edge and one third were recorded jumping in from height over 2 m (*n* = 227, 36%). Jumpers were most likely to be male (from edge *n* = 28, 72%; from height *n* = 201, 86%) and aged under 15 years (from edge *n* = 202, 64%; from height *n* = 133, 59%).

One in ten (*n* = 64, 10%) of all in-water observations recorded people displaying the risky behaviour of river drifting without buoyancy, again these were most likely to be male (*n* = 44, 69%) and aged under 15 years (*n* = 52, 81%). A small number of river users drifted with buoyancy (*n* = 10, 2%). One-half (n = 299, 48%) of river users were wearing inappropriate clothing.

Table 3. Risky Behaviours Observed

	Numbers in water		**Jumping from edge**		**Jumping from height**		**River drifting with buoyancy**		**River drifting with NO buoyancy**		**Wearing inappropriate clothing**	
	n	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
Total	627	*100%*	318	*51%*	227	*36%*	10	*2%*	64	*10%*	299	*48%*
Male	398	*63%*	228	*72%*	201	*86%*	8	*80%*	44	*69%*	195	*49%*
Age 0-14	382	*61%*	202	*64%*	133	*59%*	4	*40%*	52	*81%*	207	*54%*
15-24	146	*23%*	90	*28%*	77	*34%*	6	*60%*	10	*16%*	83	*57%*
25+	97	*15%*	35	*11%*	23	*10%*	0	*0%*	2	*3%*	52	*54%*

Other positive and negative behaviours were observed and noted by the researchers. In more than one-fifth (*n* = 39, 22%) of the 175 observations, young children were observed being adequately supervised by a responsible adult. However, one-fifth (*n* = 33, 19%) were observed without appropriate adult supervision. In addition, male youth were seen encouraging risky behaviours in more than one-quarter (*n* = 48, 27%) of the observations.

Table 4. Other Risky Behaviours Observed

Other Behaviours Observed	*n*	%
Male youth encouraging risky behaviours	48	27.4%
People being threatened by others to perform risky behaviours	10	5.7%
Consumption of alcohol or other drugs	12	6.9%
Lack of appropriate adult supervision of young children	33	18.9%
People trying to stop risky behaviours	6	3.4%
Adult supervision of young children	39	22.3%

Further comments collated from researchers:

"Father encouraging kids, who clearly cannot swim, to jump in the water when he is the entire jetty's length away from them."

"Another incident was that a boy that 'didn't know how to swim' wanted to jump off with everyone else"

"Toddler, fully clothed swimming in the shallows with fully clothed mother."

"Two river users drifting down river without buoyancy. Drifted past the site and continued down river"

"Kids being unsupervised trying to jump off bridge into water, and cannot see what's below"

"Two boys jumping from tree upstream from the dock and floating down the river. Need to put signs up"

"Water is too high for the pathway along the bank"

"Saw sign for contamination and ignored it"

"Swimming in water that is cloudy and currently has a warning for chemicals in the water"

Table 5. Risky Behaviours by Location

	Wellington Street Beach		**Hamilton Gardens**		**Swarbrick Landing**		**Braithwaite Jetty**		**Hammond Park Beach**		**Duck Island**	
	n	***%***	***n***	***%***	***n***	***%***	***n***	***%***	***n***	***%***	***n***	***%***
In-water observations (76)	30	*39%*	12	*16%*	19	*25%*	2	*3%*	11	*14%*	2	*3%*
Visitors at site (1,214)	814	*67%*	66	*5%*	159	*13%*	11	*1%*	153	*13%*	9	*1%*
Visitors In water (627)	369	*59%*	55	*9%*	118	*19%*	8	*1%*	71	*11%*	6	*1%*
Jumping from edge (318)	163	*44%*	45	*14%*	99	*31%*	6	*2%*	5	*2%*	0	*0%*
Jumping from height (227)	109	*30%*	28	*12%*	89	*39%*	1	*0%*	0	*0%*	0	*0%*
River drifting - buoyancy (10)	5	*50%*	3	*30%*	0	*0%*	0	*0%*	3	*30%*	0	*0%*
River drifting without buoyancy (64)	21	*33%*	6	*9%*	24	*38%*	0	*0%*	13	*20%*	0	*0%*
Inappropriate attire (299)	174	*58%*	26	*9%*	73	*24%*	7	*2%*	18	*6%*	1	*0%*

Wellington Street Beach was the location most likely to record in-water river users with 39 percent of all in-water observations and the greatest proportion of river users (*n* = 369, 59%). The next most popular location for in-water users was Swarbrick Landing (*n* = 118, 19%). These two locations accounted for most of the at-risk water behaviours. For example, these two locations accounted for almost three-quarters (71%) of the high-risk water entries of jumping in from the edge and jumping in from height >2 m (69%). They also accounted for most of the river drifting without buoyancy incidents (71%) and the wearing of inappropriate water attire (72%).

Table 6. Risky Behaviours by Gender and Location

	Wellington Street Beach		Hamilton Gardens		Swarbrick Landing		Braithwaite Jetty		Hammond Park Beach		Duck Island	
	n	***%***	***n***	***%***	***n***	***%***	***n***	***%***	***n***	***%***	***n***	***%***
Male												
Total in area	388	*48%*	56	*85%*	119	*75%*	5	*45%*	65	*42%*	6	*67%*
In water	208	*56%*	48	*87%*	100	*85%*	4	*50%*	33	*46%*	5	*83%*
Jumping from edge	107	*66%*	40	*88%*	75	*76%*	5	*83%*	1	*20%*	0	*0%*
Jumping from height	90	*83%*	29	*100%*	82	*92%*	0	*0%*	0	*0%*	0	*0%*
River drifting - buoyancy	5	*100%*	3		0	*0%*	0	*0%*	1	*33%*	0	*0%*
River drifting without buoyancy	8	*38%*	6	*100%*	22	*92%*	0	*0%*	8	*62%*	0	*0%*
Inappropriate attire	72	*41%*	21	*81%*	65	*89%*	4	*57%*	11	*61%*	1	*100%*

When risk behaviours were analysed by gender and location, Wellington Street Beach, many males were observed performing at-risk behaviours especially on entering the water with most males either jumping in for the edge (66%) or form height (83%). Males were also overrepresented in at-risk water entries at Swarbrick Landing, jumping in from the edge (76%), jumping in from height (92%) as well as river drifting without buoyancy (92%) and wearing inappropriate attire (89%).

