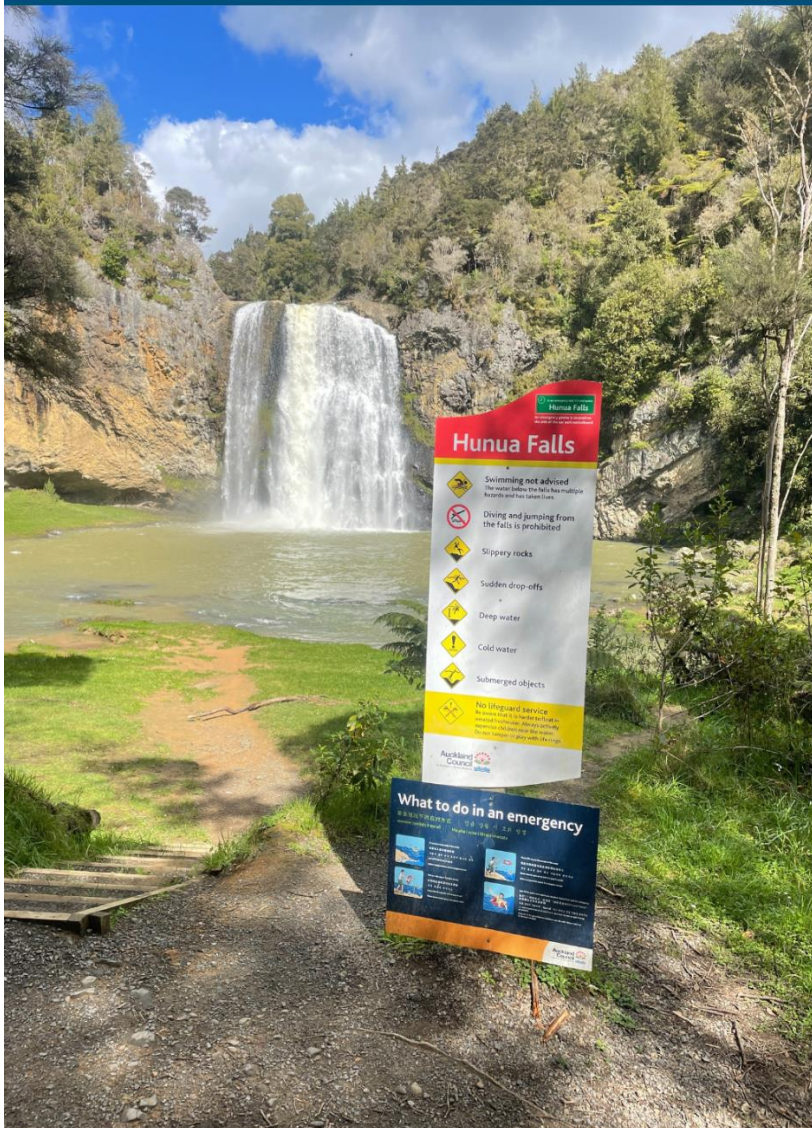


Hūnua Falls Water Safety Report

OCTOBER 2022



Preface and Acknowledgements

This report is an evaluation of the 2021-2022 Hūnua Water Safety Project developed by the Auckland Council, YMCA North, and Drowning Prevention Auckland (DPA). It reports on the third year of the initiative. Many individuals and organisations have been involved with keeping those visiting the beautiful Hūnua Falls safe.

We would like to thank Lynette Penrose and the iwi of Ngāi Tai ki Tāmaki and Auckland Council as landowners for allowing us to undertake the initiative. Acknowledgement also to the Franklin Local Board for funding.

The project was coordinated by personnel from the three organisations above. Key contributors DPA were Jo Macmillan, Ants Lowe, Tom Kearney, and Teresa Stanley. Key people involved from Auckland Council were Stuart Leighton, Bronwen Lehmann, and Trent Taylor. Dave Lockwood from YMCA North led and coordinated the Water Safety Advisor Team of Athena Bond, Harry Atkinson, Hayley Ware, Drew Hepburn, Sean Hancock, Lily Lockwood, Kainganoho Marino, Scott McCulloch, Teagan Smithson, Stephanie Deeny, Reegan Wheeler, Pierre Backmoore, and Nathan Palmer.

In addition, DPA was approached by Auckland Council to conduct an aquatic signage review to recommend improvements to existing signage within the Hūnua Falls site. Josh Carmine from DPA completed this chapter (3.2), after Josh and Ants Lowe visited the Hūnua Falls to review the sites current signage. Thanks also to Dave Lockwood from YMCA North, Bronwen Lehmann, and Kurt Cordice from the Global Swimming Project for their input to this report.

Report Prepared by:

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Suggested Reference:

Stanley, T. & Carmine, J. (2022). *Hūnua Falls Water Safety and Signage Report, October 2022*. Report prepared for Auckland Council and the Hūnua Falls Water Safety Project Team.

Executive Summary

Hūnua Falls is located in the western part of Hūnua Ranges Regional Park. This site hosts a 30-metre waterfall and large picnic areas with large numbers visiting this site. Car counter data shows over 367,000 cars visited this area over 2021. This figure represents the number of cars through the gate only, so is expected to be a very conservative figure.

YMCA North, Auckland Council, and Drowning Prevention Auckland (DPA) collaborated to run a water safety project providing Water Safety Advisers at the Hūnua Falls in the 2020-2021 summer period advising about on-site risks at Hūnua and recommended safe behaviours, and gathering data to inform further education and water safety initiatives. Three studies were completed in this summer period.

The first study involved the Water Safety Advisers recording visitor head counts when based at the Hūnua Falls entrance/carpark. Approximately 19,128 visitors were recoded from a total of 16,021 visits. Secondly, a signage study and an aquatic signage report was undertaken to provide Auckland Council with their request of clear guidelines for improvement of signage at Hūnua. Advisers collected data around signage from visitors and Drowning Prevention Auckland undertook a signage audit. Seventy-one visitors to Hūnua Falls were interviewed, approximately two-thirds of people indicated they had read the signage at each of the locations, and almost all visitors (92%, n = 65) could recall at least one water safety message from the signs. The report recommended additional fixed signage at the toilet block signage shelter, new digital signage in the main carpark/main signage, and the removal of other signage. All signage should be compliant to the A/NZ Standards for Water Safety Signage 2416. Finally, an observational study of visitors' behaviours when visiting Hūnua Falls was completed to report on the actual behaviours of visitors to Hūnua Falls, as opposed to their perceptions, and intended behaviours. The Advisers counted 4,545 visitors in 168 observations in the Hūnua Falls area. One-fifth (20%, n = 907) of visitors in the pools area entered the water. Of these, over one-half (60%, n = 544) were wading in the shallow pool and over one-third (36%, n = 330) were observed in the deep pool swimming or floating. Less than one-tenth (8%, n = 76) were seen jumping from the edge and a small number seen jumping from a height of over 2m (3%, n = 31). Most observations (89%, n = 68) of visitors jumping from the edge were male, and all jumpers (100%, n = 31) from a height of over two metres were male. Signage and education messages around the need for constant adult supervision should be considered to assist in the safety of young children around the Falls area. Supervision should include the requirement for close proximity. In addition, messages regarding the dangers of jumping from height targeting youth aged 15-24 years and the dangers of swimming close to or behind waterfall should be considered.

The public rescue equipment (PRE), installed in 2013, was part of wider PRE research, trialing the smaller sized life ring that may be better suited for the Hūnua Falls environment.

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1. Introduction

In 2021 there was a one-third (34%) increase of visitors to Hūnua Falls to 367,000 visitors. It is now the second most visited park in the Southern network

YMCA North, Auckland Council and Drowning Prevention Auckland (DPA) collaborated to run a water safety project providing Water Safety Advisers at the Hūnua Falls in the 2019-2020 and 2020-2021 summer period advising about on-site risks at Hūnua and recommended safe behaviours.

The Advisers also surveyed visitors to understand public's perception. Adult visitors to the Hūnua Falls were asked to complete an anonymous electronic survey about their reasons for visiting Hūnua Falls, perceptions of their water competencies and risk of drowning.

The inclusion of a hazard pin for Hūnua Falls was also established on the Auckland Council Safeswim platform in December 2020. The inclusion of the Hūnua pin on the Safeswim website (<https://www.safeswim.org.nz/>) provided a real opportunity to change behaviours. Two-thirds of those who accessed the site reported changing their actions at Hūnua.

Public rescue equipment (PRE) and water safety signage was installed in 2013 and has been in place at Hūnua for nine years. In the 2021-2022 year, the project was part of wider PRE research, trialing the smaller sized life ring that may be better suited for the Hūnua Falls environment. The day before the Water Safety Advisers started for the summer period an eight-year-old child was rescued with the PRE on site.

The 2020-2021 Hūnua Falls Water Safety Project Report recommended completing an observational study of visitors' behaviours when visiting Hūnua Falls for the coming season. This study would replace the electronic survey completed by the Hūnua Water Safety Advisers in the previous two seasons. The observational study will report on the actual behaviours of visitors to Hūnua Falls, as opposed to their perceptions, and intended behaviours.

In addition to this, Auckland Council requested clear guidelines for improvement of signage at Hūnua. The project team agreed to add Adviser time to the collection of data around signage. This will include interviewing visitors in regard to signage.

Finally, when based at the Hūnua Falls entrance/carpark the Advisers recorded visitor head counts.

Water Safety Advisers:

Water Safety Advisers were present at Hūnua Falls from 20 December 2021 to 7 February 2022, from 11.00am to 6.00pm, working a split cross-over shift every day except Christmas Day.

Adviser One work times will be from 10.30am – 4.00pm (30 mins lunch)

Adviser Two from 12.30 – 6.00pm (30 minutes lunch)

Adviser One day structured as follows:

10.30 – 12.30pm Hūnua Falls entrance/carpark

12.30 – 1.00pm lunch break

1.00 – 3.00pm observation research at Hūnua Falls pool, 'in cognito' at the Falls observing and collecting behavioural data

3.00 – 4.00pm Hūnua Falls entrance/carpark

Adviser Two day structured as follows:

12.30 – 3.00pm Hūnua Falls entrance/carpark

3.00 – 3.30pm lunch break

3.30 – 4.00pm interview the last visitors to enter pools area regarding signage.

4.00 – 6.00pm based at the Hūnua Falls entrance/carpark.

The Water Safety Advisers attended a full day of training completed by Drowning Prevention Auckland, held at Vector Wero. The training included information about hazards on the site and how to keep themselves safe, how to respond in an emergency, practical water safety, and how to undertake the research.

2. Visitor Numbers

2.1 Background

To enable the project team to have a better idea of visitor numbers in the Falls area, they decided to complete an electronic head count for each group of visitors to the Hūnua Falls area.

2.2 Methodology

When rostered at the Hūnua Falls carpark, the Advisers recorded visitor head counts of people entering the tracks to the Falls using the following survey link.

<https://survey.alchemer.com/s3/6656267/Hunua-Falls-Visitor-Head-Count-2021-2022> (Appendix 1)

Each group and the number per group was recorded. The exact number per group was recorded from 1-10, and approximated thereafter as 11-15, 16-20, 21-25, 26-30, and over 31.

2.3 Results

A total of 6,021 visits were recorded. The visits were fairly evenly spread throughout the day, with approximately one-third recorded each between 10.30am-12.30pm (33%, n = 1,847), 12.30-2.30pm (31%, n = 1,717), and 2.30-4.30pm (28%, n = 1,564). Less than one-tenth were recorded after 4.30pm (4.30-6.00pm 8%, n = 460).

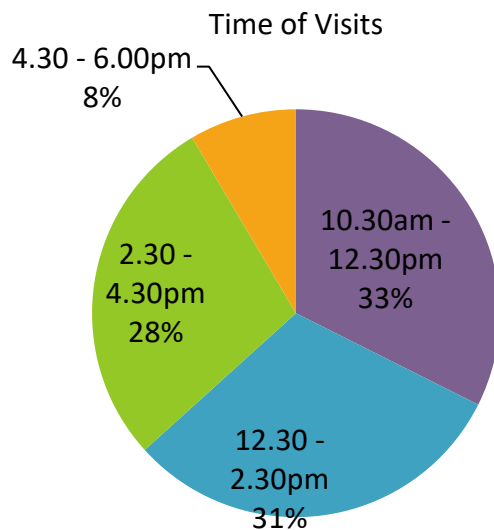


Figure 1 Time of Visits

Around 19,128 visitors were recorded entering the Hūnua Falls area while the Water Safety Advisers were in place. Three-quarters (72%, n = 4,343) of the visits and over one-half of the visitors (62%, n = 11,880) were in groups of two (38% visits, 24% visitors), three (19% visits, 18% visitors), or four (17% visits, 22% visitors). There were 676 solo visitors, accounting for one-tenth (11%) of all visits and 4% of all visitors. Sixty-seven groups of 11 or more people (1% of all visits) accounted for 6% of visitors.