Figure 26. Hamilton Gardens - Jetty Under Water During High Flow

Table 7. Risky Behaviours by Age Group and Location

	Wellington Street Beach		Hamilton Gardens		Swarbrick Landing		Braithwaite Jetty		Hammond Park Beach		Duck Island	
0-14 years												
Total in area	356	*44%*	24	*40%*	73	*46%*	6	*55%*	84	*55%*	3	*33%*
In water	243	*66%*	21	*38%*	62	*53%*	5	*63%*	48	*68%*	3	*50%*
Jumping from edge	123	*75%*	17	*40%*	47	*47%*	5	*83%*	0	*0%*	0	*0%*
Jumping from height	72	*66%*	13	*50%*	48	*54%*	0	*0%*	0	*0%*	0	*0%*
River drifting – buoyancy	2	*40%*	0	*0%*	0	*0%*	0	*0%*	0	*0%*	0	*0%*
River drifting without buoyancy	18	*86%*	4	*67%*	20	*83%*	0	*0%*	10	*77%*	0	*0%*
Inappropriate attire	95	*55%*	10	*38%*	41	*56%*	5	*71%*	3	*17%*	2	*0%*
15-24 years												
Total in area	170	*21%*	24	*37%*	73	*46%*	3	27%	15	*10%*	2	*22%*
In water	56	*15%*	20	*36%*	52	*44%*	3	38%	12	*17%*	2	*33%*
Jumping from edge	32	*20%*	17	*36%*	33	*33%*	3	50%	4	*80%*	0	*0%*
Jumping from height	24	*22%*	11	*35%*	40	*45%*	1	100%	0	*0%*	0	*0%*
River drifting - buoyancy	0	*0%*	0	*0%*	0	*0%*	0	*0%*	3	*100%*	0	*0%*
River drifting without buoyancy	2	*10%*	1	*17%*	5	*21%*	0	*0%*	2	*15%*	0	*0%*
Inappropriate attire	31	*18%*	10	*38%*	35	*48%*	2	*29%*	5	*28%*	0	*0%*
25+ years												
Total in area	271	*33%*	16	*20%*	18	*11%*	3	27%	61	*40%*	5	*56%*
In water	68	*18%*	11	*18%*	8	*7%*	0	*0%*	9	*13%*	1	*16%*
Jumping from edge	17	*10%*	9	*19%*	8	*8%*	0	*0%*	1	*20%*	0	*0%*
Jumping from height	13	*12%*	6	*19%*	4	*4%*	0	*0%*	0	*0%*	0	*0%*
River drifting - buoyancy	0	*0%*	0	*0%*	0	*0%*	0	*0%*	0	*0%*	0	*0%*
River drifting without buoyancy	0	*0%*	0	*0%*	0	*0%*	0	*0%*	2	*15%*	0	*0%*
Inappropriate attire	37	*21%*	5	*19%*	4	*5%*	0	*0%*	5	*28%*	1	*100%*

Some differences in at-risk behaviours were evident when analysed by age. Young people (<14years) were more likely to jump in from the edge (75%) or from height (66%) than the older age groups

with those aged >25 years least likely to jump from the edge (10%) or from height (12%). The youngest age group were also more likely to engage in river drifting with (40%) or without (86%) buoyancy, and the oldest age group were least likely to engage in river drifting activity with (0%) or without (0%) buoyancy. The younger age group were also most likely to wear inappropriate attire in the water (<14years 55%; 15-24 years 18%; >25 years 21%).

Hammond Park is a site that seems to appeal to families of young children. In the 0–15-year age bracket, the researchers reported that apart from Hammond Park, where about 80 per cent were aged 0-4 years, younger teens made up the majority of the age bracket at other sites. They reported Duck Island, Swarbrick Landing, and Braithwaite Jetty had little or no younger children, and they were also the minority at Hamilton Gardens and Wellington Street Beach (approximately 20% and 30% respectively). The one time that 0–4-year-olds were observed at Braithwaite Jetty they witnessed an incident that could have easily turned tragic.

The researchers also reported that those who were overweight were more likely to wear inappropriate swimwear.

Figure 27. Swarbrick Landing - Jumping from Viewing Platform - Shallow Water with Obstructed Entry

3.3.2 Interviews

A total of 105 interviews were completed at six sites along the Waikato River. The Duck Island site was added when the Braithwaite Jetty site was closed. Most (*n* = 44, 42%) of the interviews were completed at Wellington Street Beach. The others were Swarbrick Landing (*n* = 27, 26%), Hamilton Gardens (*n* = 18, 17%), Hammond Park Beach (*n* = 12, 11%), Braithwaite Jetty (*n* = 3, 3%), and Duck Island (*n* = 1, 1%).

Table 8. Site where Interview was Conducted

Location	*n*	*%*
Wellington Street Beach	44	41.9
Hamilton Gardens	18	17.1
Swarbrick Landing	27	25.7
Braithwaite Jetty	3	2.9
Hammond Park Beach	12	11.4
Duck Island	1	1.0
Total	105	100.0

Participants were asked to complete an interview as reported in Table 9 below. Over one-half (*n* = 63, 60%) were male, over two-thirds (*n* = 75, 71%) self-identified as Maaori, followed by Paakehaa/NZ European (*n* = 28, 27%) and Pasifika (*n* = 17, 16%).

Table 9. Behaviours Observed Before Interview

Behaviours	*n*	*%*
Wearing inappropriate swimwear	45	42.9
Jumping from height	29	27.6
Inadequate supervision of young children	17	16.2
Encouraging risky behaviours	15	14.3
River drifting	11	10.5
Pushing others	5	4.8
Presence of alcohol or other drugs	4	3.8
No risky behaviours observed	24	22.9
Total	105	100.0

Approximately one-quarter of participants (*n* = 24, 23%) observed at the sites did not display any risky behaviours and were removed from further analysis. Inappropriate swimwear was observed in almost one-half of participants (*n* = 45, 43%) river users, mostly in addition to other risky behaviours displayed.

Table 10. Site where Risky Behaviour was Observed before Interview

Location	*n*	*%*
Wellington Street Beach	30	37.0
Hamilton Gardens	17	21.0
Swarbrick Landing	26	32.1
Braithwaite Jetty	2	2.5
Hammond Park Beach	6	7.4
Total	81	100.0

Most of those displaying at-risk behaviours were male (*n* = 46, 61%). Participants were spread throughout the three age brackets: 15 years and under (*n* = 36, 44%, 16-24 years (*n* = 20, 25%), 25+ years (*n* = 25, 31%). Three-quarters (*n* = 61, 75%) identified as Maaori, followed by Paakehaa/NZ European (*n* = 18, 22%) and Pasifika (*n* = 16, 20%).

Frequency, Companions, and Reasons for Visiting Site

Table 11. Familiarity of Site

Frequency of visits	*n*	*%*
This is my first time	13	16.0
Between 2 - 4 times	7	8.6
Between 6 - 10 times	12	14.8
Between 11 - 20 times	2	2.5
More than 20 times	47	58.0
Total	81	100.0

Table 11 shows that most respondents (*n* = 47, 58%) who had been observed displaying risky behaviours were frequent users of the site, having visited more than 20 times. In contrast, one-

quarter of respondents (*n* = 20, 25%) had visited the site where they were interviewed less than five times and for 16 percent it was their first visit.

In summer, many of the respondents (*n* = 33, 41%) had visited one of the Waikato River sites daily, while one-fifth (*n* = 18, 22%) visited the river sites a few times per week and one-quarter (25%) had visited less often than one per week.

Table 12. Frequency of Visits to Waikato River During Summer

Frequency	*n*	*%*
Daily	33	40.7
Once a week	10	12.3
A few times per week	18	22.2
Less often	20	24.7
Total	81	100.0

Most participants visited the location to either swim or cool off (*n* = 46, 57%) or to perform manus/jumping in (*n* = 25, 31%). Drifting was not frequently reported (<4 percent of respondents) and play and other land-based leisure activities were also reported (5%).

Table 13. Main Reason for Visiting Location

Frequency	n	%
Manu / jumping	25	30.9
Swimming/Cool Off	46	56.8
Play/Picnic next to river/fish/feed ducks/dog	4	4.9
River drifting	3	3.7
Other	3	3.7
Total	81	100.0

Table 14 shows, in descending order of frequency, who had accompanied them to the river site on the day they were interviewed. Most respondents reported they were with family/whaanau (*n* = 46, 57%) or mates/friends (*n* = 30, 37%). A small proportion (5%) had come on their own or with a partner (1%).