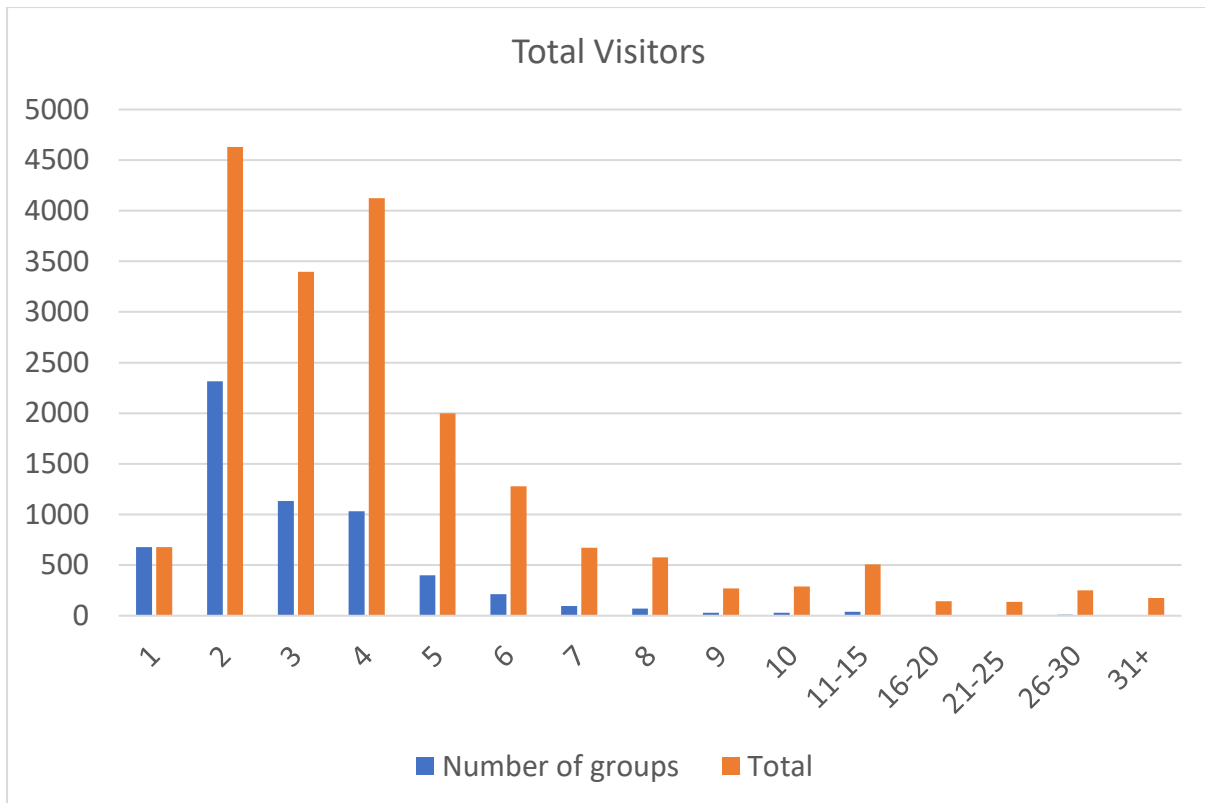


Figure 2 Total Visitors

2.4 Discussion

Car counter data shows over 367,000 cars visited this area over 2021. This figure represents the number of cars through the gate, so it is expected that the total number of visitors to the site to be considerably higher. In addition, neither pedestrian access nor access throughout the lockdown periods were counted, so this number is considered to be a very conservative figure.

Over 19,000 visitors were recorded from over 6,000 visits of people entering the Hūnua Falls area while the Water Safety Advisors were working, perhaps five percent of the total annual visitors. Most of the visitors arrived in small groups of two to four (72%). One per cent of all visits arrived in groups of 11 or more people and accounted for 6% of visitors. These larger groups were more likely to stay for a longer period enjoying a picnic or other social activities.

There was no single popular time for visits, they were fairly evenly spread throughout the day, with approximately one-third recorded each between late morning (10.30am-12.30pm), early afternoon (12.30-2.30pm, and late afternoon (2.30-4.30pm). Late afternoon/early evening proved a less popular time for visitors. Although there may have been visitors, no visitors were recorded after the Water Safety Advisors finished their shifts at 6.30pm.

2.5 Conclusions and Recommendations

Further initiatives involving the Water Safety Advisors should be on-site at least between 10.30am and 4.30pm to enable interaction with the majority of visitors. The use of CCTV cameras would assist in providing information about visitor numbers after 6.30pm and before 10.30am.

Investigation into the car counting data could provide further clarification regarding visitors outside of daylight hours.

3. Signage

Auckland Council requested clear guidelines for improvement of signage at Hūnua. The project team agreed to add Adviser time to the collection of data from visitors around signage in the form of interviews. This study is covered in 3.1. Additionally, Auckland Council requested a professional analysis of improvement to current aquatic signage from Drowning Prevention Auckland (3.2). Both studies are used to provide the recommendations for signage improvement at the end of this chapter (3.4).

3.1 Visitor Recall of Signage

3.1.1 Background

As part of feedback to Auckland Council regarding the effectiveness of current signage, the project team agreed to source information on visitor behaviours and recall of current signage. This study involved interviewing visitors in regard to whether they had seen or read any signage, and what they could recall.

Research Question: What do visitors recall from signage at Hūnua Falls?

Study Design

The study is implemented to provide Auckland Council with direction about future signage at Hūnua Falls. The design of the study is interviews completed by Water Safety Advisers. It involved the Adviser selecting the most recent visitor to enter the Falls area and requesting them to be part of an interview about signage.

3.1.2 Methodology

Water Safety Advisers, present at Hūnua Falls from 20 December 2021 to 7 February 2022, collated data from interviews with visitors about signage. The Advisers were present from 10.30am to 6.00pm, working a split cross-over shift every day except Christmas Day.

From 3.30-4.00pm, after their lunch break, Advisor Two went to the Falls area to interview the most recent visitor/s about their behaviour and recall of the signage using the following link. Advisers attempted collect two interviews per day. Allowing for days when there may be no visitors, the expectation was a minimum of 50 interviews (in practise should be closer to 80-90).

1. <https://survey.alchemer.com/s3/6645845/Hunua-Falls-Signage-Interview-2021-2022>
(Appendix 2)

3.1.3 Limitations: Behaviours of visitors may be subjected to change due to the Water Safety Advisers being on-site. Recognising a safety issue, visitors may be more inclined to read safety signage.

Ethical Protocols

An ethical committee review is not 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 will be completed using the following protocols:

2. Anonymity – behaviours reported will not be identifiable to any one individual.
3. Confidentiality – in the course of recording behaviours, Water Safety Advisers will not disclose behaviours or comments of individual people.

4. Respect for People – all people will be treated with respect.
5. Māori and ethical considerations - Ngāi Tai ki Tāmaki are tangata whenua and the top of the Falls and half of the bottom of the pool have been gifted back to them. Auckland Council remains as the land manager. Ngāi Tai ki Tāmaki have been consulted and are supportive of the research.
6. 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.
7. 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 Hūnua 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. Water Safety Advisers should be coached in their response to this.
 - Concern from Water Safety Advisers monitoring risky behaviour that could compromise safety of individuals being monitored.
 - Water Safety Advisers present during a drowning incident.
8. Integrity – the Water Safety Advisers will collect honest and actual data and the information will be analysed in a careful and rigorous manner.
9. Diversity – the Water Safety Advisers will understand, respect and make due allowance for diversity among participants and their communities.
10. Conflict of Interest – perceived, potential, or actual conflicts of interest will be noted. Any conflict of interest will be minimised.

Requirements:

- A second iPad and an electronic method of collecting data developed for signage interview
- Hūnua Water Safety Advisers – one-half hour adviser time for interview study
- Contact card for Advisers to hand out to prospective interviewees.
- Training information developed, included, and shared in the Water Safety Adviser training
- YMCA North management of Hūnua Water Safety Advisers
- DPA commitment and time to oversee the study, develop the methodology analyse the data, and complete the research report.

3.1.4 Results

Seventy-one visitors to Hūnua Falls were interviewed to seek information on their recall of water safety messages and their thoughts about improving signage at Hūnua Falls.

Visitor Frequency

For almost one-half of visitors (42%, n = 30) were first-time visitors to Hūnua Falls. Slightly less (39%, n = 28) had visited up to five times. Almost one-fifth of visitors (18%, n = 13) are regular visitors attending the Falls more than five times.

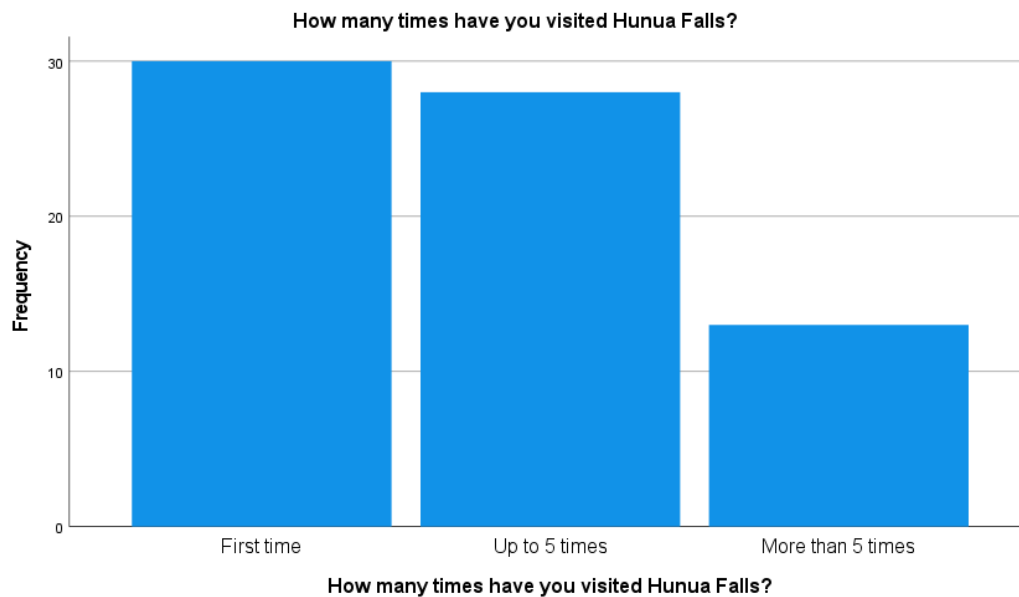


Figure 3 Signage Interviewee Visitation

Signage Readership

Signage is located at three sites at Hūnua; the carpark, entrance to the tracks, and in the Falls area.

Approximately two-thirds of people indicated they had read the signage at each of the locations; track entrance (65%, n = 46), and Falls area (66%, n = 47), and slightly less at the carpark (61%, n = 43). Conversely, almost one-third of visitors indicated they had not read any of the signage; track entrance (28%, n = 20), and Falls area (28%, n = 20), and slightly less at the carpark (32%, n = 23). A small number at each location responded that they had read other signage apart from the water safety information; carpark (7%, n = 5), track entrance (7%, n = 5), and Falls area (6%, n = 4).

There was no statistical correlation between those who indicated they had read any of the three signs and how often they had visited Hūnua Falls.