Table 14. Companions to the Site

Who did you come with?	*n*	*%*
My family / whaanau	46	56.8
My mates / friends	30	37.0
Myself	4	4.9
My partner	1	1.2
Total	81	100.0

Respondents were asked what their favourite feature of the river was. Table 15 shows, in descending order of frequency that convenience was the most frequently reported favourite (*n* = 24, 30%) and it was a cool place appealed to one quarter (*n* = 20, 25%) of the respondents.

Table 15. Favourite Thing About the River

Favourite thing	n	%
It's close to where I live/ Location	24	29.6
It's cool	20	24.7
Its free	14	17.3
It's exciting	12	14.8
Calm/relaxing	4	4.9
Whakapapa	4	4.9
Jetty	3	3.7
Total	81	100.0

Table 16 shows, in descending order of preference, the main reasons that interviewees cited for being in the water on the day of the interview. The three most popular reasons were: were fun (*more fun than local pools, n* = 23, 28%), to cool off (*it's hot and the weather looked inviting, n* = 22, 27%), and lack of any cost (*I can't afford the pools n* = 21, 26%).

Table 16. Reason for Being in the Water

	n	*%*
It's more fun than local pools	23	28.4
It's hot and water looked inviting	22	27.2
I can't afford the pools	21	25.9
Friends/family encouraged me	9	11.1
Location	3	3.7
I don't like the beach	2	2.5
No reason not to	1	1.2
Total	81	100.0

Figure 28. Duck Island

Perceived Water Competence – Swimming and Floating

Respondents were asked to self-estimate their water competency with respect to their swimming and flotation. Almost all of those displaying risky behaviours perceived they could swim (*n* = 79, 98%) and float (*n* = 76, 94%), with most believing they were competent swimmers (*swim well/very well, n* = 63, 78%) and floaters (*float well, very well, n* = 69, 85%). One-third (*n* = 27, 33%) thought they could swim more than 200 m in five minutes and more than three-quarters (*n* = 63, 78%) believed they could float for more than five minutes. No statistical differences were evident in perceived self-reported swimming and floating competence when analysed by gender or age group.

Table 17. Perceived Swimming and Floating Competence

		n	*%*
How well can you swim?	Poor/Can't swim	4	4.9%
	Fair form	14	17.3%
	Good form	33	40.7%
	Very good form	30	37.0%
How far can you swim in 5 mins?	Less than 50 m	23	28.4%
	51 – 100 m	14	17.3%
	101 – 200 m	17	21.0%
	More than 200 m	27	33.3%
How well can you float?	Poor/Can't float	7	8.6%
	Fair form	5	6.2%
	Good form	17	21.0%
	Very good form	52	64.2%
For how long can you Stationary Float?	Less than 30 seconds	6	7.4%
	30 seconds – 1 minute	1	1.2%
	1 - 5 minutes	11	13.5%
	More than 5 minutes	63	77.8%

Water Safety Attitudes

Respondents were asked to agree/disagree to six statements relating to their safety at the river site where interviewed. Table 18 shows, in descending order of agreement, the number and percentages of respondents who agreed with the statements. Most respondents considered that the swimming competence would keep them safe when swimming in the river (91%), that their swimming competence meant they didn't need to wear a lifejacket (82%), and that they were confident in their capacity to rescue others in the river (74%). In terms of the perceptions of the risk of drowning, two thirds of respondents (68%) thought that others were at greater risk of drowning than themselves, and that they were aware of the risk of drowning when recreating in the river (59%) but fewer (37%) thought they felt at risk when swimming/jumping in the river. Surprisingly, there were no statistical differences for any of the water safety attitudes by gender or age group.

Table 18. Attitudes toward Water Competency and Drowning Risk in the River

Statement	Agree *n*	Agree *%*
My swimming competence will keep me safe when swimming in the river	74	91.4
My swimming competence means I don't need to wear a lifejacket in the river	66	81.5
My swimming competence means I am capable of rescuing others in the river	60	74.1
Others are at greater risk than me when swimming/jumping in the river	55	67.9
The risk of drowning is always in the back of my mind when swimming/jumping in the river	48	59.3
I often feel at risk when swimming/jumping in the river	30	37.0

Perception of Risk

Participants were asked to rate the risk to their life in five scenarios using a 4-point scale of risk from extreme, high, low and no risk. Table 11 shows the dichotomised aggregation of extreme/high risk and low/no risk. Most respondents considered swimming >10m from the bank (82%), falling fully clothed into the river 67% as high risk. Slightly more than half (54%) thought missing your exit point when drifting as high risk, but less than half (41%) considered jumping in from height (>2m) as high risk with a small proportion (10%) perceiving that knee depth standing at the river's edge was high risk.

Table 19. Perception of Drowning Risk in the River

	Extreme / High Risk		Low / No Risk	
	n	%	n	%
Swimming in river more than 10 m from the riverbank	66	81.5	15	18.5
Falling into river fully clothed	54	66.7	27	33.3
Missing the exit point when drifting down river	44	54.3	37	45.7
Jumping into river from height (over 2 m)	33	40.7	48	59.3
Standing in knee depth at river's edge	8	9.9	73	90.1

Females were significantly more likely than males to rate the risk of falling into the river fully clothed extreme or high risk (females 81% vs. males 57%; $\chi 2(1) = 5.063$, $p = 0.024$). Although not statistically significant, females were more likely than males to be risk averse to jumping in the river from height (females, $n = 14$, 44%; males, $n = 19$, 39%) and swimming more than 10 m from riverbank (females, $n = 27$, 84%; males, $n = 39$, 80%). No statistical differences were observed when risk of drowning was analysed by age group.

In a separate question specifically related to respondent perceptions of drowning risk during their aquatic activity on the day of interview at that site, slightly more than half ($n = 42$, 52%) of interviewees believed there were risks associated with their activity.

Swimming and River Safety Knowledge Source

More than one-half (*n* = 46, 57%) of risky river users learnt their river safety knowledge from family/ whaanau/elders (kaumaatua). A further one-fifth (*n* = 14, 17%) gained their knowledge from their school/kura. One person cited a Hamilton Facebook page as a source of knowledge.

Table 20. River Safety Knowledge Source

Knowledge source	*n*	%
I don't have any	7	8.6
Family / whanau / elders (kaumaatua)	46	56.8
Self-taught	6	7.4
From my peers	2	2.5
At school/kura	14	17.3
Other -	6	7.4
Total	81	100.0

Family and whaanau were also the main deliverers for teaching swimming for one-half (*n* = 39, 48%) of participants. Other key sources were commercial swim lessons (*n* = 15, 19%), school/kura (*n* = 13, 16%), and self-taught (*n* = 11, 14%).

Table 21. Teaching Swimming Source

Teaching swimming source	*n*	*%*
I haven't learnt to swim	2	2.5
At commercial swimming lessons	15	18.5
From my family / whaanau	39	48.1
From my peers	1	1.2
I taught myself	11	13.6
School/kura	13	16.0
Total	81	100.0

Experience or Observation of Rescue or Drowning Incidents

More than one-half (*n* = 47, 58%) of river users exhibiting at-risk behaviours have either had, or know of someone who has had, a rescue or a drowning incident. The researchers noted that multiple participants commented that on multiple occasions they had had to save people.

A question was included in the interview to provide further details of rescue incidents. Unfortunately, no responses were included in responses. It is not known whether the answer was too difficult to complete, being free-text, or if participants were unwilling to share their responses.

A separate question asking for any other comments included the following response:

'*Yeah I had to help a 3 year old out cause the parents let it wonder down the bank and nobody was watching her, where was around 90 people at the beach, she could have easily drowned. People need to take care of their kids'* - Wellington Street Beach02/02

Signage

Almost one-half (*n* = 37,46%) of participants had seen signage at the site they were at and one-third (*n* = 27, 33%) could correctly recall a message.

River users at Hamilton Gardens were significantly more likely to recall messages (*n* = 11, 65%) compared to Wellington Street Beach (*n* = 10, 33%), and Swarbrick Landing (*n* = 4, 16%) ($\chi 2(4) = 14.043$, $p = 0.00724$). Participant numbers at Hammond Street Bridge and Braithwaite Jetty were too small to statistically test for significant differences.

Anecdotal Data Gathered from the Researchers

The researchers were asked if they could recall any comments or insights that may assist in explaining behaviours. These have been left verbatim.

'*It's good to see something is being done'* - multiple people mostly at Wellington Street
'*Even expert divers have sometimes not resurfaced*' - Hammond Park
'*It's not us that you should be worried about*' - Swarbrick Landing
'*They say the waters always dangerous when it's low and when it's high, why shouldn't we be swimming*' - Wellington Street Beach
'*Yeah I had to help a 3 year old out cause the parents let it wonder down the bank and nobody was watching her, where was around 90 people at the beach, she could have easily drowned. People need to take care of their kids'* - Wellington Street Beach02/02
'*You see these kids in the water and they can't swim, you know, something needs to be done*'

'*Nah we don't check the bottom before we jump, we know there's rocks there so we don't jump when it's low but when it's high it's alguds'* after me saying have you checked for objects - Swarbrick

'*I've found knives, signs, sticks, all sorts when jumping into the river before'* - Braithwaite

'*Yeah there was 20 of us trying to save this "larger guy" who was Fijian, they just didn't know how strong the currents where and he got pulled out, nothing could be done*'

'*Yeah I don't wanna be empaled miss' and doesn't jump from the tree - after I said have you checked where your jumping, there are objects that can impale you after the storm*' - Swarbrick

Water Safety Suggestions

In an open-ended question seeking suggestions for improving water safety at the site where they were interviewed. The following tables report these suggestions verbatim.

Table 22. Wellington Street Beach Suggestions

Comments
Add solar lights to the area as a lot of Māori like to hang out or walk along the river at night-time
Better signage – people need to be more aware of the risks around the river and how they change with the flow
Big sign visible to everyone on their way to water. Common sense, watching out for everyone's kids
Clean out hazards from underneath the surface
Fix the bridge, it's falling apart and is a risk to kids safety
Fix the jetty, more signage and better placement
Fix the jetty, signs
Get rid of the dock to stop rope jumping off, or chop down all the trees and make people more aware
Having a pontoon. Having something for the pollution that occurs to stop the contamination and there
Having some sort of lifesaver material on the dock
Improve the jetty
Jetty extended across parallel to the beach so people could jump towards beach
Lifeguards on duty
Lifeguards on the weekend. Having nets to stop people from drifting off. Making a river filled pool
Make extension for the board walk, to help create a safer environment

Make a platform for the kids to jump off as dock is slippery. Ladders are needed
Make a safe bombing spot for us
More sandy beaches for people to swim into ~ cove
More signage, better access, warnings of how fast the beach drops off
More signage, make parents aware that they should watch kids. Awareness of currents through school.
More signage. Better access like stairs
Purpose built diving platform, improve access
Put up a Fence to cut if the current and keep people from floating away.
qr code with information of river, any risks of specific day. show Maaori history of river too.
Signage about what to expect for newcomers and what to be mindful of
Signage around for people who don't know. And making sure parents watch their kids
Signs about respecting the water, supervision of children, don't swim when drunk
Signage specific to site, rubbish bins closer
Signage to show how strong the current is everyday, and a stick to show how high the levels are
Signage, water ring
Signs telling parents to supervise kids
The wharf - people have been falling off because there is no grip. Put grip on the rails as well
Warning about the water and what to expect with the currents. Signs to make people aware of risks
Water safety signage

Wellington Street Beach (where the majority of interviews were conducted (42%) elicited the greatest number of suggestions (*n* = 34, 43%), specifically related to infrastructure (e.g. jetty repair, provision of pontoon, clear underwater beneath jetty, barriers around beach area to prevent entering main river current), lifeguard supervision (e.g. lifeguards on duty especially on weekends), signage (e.g. about currents and other hazards, water safety practice such as supervision, no alcohol), and public rescue equipment (e.g. lifebuoys, lifesaving rescue information on deck).

At **Swarbrick Landing** (26% of interviews), respondents made 18 suggestions (23% of responses) for improving water safety with a focus on improved infrastructure (e.g. improved, larger and more accessible non-slip jetty), improved water access (e.g. via riverbank), and improved safety signage (e.g. more safety awareness related signage aimed at children and adults (See Table 23).

Table 23. Swarbrick Landing Suggestions

Comments
Better access to the water I.e. not just jetty
Access
Add a ponton
Better signage, something that grabs attention
Bigger Jetty so less crammed, safer
Clear out rocks under jetty
Education and awareness
Improve the riverbank to make access other than the jetty better
Improving access, safety
Make the deck bigger
More room on the wharf, as slip off a lot on it
Net area
Provide a safe bombing site and flotation, provide rope boundary
Remove the rocks under the water at end of jetty
Sign saying watch out for current
Signage of awareness, for kids and adults
Signs
Water height

Interviewees at the **Hamilton Garden site** (which accounted for 17% of all interviews) respondents made 14 water safety suggestions (18% of responses) that related to infrastructure (e.g. provision of ladders and ropes for water entry and exit), signage (e.g. to warn off drop-offs, rough water currents, underwater hazards), and public rescue equipment (e.g. flotation devices, grab ropes).

Table 24. Hamilton Gardens Suggestions

Comments
Build a jumping construction, stable, in spaces that are safe
Drowning awareness
Have people more knowledgeable of the rivers
Ladder and rope
Ladder on multiple sides and cliff jumping areas. Making people aware to check for objects
Ladder or rope, a gate
Ladders around the site, more signs on the dock
Ladders to get out of water, floatation device to throw to anyone in trouble
Ladders, flotation device for helping people
Put a ladder in, a rope
Sign will rise, and have a designated swimming area
Signs for rough water. Have a designated swimming area
Signs to warn people of drops, ladder for jetty, more rubbish bins, rope to grab for struggling people
Stated that there needs to be more signage around the water. Need there to be more attention around safety

At the **Hammond Park Beach** site (11% of interviews), respondent provided 10 suggestions (13% of all comments) that mirrored previous comments from the other sites regarding infrastructure (e.g. need to demarcate safe swimming area with bouts and ropes, reduce steepness of the riverbank), provide more safety signage especially about water depth and water movement).

Table 25. Hammond Park Beach Suggestions

Comments
Border to keep people from going into the currents or a rope to signal where the currents get strong
Buoys at certain distance from shore to know not to swim past. Remove trees to make beach bigger
General warnings about the sleep banking, water, currents. Make people aware of the under current
Make less steep

More signage
More signage, more noticeable ones
Signage – although most people ignore it!
Signage about the undercurrent and about swimming out into the current when people aren't capable.
Signs about risks of drowning: currents
Warning signs for people who aren’t familiar with the river

Finally, at the **Braithwaite Jetty site** (where fewest interviews - 3%- were conducted because of site closure partway through the interview period) three comments were recorded related to improvements in infrastructure (e.g. repair stairs and provide an exit point).