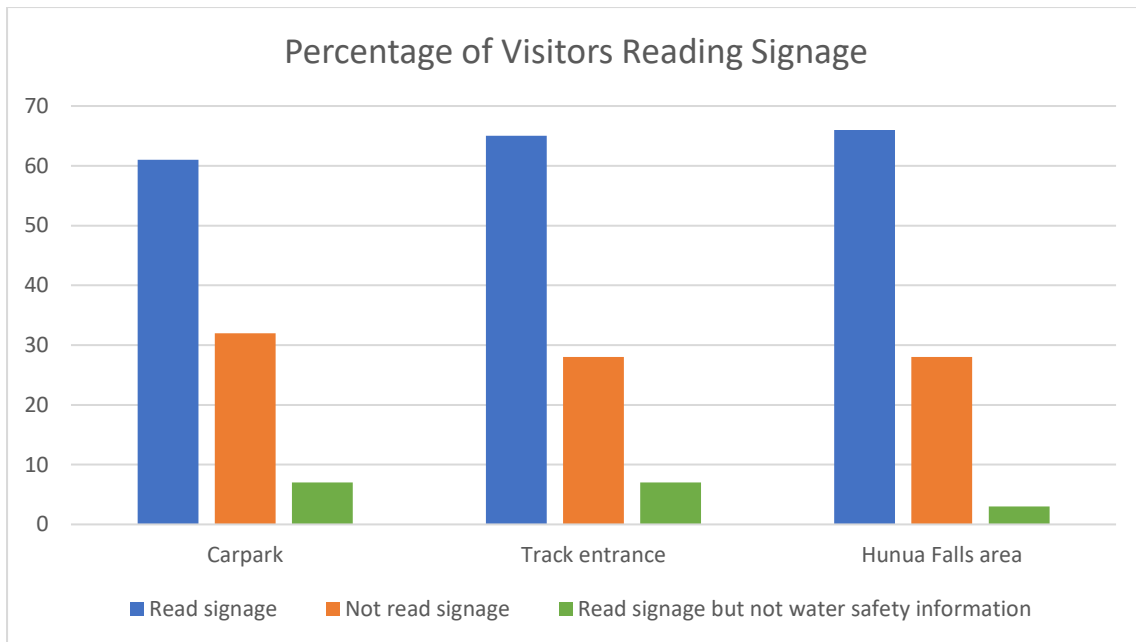


Figure 4 Signage Interviewee Sign Readership

Recall of Water Safety Information

Without prompting, visitors were asked to recall any safety messages they had read on the signage. Despite only two-thirds responding they had read the signage, almost all visitors (92%, n = 65) could recall at least one water safety message form the signs. Less than ten percent of visitors could not recall a message (95, n = 6).

Readership and recall of signage has improved since 2014 (Auckland Council, 2014) where only 58% of visitors indicated they read the signs and only 51% of visitors could recall a message.

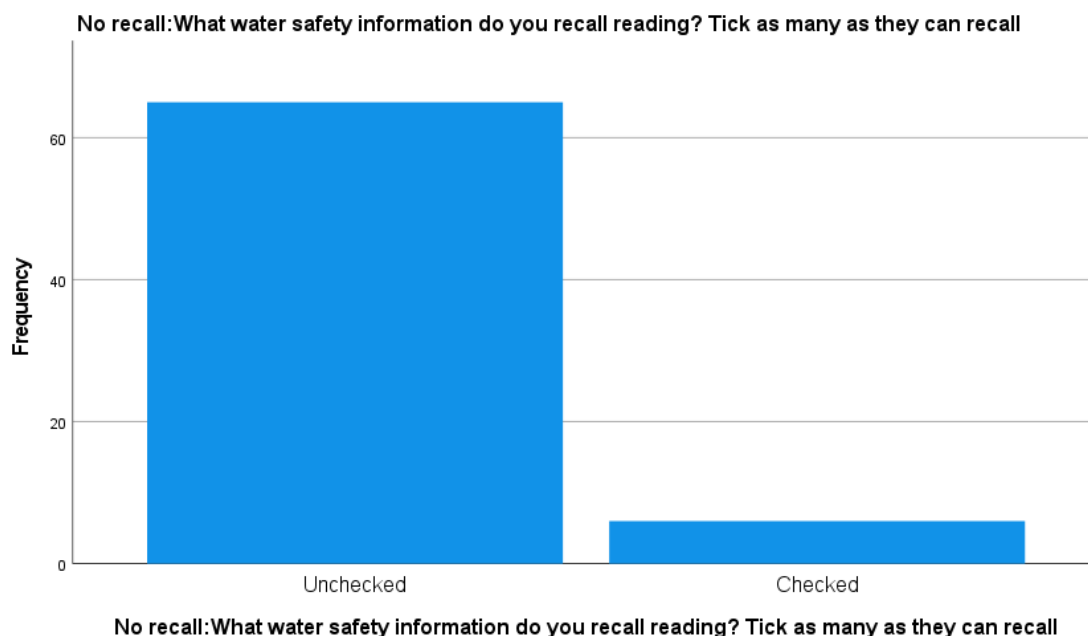


Figure 5 Signage Interviewee Recall of Messaging

A total of 174 messages were recalled from the 71 interviews, an average of 2.7 per person for the 65 who could recall a message.