Table 26. Braithwaite Jetty Suggestions

Comments
Fix stairs; same with Wellington Street. Stairs not low enough
Make an exit point at this site
Make the docks accessible to getting back up, cause have chipping on the wood

Figure 29. Signage Example

3.3 Discussion

This observation and interview part of the study sought to determine the types and extent of drowning risk behaviours on popular recreation sites on the Waikato River by recording actual observations of visitors to the sites. Follow up interviews with those displaying at-risk behaviours were undertaken to provide new knowledge on their river safety attitudes, and self-reported floating and swimming competence. In addition, information on respondents' acquisition of water competency and river safety knowledge was collected, signage recollection, and suggestions for making the sites safer were also elicited.

Following the 175 observations of behaviours at the sites along the Waikato River, 105 interviews were completed to garner information on what may motivate high risk behaviours on the river. One-quarter (23%) of the observed river users had not displayed any at-risk behaviours, so their responses were discarded for this data analysis. It is worth noting that during the time of the study data collection was impeded by inclement weather conditions (unseasonal flooding and cyclone conditions) so fewer observations and interviews were conducted than had been originally estimated.

A significant finding from the observation study is the high level of in-water recreation on the Waikato River. One-half (52%) of all visitors to the sites were observed entering the river. Even more concerning than this was the high proportion of at-risk behaviours observed. More than one-half (51%) of those entering the water were observed jumping in from the edge, one-third (36%) jumping from height, one-tenth (10%) river drifting with no buoyancy, and almost one-half (48%) were wearing inappropriate swimwear. Location (30%), cooling off (25%), and lack of cost (17%) were key reasons people cited for being in the river indicating the river's convenience is a key influencer for participation.

As in other studies of high-risk aquatic recreation of jumping and rock-based fishing (Stanley & Carmine, 2022; Moran, 2013; Moran, 2022), most of those observed in the water (63%), and those observed performing high-risk behaviours such as jumping from the edge (72%), jumping from height (86%), and river drifting without buoyancy (69%), were male. Similarly, more than one-half (61%) of those interviewed after displaying at-risk behaviours were male. Male risk-taking behaviours are reflected in the New Zealand drowning statistics where males comprise 81% of all drowning fatalities from 2018 - 2022 (WSNZ, 2023). Interestingly there were no statistical gender differences in this study from the interviews for perceived risk awareness, perceived swimming and floating competence, and water safety attitudes. This is different to previous findings at other

locations such as beaches and other populations such as older adults or other activity groups such as rock-based fishers (McCool et al., 2008; Stanley & Moran, 2021; Moran, 2022).

Surprisingly, almost two-thirds (61%) of those observed entering the water were aged 14 years or under. Most of those in this age bracket were 13 or 14 years old, without adult supervision, ages not generally accepted as being responsible for themselves or others in and around water. Despite two-thirds of those observed undertaking risky behaviours being in the younger age group, less than one-half (44%) of those risky river users interviewed were 15 years or younger, still a significant proportion of the cohort. This suggests a lack of awareness of personal competency, knowledge, and unsound perceptions of risk and risk assessment capacity that has also been found in other studies (McCool et al, 2009; Moran, 2011; Moran et al., 2016, 2018; Moran & Stanley, 2013). Consideration should be given to targeting this age group for river safety information and water competence in the river.

Wellington Street Beach was the most popular site for both visitors (67%) and in-water river users (59%), as well as at-risk behaviour interviews (37%). Together with Swarbrick Landing, these two sites reported over three-quarters (78%) of all in-water activity, and over two-thirds (69%) of the jumping from height and at-risk interviews. The three sites of Wellington Street Bridge, Swarbrick Landing, and Hammond Park Beach accounted for almost all (91%) of all the river drifting without buoyancy observed. The three sites of Wellington Street Bridge, Swarbrick Landing, and Hamilton Gardens accounted for almost all (90%) of all the interviews following at-risk observations. Priority should be given to these sites when making decisions around safety requirements.

Most at-risk river users are frequent visitors to the Waikato River. More than one-half (58%) have visited more than 20 times and almost one-half (41%) visit daily in summer months. This familiarity may encourage nonchalance for safety around the river. As most visit the river area with the purpose to swim or cool off (57%) or for jumping/manus (31%), there is a clear intent to enter the water. Family (57%) and friends (37%) are the key companions for risky river users, highlighting the importance of these key relationships in encouraging behaviours. Similar findings were found in a previous national study on New Zealand youth (Moran, 2009) where male youth were ten times more likely than females to identify their peers as their key source of water safety knowledge whereas females tended to rely on parents and schools.

In this study, family and whaanau also played a key role in the in teaching the participants to swim (48%) and providing river safety knowledge (57%). The heavy reliance on family and/or friends may not be the best source of knowledge for young people as previous evidence has suggested (Moran, 2009). Knowledge of river safety may not be enough for this cohort to display safe behaviours. One

third (33%) of risky river users could correctly recall safety messages from signage at the location they were observed behaving unsafely. This suggests some, particularly youth, may not be putting safety principles into practice and further research on this phenomenon with regards to aquatic recreation in a river environment is required.

The high reliance on family and whaanau both as companions for risky river activity and as a key source of river safety knowledge and swimming development provides an opportunity for targeted, co-designed family and whaanau education that would encourage river users to positively influence and protect each other. Best practise drowning prevention educational initiatives teach all 15 water competencies recommended for preventing drowning (Stallman et al., 2017; Langendorfer et al., 2018). The 15 competencies are adaptable to the activity (such as bombing) or environment (such as river) and each merits its inclusion based on the evidence provided. Competencies 1–10 are in the practical or psychomotor domain, competencies 11-14 are cognitive or knowledge based, and 15 is in the affective domain (Drowning Prevention Auckland, 2023). The intent of co-designed education would be to ensure that any initiatives would holistically include local knowledge and tikanga, together with river safety and bombing expertise, and covering all 15 water competencies.

The risky river users interviewed were very confident in their perceived swimming and floating competence. One third (33%) believed they could swim more than 200 m in 5 minutes and three-quarters (78%) thought they could float for more than 5 minutes. A previous study (Stanley, 2021) to compare perceived and actual adult water competence found a disconnect between how well participants thought they could swim and float to what they could actually do, especially in open water settings such as a river. Although one-quarter (22%) estimated they could swim more than 200m in 5 minutes and two thirds (71%) thought they could float for more than five minutes, when tested in an open water setting (Stanley, 2021) only one participant (1.6%) could float more than 5 minutes, and none could swim the 200m in 5 minutes. The swimming and floating competence levels perceived by these risky river users are unlikely to transform into reality. This overestimation of competence is likely to be a factor in their propensity to take risks in and around the river.

Despite all of this cohort displaying at-risk behaviours in the river, more than one-half rated the risk to their life *high* or *extreme* for swimming more than 10 m from the riverbank (82%), falling into the river fully clothed (67%), or missing their exit point when river drifting (54%). It seems there are other factors encouraging at-risk behaviours, the knowledge and understanding of the risk alone is not enough to inspire safer behaviours. Further co-designed research is required to ascertain river safety knowledge or maatauranga within the river users and to determine if any connection, or disconnection, with iwi has any effect on behaviours.

In comparison, most risky river users reported unsafe attitudes toward being in the river. Most were happy to rely on their swimming competence to keep them safe (91%), to not wear a lifejacket (82%), and to be able to rescue others (74%). Furthermore, two-thirds (63%) reported not often feeling at risk when swimming or jumping in the river. Unsafe opinions may lead to unsafe behaviours and practices around the river. Previous findings have determined risky attitudes likely to be a predictive factor in drowning among youth (Moran, 2006), older adults (Stanley & Moran, 2021), minority groups (Stanley & Moran, 2018), and beachgoers (Moran, 2010).