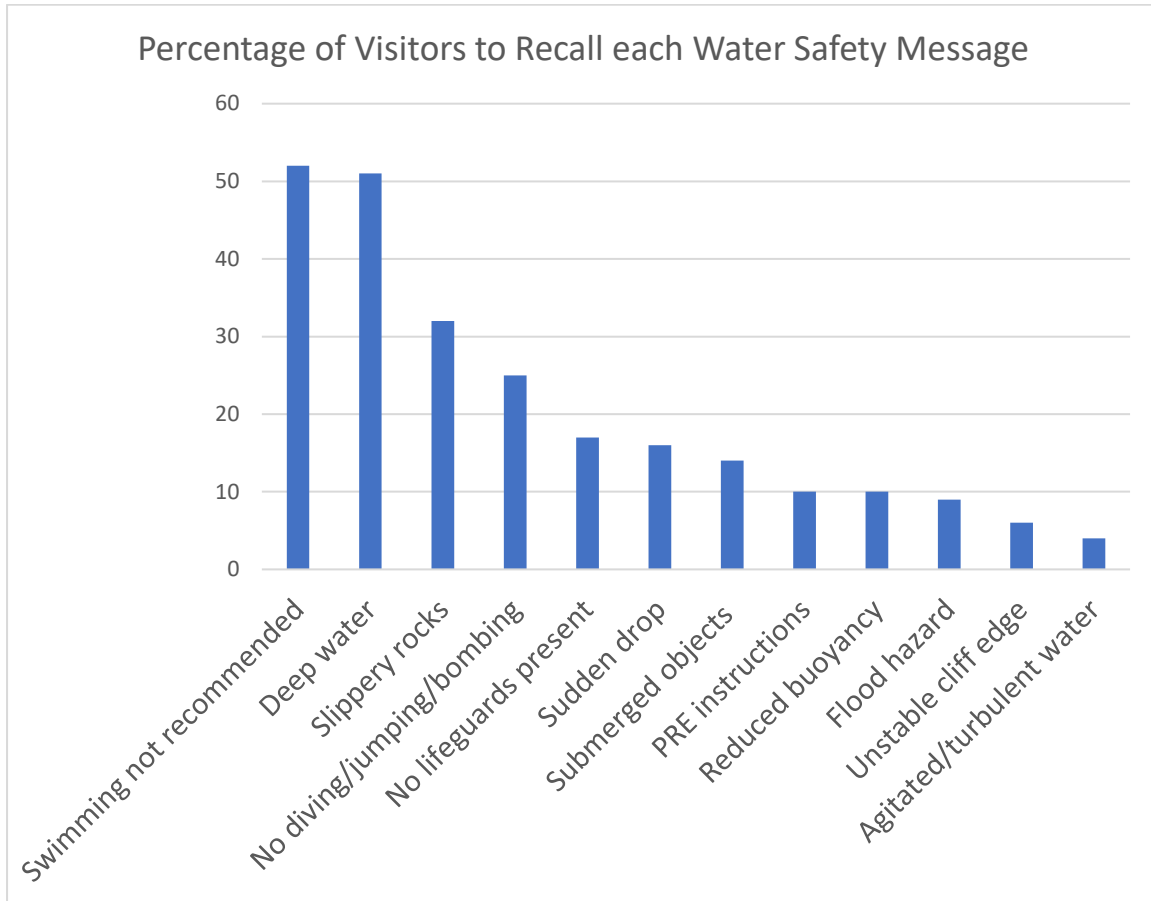


Figure 6 Signage Interviewee Percentage Recall of Messaging

Over one-half could recall messages about swimming not being recommended (52%, n = 37) and deep water (51%, n = 36). One-third (32%, n = 23) recalled slippery rocks and one-quarter (25%, n = 18) recalled information about no diving, jumping, or bombing. Less than a fifth of visitors could recall signage about there being no lifeguards (17%, n = 12), sudden drops (16%, n = 1), or submerged objects (14%, n = 10). Less than one-tenth could recall reading about PRE instructions (10%, n = 7), reduced buoyancy (10%, n = 7), flood hazards (9%, n = 6), unstable cliff edges (6%, n = 4), and agitated or turbulent water (4%, n = 3).

There was no association between any of the messages recalled and how many times people had visited the Falls.

Visitors who had read only the carpark signage or who had read no signage were significantly more likely to have no recall of water safety information from the signs. All those who had read the track or fall area signage, or a mixture of two or three signs, could recall at least one message (100% vs. 75% (carpark only sign) and 44% (read no signage); $\chi^2(5) = 32.582, p \leq 0.001$).

Respondent Recommendations for Signage

Visitors were asked to provide any suggestions that would make the signage more appealing to read. Most respondents indicated that there was nothing to improve or that they were already good (36%, n = 25). Just over one-quarter (27%, n = 19) suggested the signs are bigger, brighter, or more pictorial for non-English readers, and almost one-fifth (17%, n = 12) suggested a change in location, closer to the water, or increasing the number of signs.

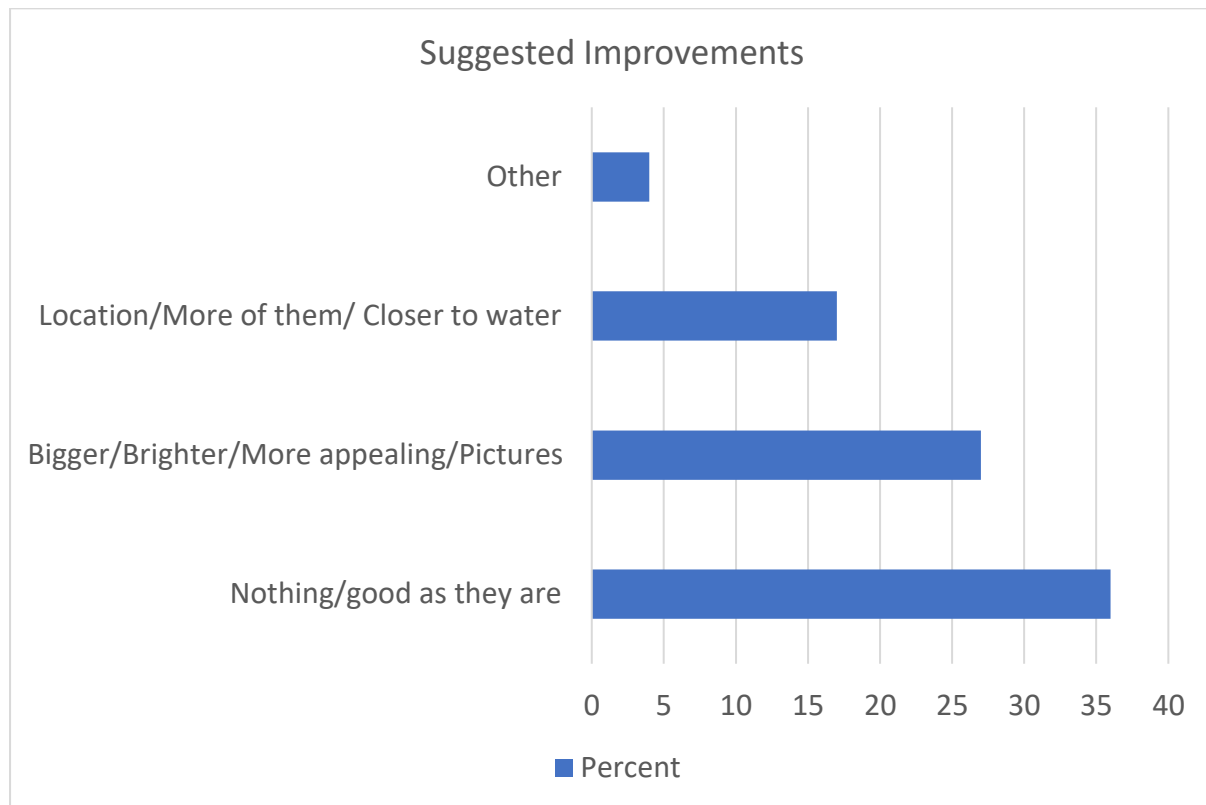


Figure 7 Signage Interviewee Suggestions

3.1.5 Discussion

Approximately two-thirds of people indicated they had read the signage at each of the three locations. This is up slightly when compared with previous research completed in 2014 (Auckland Council, 2014). Almost one-third of visitors indicated they had not read any of the signage, up from 15% in 2014. In the present study the number of previous visits to Hūnua Falls made no difference to readership of signs.

There are many water safety hazards that are included on the signage, and at least twelve hazards that are a danger at Hūnua Falls. Visitors recalled an average of 2.7 messages without being prompted. While nowhere close to the possible twelve, it does show a reasonable recall of the hazards included in the signage. Not surprisingly, those who had read the water safety signage were more able to recall the messages. More than one-half of the visitors interviewed could recall about swimming not being recommended and deep water, probably two of the most important messages to recall. Recall of messaging in this study is higher than in the 2014 study (Auckland Council, 2014) where only one-half of respondents could recall a message from the signage. Additional and compliant signage has been erected since 2014 which may account for the improved recall. In this study almost all of those interviewed could recall a safety message.