3.4 Limitations

The two research methods used in these studies have gathered invaluable new knowledge about the level of risky behaviours on the Waikato River, together with the demographics and influencing factors of those who engage in them. Nevertheless, there are a number of limitations to the studies that should be considered when understanding the results.

First, the weather played an important part in whether there were any visitors to the sites, or whether they were engaging in water-related activities. Unseasonal flooding and cyclones meant there were many days with no visitors. Observations with no visitors were discarded, and no in-water river users meant there were no possible interviews. Additionally, many of the river users were frequent visitors and repeat users were not asked to complete interviews more than once.

Second, observations and subsequent interviews took place between 11.00am – 7.00pm so may not comprehensively capture all usage of the sites. In addition, this phase of the study was confined to six weeks in January-February which again may not have comprehensively capture all usage of the sites.

Third, in the observation study, the high-risk behaviours of visitors may be underreported due to researchers being on-site. To minimise this, one researcher remained as covert as possible during the recording of observation data, but it was still possible that risky behaviours may have been tempered by the presence of someone appearing in some official capacity on the site. Observational research is non-experimental because nothing is manipulated or controlled, and as such we cannot arrive at causal conclusions using this approach. The observational research findings are considered strong in validity because actual behaviours were recorded. However, there are negative aspects.

Fourth, results may only reflect the unique population of river users in the selected sites, and therefore cannot be generalised to other places and populations. Similarly, the interview study has structural bias as it only included those participating risky in water activities on the Waikato River. Results cannot be generalised for the entire population.

Fifth, there may also have been problems with researcher bias in that they may have a motivated perception. Overcoming this bias was covered in the training session and by electronically recording observations.

Sixth and finally, risky river users may not have been willing to participate in an interview, there was no compulsion or expectation to do so. An incentive was offered, and this may have biased the

results, in that only those willing to receive an incentive may have participated. These limitations notwithstanding, the results of these studies are indicative of the high-risk behaviours, demographics, and motivating factors for engaging in at-risk behaviours on the Waikato River.

Figure 30. Jumping at Hamilton Gardens

3.5 Conclusion and Recommendations

To our knowledge, this is the first study of its kind to explore the actual high-risk behaviours of urban river users and investigate the influencing factors on those behaviours.

The results suggest that there is a high level of in-water activity on the Waikato River, and a proclivity for some of the in-water activities to be high-risk. Many of the risky river users were male and young (aged under 15 years), and frequent visitors and users of the river.

Influencing factors for displaying high-risk behaviours are a likely overestimation of swimming and floating competence, an underestimation of risks, and unsafe attitudes toward their behaviours.

Recommendations to encourage safer behaviours and assist in making the activities safer include:

d) HCC to adopt a co-ordination role to actively promote holistic and best-practise river safety education for local communities in collaboration with water safety and river safety experts, and river user or bombing advocates and organisations,
e) Targeting education both to the user demographic and their wider family/ whaanau on the whakapapa of the river, river safety knowledge, how to engage safely, and developing water and river safety competence. This would be especially relevant to the older primary school age group and high school students,
f) Promoting river safety education and advice (via classrooms, workshops, and online) developed in association with water safety experts and river user or bombing advocates for the wider community, and
g) Undertaking/facilitating further co-designed research to ascertain river safety knowledge, maatauranga, and actual water and river competence of the river users.
h) Creating safer environments by addressing infrastructure hazards as indicated by many of the safety suggestions made by respondents, notably safe jetties and better access and exit points,
i) Creating on-site river safety advice including installation of compliant signage and public rescue equipment,

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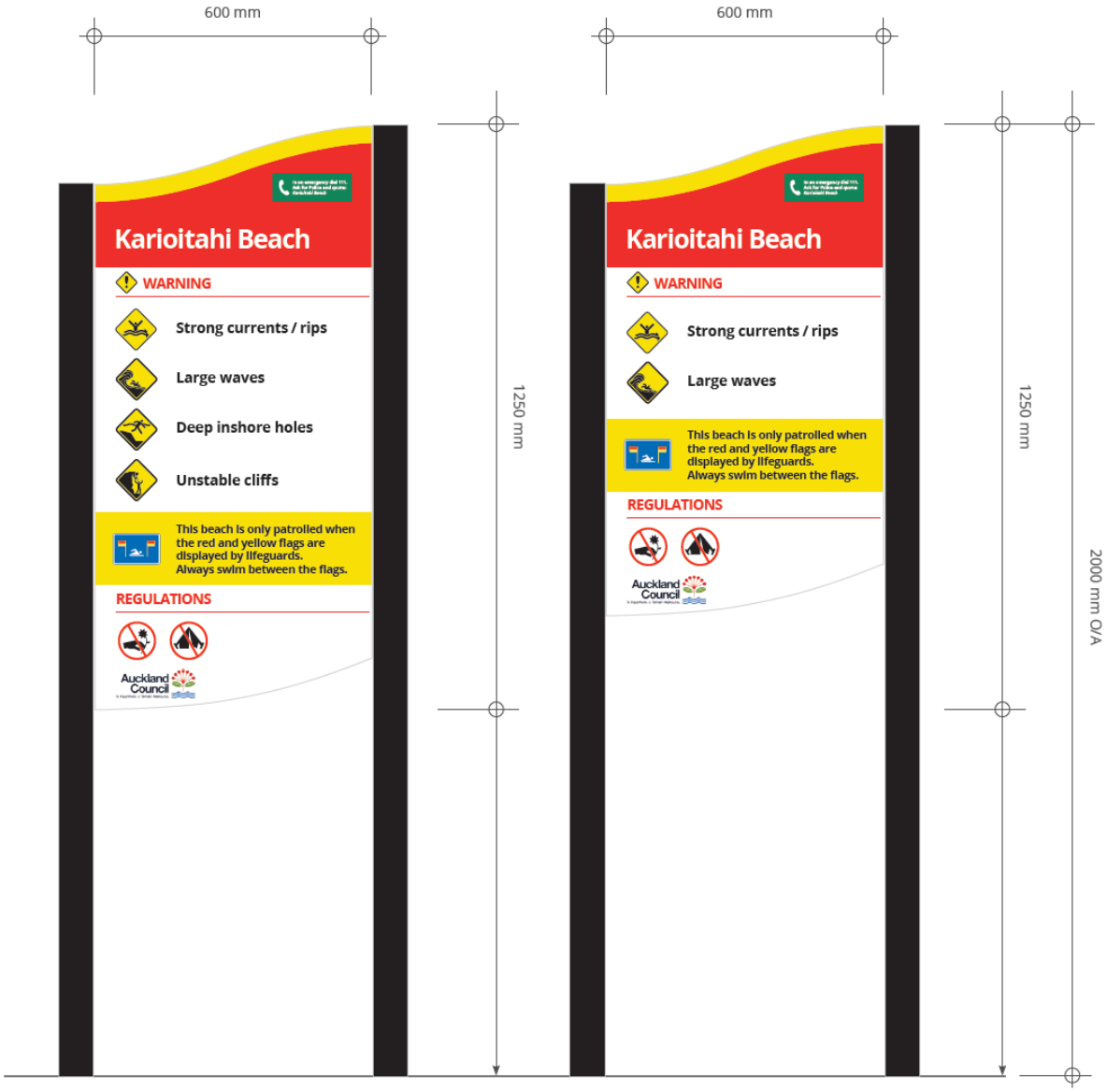
5. Appendices

5.1 Open Access Signage

Open Access sign - to be used for areas where access is not limited to pathways or alternatively for wide pathways.