Over one-third of visitors responded that the signage needed no improvement. However, almost one-half of visitors had recommendations. The recommendations were grouped in either changing the location or making the signage more appealing. Individual comments are included in Appendix I.

Many comments suggested the signage is located closer to the pools where people sit, as they tend to go straight to that location. Flooding that occurs at Hūnua Falls limits the placement of signage close to the pools. Current signage is monitored after rain for any damage.

Although numerous respondents suggested the signs should be made more appealing by increasing size, making brighter, or having pictures instead of words, it is important that all signage is compliant to the Australia Standards and New Zealand Standards 2416 Water safety signs and beach safety flags standards. These signs standardise messaging across all aquatic environments, making it easier for people to understand specific hazards and to each area and comply to the recommendations.

3.2 Drowning Prevention Auckland Aquatic Signage Report

3.2.1 Introduction

Auckland Council approached Drowning Prevention Auckland to conduct an aquatic signage review to recommend improvements to existing signage within the Hūnua Falls site.

The purpose of this assessment is to provide recommendations to address the existing and future signage for the site.

The recommendations in this assessment should be considered by the Auckland Council to inform the public of such hazards and appropriate actions to minimise the associated risks at this site. Drowning Prevention Auckland shall not be liable for the implementation, or lack thereof, of such recommendations.

Current aquatic signage is located in four areas: the main carpark, all along the Western Bay track entrance, on the Eastern side on the waterhole, and on the Western side of the waterhole.

The current signage consists of a multitude of warnings, history, underwater topography, and swimming safety signage that is spread around the location on multiple tracks, viewing areas and signage stations at the falls site.

In its current observed state, Hūnua Falls currently has three life rings on site for emergency use with locations spread around the 50 m x 80 m waterhole at the base of the falls with a run-off stream running north from the falls.

This site is currently on the SafeSwim website which recommends 'Swimming not advised due to a number of drownings at this site.'

3.2.2 Methodology

Josh Carmine and Ants Lowe from Drowning Prevention Auckland (DPA) visited the Hūnua Falls site on 8 September 2022, to review the site's current signage.

Josh and Ants were accompanied by Dave Lockwood - Kaiwhakahaere Akoranga Tū-ā-nuku, YMCA North. Dave provided great user insight into local recreational use of the site as well as historical backgrounds and flooding information of the site.

Josh also consulted Bronwen Lehmann - Senior Ranger Recreation & Education, Auckland Council - Southern Regional Parks, to provide further context to this assessment and to provide further insight into digital signage and the parks history. Kurt Cordice from the Global Swimming Project was also consulted around the provision of multi-lingual signage.

A site safety induction was completed during the site assessment walk. The history and future of Hūnua Falls was discussed to provide context to the site assessment.

3.2.3 Limitations

There are no limitations to be noted within this report. The site was comprehensively covered and assessed with the support of Dave Lockwood.

3.2.4 Current Infrastructure and Safety Signage

At present the site hosts a multitude of aquatic safety signage and warnings which may be overloading visitors with information and causing people to take little notice of the important messages to impart. Additional to the aquatic signage is other signage information on kauri dieback, the park code, removal of rubbish, water quality, bait traps, and instructions on the emergency phone.

There is also overwhelming information on the underwater topography and swimming warning signs located near public rescue equipment use sign. The underwater topography map could suggest safer places to enter the water which may encourage site visitors to swim/bomb off sites in and around the falls. Dave Lockwood corroborated observational data recorded in Chapter 4 of this report of people seen jumping from heights of up to 15 m up the rock face of the waterfall into the deeper parts of the pool. This behaviour poses extreme danger which needs to be addressed. Effective signage could assist this.

Additionally, the current signage may provide mixed messaging with the ‘no swimming’ recommendation. Signs such as ensuring supervision of young children in and around water, use of public rescue equipment, under water topography, and what to do in an emergency suggest that being in the water is acceptable.

Currently the park has access to an emergency mobile phone fixed to the main carpark signage area, an AED is currently located at the lodge approximately 150 m away from the emergency phone.



Figure 8 Examples of Signage

3.2.5 Discussion

At present the site contains a multitude of signs which contribute to sign pollution and confusion of the essential messages. The removal of all fixed water safety signage from the site with exception to the NZ Standards compliant two white, red, and yellow signs located on the eastern and western sides of the waterhole would eliminate sign pollution and enhance the no swimming recommendation message.

The non-compliant use of public rescue equipment information should be removed, and displayed in compliant colours and symbols, together with the rescue equipment, on the reverse side of these signs.

All signage should be raised to facilitate reading at eye level/line of sight for ease of message delivery.

In addition, water safety signage compliant to AS/NZS 2416, should be installed in the main carpark signage shelter with additional fixed signage to be installed at the toilet shelter area. An additional ‘no swimming advised’ message should be added onto the main Hūnua Falls sign on entry to the main carpark.

Signage at the main carpark signage shelter should be digital. Digital signage could provide real-time information to the public about the site’s history, the no swimming recommendation, current flood



Figure 9 Compliant Signage

risk, seasonal hazards, how to use the emergency phone and life rings in an emergency, and the location of the AED in proximity to the carpark. This signage should be capable of displaying integrated multi-lingual information for Māori, Pasifika, and Asian communities. Within the digital signage content, information about cultural heritage sourced by Ngāi Tai ki Tāmaki (local Iwi). The digital sign should contain tikanga information as to why this site is not recommended for swimming. Information on how to respond to person(s) in trouble in the water in an emergency, child supervision, and instructions on how to use public rescue equipment in emergency situations should also be added to the digital and static signs in the carpark.

Additional fixed signage at the toilet block signage shelter should be considered. On the day of the visit, several observations were carried out from the main carpark. We observed number of site visitors did not look at the main signage board and progressed to the toilet block and used the back entrance to the site. There would be benefit in having fixed signage at this location to enable consistent messaging at both entrances to the Falls site.

All water safety messaging on the tracks should be removed, with new water safety access signs erected at both the eastern and western track entrances (Surf Life Saving New Zealand, 2022). These signs should contain consistent messaging and be compliant with AS/NZS 2416. An example is shown in Figure 11.