Sourced from Surf Life Saving New Zealand. (2022). *A guide to beach safety signs in New Zealand.*

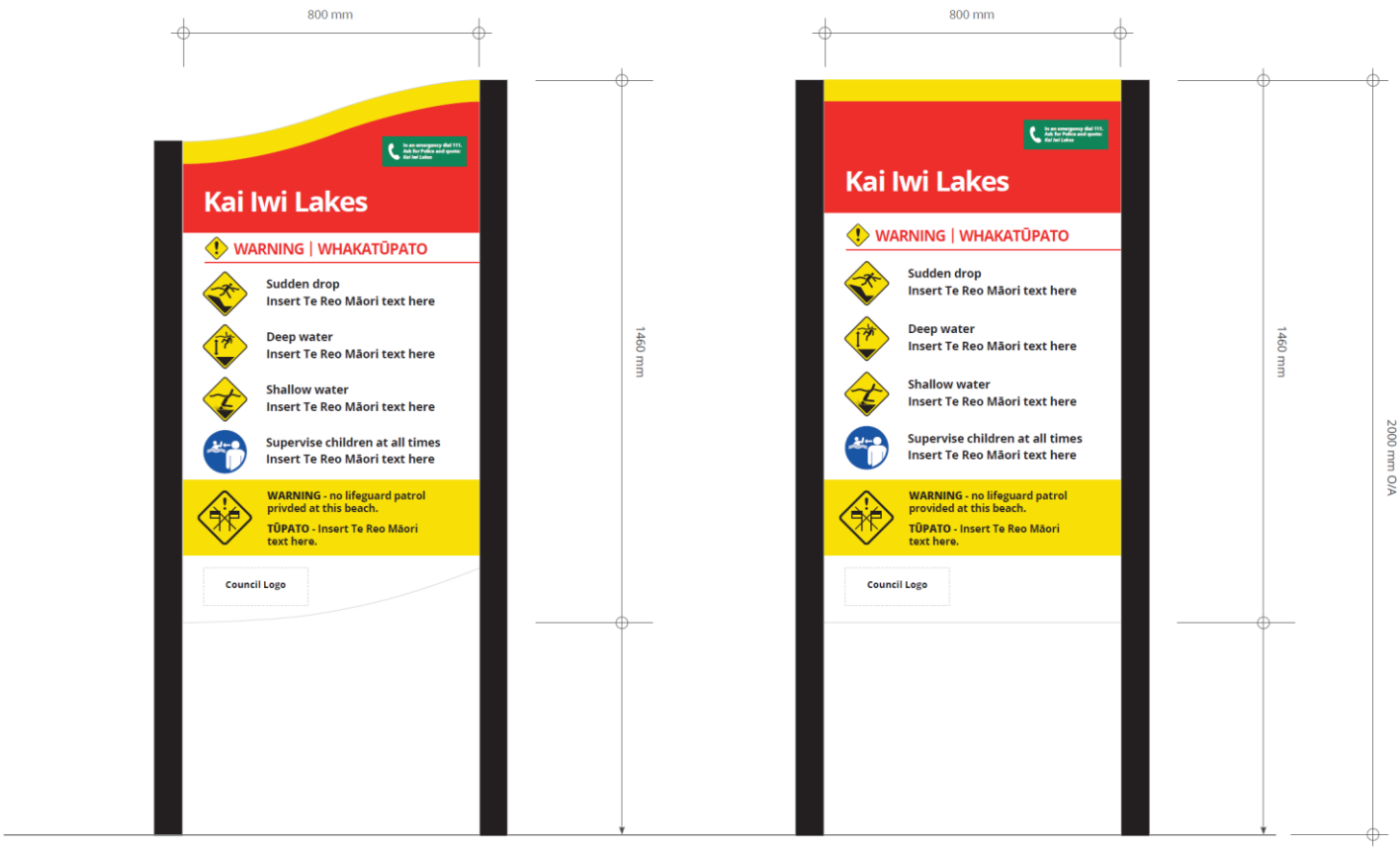
5.2 Narrowed Access Signage

Defined Access sign – for use where access to the area is controlled via a narrow pathway.

Sourced from Surf Life Saving New Zealand. (2022). *A guide to beach safety signs in New Zealand*

5.3 Carpark Signage

Beach Signage / Kai Iwi Lakes / Carpark Sign
English / Te Reo Māori

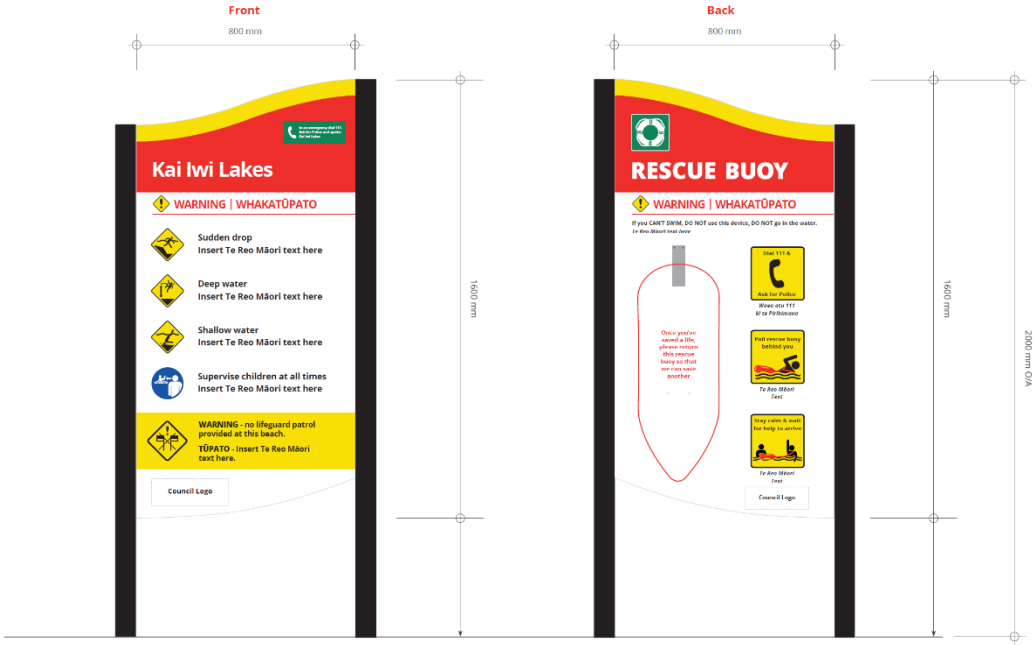


Water safety and information signage template for Kai Iwi Lakes.
The design complies with the current water safety signage standard AS/NZS 2416:2010

Sourced from Surf Life Saving New Zealand. (2022).

5.4 PRE Mounted Signage

Beach Signage / Kai Iwi Lakes / Carpark Sign with PRE on the back
English / Te Reo Māori



Water safety and information signage template for Kai Iwi Lakes.
The design complies with the current water safety signage standard AS/NZS 2416:2010

Beach Signage / Kai Iwi Lakes / PRE sign front & side

Sourced from Surf Life Saving New Zealand. (2022).

5.5 Observation Study Research Instrument

HCC Waikato River Observation Study Jan Feb 2023 NEW

(untitled)

1) Date:*

_____

2) Location:*

( ) Wellington Street Beach

( ) Hamilton Gardens

( ) Swarbrick Landing

( ) Braithwaite Jetty

( ) Hammond Park Beach

( ) Duck Island

3) Time:*

( ) 11.00am

( ) 11.30am

( ) 12.00pm

( ) 12.30pm

( ) 1.00pm

( ) 1.30pm

( ) 2.00pm

( ) 2.30pm

( ) 3.00pm

( ) 3.30pm

( ) 4.00pm

( ) 4.30pm

( ) 5.00pm

( ) 5.30pm

( ) 6.00pm

( ) 6.30pm

( ) 7.00pm

4) Weather Conditions:
*****

( ) Sunny

( ) Cloudy

( ) Windy

( ) Rainy

( ) Stormy

5) Temperature:*

_____

6) Water conditions - tick all that apply:
*****

[ ] Calm

[ ] Rough / Wind chop

[ ] Fuller than normal

[ ] Lower than normal

[ ] Other - Write In: _____

7) Fill in the boxes with your most exact numbers.

	Approx head count in area	**Total in water**	**Number jumping from edge**	**Number jumping from height over 2m**	**Number river drifting using buoyancy**	**Number river drifting - no buoyancy**	**Number wearing inappropriate attire**

Total	_____	_____	_____	_____	_____	_____	_____
Male	_____	_____	_____	_____	_____	_____	_____
Age 0-14 years	_____	_____	_____	_____	_____	_____	_____
Age 15-24 years	_____	_____	_____	_____	_____	_____	_____
Age 24	_____	_____	_____	_____	_____	_____	_____

+ years	_____	_____	_____	_____	_____	_____	_____

8) What other behaviours did you observe at this time? *

[ ] Male youth encouraging risky behaviours

[ ] People being threatened by others to perform risky behaviours

[ ] Consumption of alcohol or other drugs

[ ] People trying to stop risky behaviours

[ ] Adult supervision of young children

[ ] Youth (under 16 years) supervision of young children

[ ] Lack of appropriate adult supervision of young children

[ ] None

[ ] Other - Write In: _____

9) Any other comments?

_____

10) Upload a photo of the area.

_____1

Thank You!

5.6 Interview Study Research Instrument

HCC - Waikato River Interview YE23

Hamilton City Council - Interviews YE23

1) Researcher Only
What risky behaviour/s was the participant seen doing prior to the interview?*

[ ] Pushing others

[ ] Jumping from height

[ ] River drifting

[ ] Not supervising young children adequately

[ ] Presence of alcohol or other drugs

[ ] Encouraging others to perform risky behaviours

[ ] Wearing inappropriate swimwear

[ ] Other - Write In: _____

[ ] No-one was displaying at-risk behaviours

2) What are the positive or safe behaviours displayed by the participant?

_____

3) Date*

_____

4) Location*

( ) Wellington Street Beach

( ) Hamilton Gardens

( ) Swarbrick Landing

( ) Braithwaite Jetty

( ) Hammond Park Beach

( ) Duck Island

5) Are you?*

( ) Male

( ) Female

( ) Other - Write In: _____

6) What age bracket do you fall into?*

( ) 15 years or under

( ) 16 - 19 years

( ) 20 - 24 years

( ) 25 - 34 years

( ) 35 - 44 years

( ) 45 - 54 years

( ) 55 - 64 years

( ) 65+ years

7) What ethnicity/ies do you identify with?*

[ ] NZ European / Pakeha

[ ] Maaori

[ ] Pacific Peoples - Please specify: _____

[ ] Asian - Please specify: _____

[ ] Other - Please specify: _____

8) How often have you visited this location?*

( ) This is my first time

( ) Between 2 - 4 times

( ) Between 6 - 10 times

( ) Between 11 - 20 times

( ) More than 20 times

9) What is the main reason for visiting this location today?*

( ) Manu / jumping

( ) Swimming

( ) River drifting

( ) Other - Write In (Required): _____*

10) Who did you come with today?*

( ) My mates/ friends

( ) My family / whanau

( ) My partner

( ) Myself

( ) Other - Write In (Required): _____*

11) In summer months, how often do you this or other sites along the Waikato River?*

( ) Daily

( ) Once a week

( ) A few times per week

( ) Less often

12) What is you favourite thing about this river?*

( ) It's close to where I live

( ) It's free

( ) It's cool

( ) It's exciting

( ) Other - Write In (Required): _____*

13) Can you swim?*

( ) Yes

( ) No

14) How well can you swim?*

( ) Poor

( ) Fair

( ) Good

( ) Very good

15) How far can you swim non-stop in 5 minutes? (25m = 1 length of a pool) *

( ) Less than 25m

( ) 26 - 50m

( ) 51 - 100m

( ) 101 - 200m

( ) More than 200m

16) Can you float?*

( ) Yes

( ) No

17) How well can you float?*

( ) Poor

( ) Fair

( ) Good

( ) Very good

18) How long can you float for?

( ) Less than 30 seconds

( ) 31 seconds - 1 minute

( ) 1 minute - 3 minutes

( ) 3 minutes - 5 minutes

( ) More than 5 minutes

19) Tick the box that best reflects your opinion on the following statements:*

	Agree	**Disagree**

My swimming competence will keep me safe when swimming in the river.	( )	( )
Others are at greater risk than me when swimming/jumping in the river.	( )	( )
My swimming competence means I don't need to wear a lifejacket in the river.	( )	( )
I often feel at risk when swimming/jumping in the river.	( )	( )
My swimming competence means I am capable of rescuing others in the river.	( )	( )
The risk of drowning is always in the back of my mind when swimming/jumping in the river.	( )	( )

20) Rate the risk to your life in the following situations:*

	Extreme risk	**High risk**	**Slight risk**	**No risk**
Standing in knee depth at river's edge	( )	( )	( )	( )
Missing your exit point when drifting down river	( )	( )	( )	( )
Jumping into the river from height (over 2m)	( )	( )	( )	( )
Falling into the river fully clothed	( )	( )	( )	( )
Swimming in the river more than 10m from the river bank	( )	( )	( )	( )

21) Why are you in the water today? Tick all that apply*

[ ] It's hot and the water looked inviting

[ ] It's more fun than the local pools

[ ] I can't afford the local pools

[ ] I don't like swimming at the beach

[ ] There's no reason not to

[ ] My friends/peers encouraged me to

[ ] Other - Write In (Required): _____*

22) Where did you learn your river safety knowledge or tikanga around the river? Give an example of your knowledge/tikanga in the comments box*

( ) I don't have any

( ) From family / kaumaatua (elders)

( ) From family / whanau (siblings/parents)

( ) From my peers

( ) At school

( ) Other - Write In (Required): _____*

Comments:

23) Where did you learn to swim?*

( ) I haven't learnt to swim

( ) At commercial swimming lessons

( ) From my family / whanau

( ) From my peers

( ) I taught myself

( ) Other - Write In (Required): _____*

24) Signage

	Yes	**No**

Have you seen any water safety signage?	( )	( )
Do you recall any of the messages?	( )	( )
What is your key recall of any message of the signage. Researcher write in comments section below.	( )	( )

Comments:

25) Do you think there are any risks associated with your activity in or on the river today? What are they? Researcher, please explain in the comment box.*

( ) Yes

( ) No

Comments:

26) Have you or anyone you know of had a rescue or drowning incident on the river?*

( ) Yes

( ) No

27) Please explain what happened.

_____

28) Do you have suggestions that would make this site safer for aquatic recreation?

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29) If you would like to enter a draw to win a prize for taking part in this interview please scan the QR code to enter the draw

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Thank You!