Figure 10 Existing Carpark Signage



Figure 11 Access Sign Example

3.3 Signage Literature Review

For signage to be effective it must gain attention, affect knowledge by making individuals aware of the hazard and how to avoid it, and lead to compliance or safe behaviours (Laughery & Wogalter, 2014, Meis & Kashima, 2017). Furthermore, Laughery & Wogalter (2014) developed a list of factors that have shown significant effects to signs gaining attention, being understood, and changing behaviours:

- *Well-known terms – meaningful often-used terms*
- *Signal word – a bold printed word intended to convey levels of hazard*
- *Connotation – nonverbal elements such as colour to connote hazard*
- *Brevity – promotes comprehension because more people will read shorter text*
- *Format – potentially show some organised structure to the information via format*
- *Explicitness – giving specific information rather than general information*
- *Symbols/Pictorials – a symbol/picture can be worth including if it conveys meaning quickly.*
- *Location – placed where it is likely to be encountered.*
- *Size – bigger is generally better.*
- *Color – hue differences for prominence.*
- *Contrast – brightness differences; black on white or vice versa for greater legibility.*
- *Format – “chunked” text and outline/bulleted lists attract attention better than large dense paragraphs of text (Laughery & Wogalter, 2014 pp 5 and 6).*

The Australia Standards and New Zealand Standards 2416 Water safety signs and beach safety flags standards are designed with the above factors to encourage attention and understanding of the water safety messages.

One Australian beach signage study (Matthews et al., 2014) reported that less than one-half of beachgoers saw any signage, but of those who did, almost all recalled the hazard symbol signage. Poor location or a signage clutter may have precluded observation of the signs by almost one-half of beachgoers, but the knowledge affected by inclusion of recognised hazard symbols by those who did see them is encouraging. The clutter of signage at Hūnua or lack of signage by the toilets may be a factor in visitors not reading the water safety signs.

Despite a reasonably high recall of messaging from the existing signage in the present visitor interview study (3.2), there is still a significant group of visitors who have not seen or read the water safety information. This highlights the importance of including multiple risk management strategies at Hūnua.

Laughery & Wogalter (2014) recommend including information regarding the consequences of neglecting to comply with signage recommendations or reasons for required compliance. This suggests the inclusion of tikanga for Hūnua (Māori customs and traditional values relating to Hūnua Falls) would improve the likelihood of behavioural change or safer behaviours after reading the signage.

Electronic Signage

Limited data is available regarding the attention, understanding, and compliance with electronic signage. Four studies that were sourced all related to road traffic safety. A Qatar study (Ghadban et al., 2018) found the differences in comprehensibility between static and static electronic signage was negligible. In Toronto, Izadpanah et al. (2014), also found inconclusive evidence of an improvement in road safety after the installation of ten static electronic signs (SES) along a highway. However, in Tasman and Marlborough Districts in New Zealand, preliminary data of cycle activated, and vehicle activated curve electronic warning signs has been encouraging in eliminating crashes (Gardener & Kortegast, 2010). Furthermore, an Australian study (Ebrahim et al., 2014) found that drivers significantly slowed their driving speed after the installation of flashing electronic signs.

Installation of electronic signage at Hūnua Falls has been considered as an option at the carpark to complement the static signage at the track entrance and pools area. Electronic signage would allow real-time information of current condition to be shown on the signs, although this would require internet connectivity. Hūnua Falls is an area subject to flood (Mulcahy, 2014; 2016). High rainfall and subsequent increase in water velocity and strength of currents places significant risk on individuals. The reserve around the pools area and Wairoa River, downstream of the Falls, have been submerged, and even the carpark is in the area of a 100-year flood, although the carpark has been flooded several times in recent years. The water may rise rapidly due to the steep nature of the surrounding areas and visitors may be caught unaware of the rising risk. All visitors in the area, both those entering the water and in the surrounding area, are at risk to the flood hazard. Evidence suggests that moving electronic signs to indicate any imminent flooding could minimise the risk to flood hazards considerably. Other information could be provided in a static electronic format. Consideration would need to be given to placement in terms of flood risk and damage to the sign.

3.4 Signage Recommendations

The site in its current form contains an excessive amount of visual signage conveying several different messages. The excessive signage should be removed to enable clear, concise messaging about the site's history, the no swimming recommendation status, dangers, flooding potential, how to use the emergency phone, AED and life rings, and their locations in an emergency.

Drowning Prevention Auckland recommends six sources of signage at this location.

1. The existing Standards NZ compliant western water safety stands around the waterhole.
2. The existing Standards NZ compliant eastern water safety stands around the waterhole.
3. New access signage at the western track entrance
4. New access signage at the eastern track entrance.
5. A new digital sign in the main carpark is strongly recommended to include site history and tikanga, no swimming recommendation and reasons, current flood risks, seasonal hazards, how to use the emergency phone, how to use the public rescue equipment in an emergency and the location of the AED.
6. Additional fixed signage with the same information as the digital sign should be erected at the old signage stand near the toilets. Signage should comply with the Australia and New Zealand Standards 2416 Water safety signs and beach safety flags standards.

In addition, Drowning Prevention Auckland recommends the following:

- Signage should be raised to facilitate reading at eye level/line of sight for ease of message delivery.
- All other signage should be removed from the water safety signage to mitigate the visual pollution, mixed messaging, and information overload of safety messaging at the track entrance and waterhole sites. The main message to be conveyed at these sites is the strong no swimming recommendation. The other information on kauri dieback, the park code, removal of rubbish, water quality, bait traps, and instructions on the emergency phone should be included on the main carpark signs.
- This message should support the SafeSwim website which enables people to locate and identify this information prior to travelling to the site. At present, the site on SafeSwim has a 'Swimming not advised' pin.
- The continued provision of public rescue equipment. The importance of implementing multiple layers of risk management strategies, such as continued provision of public rescue equipment (PRE), is highlighted by the number of visitors who did not see or read the water safety signage. Instructions on use of public rescue equipment should be display on the reverse side of the existing compliant eastern and western signage around the waterhole.
- Multilingual integration could be considered on the electronic sign for increased ease of interpretation English as a second language visitors.
- Further data collection and research on recall of messaging from new and existing signage should be implemented to evaluate signage improvement.

4. Observation Study

4.1 Background

The 2020-2021 Hūnua Falls Water Safety Project Report recommended completing an observational study of visitors' behaviours when visiting Hūnua Falls for the coming season. This study would replace the electronic survey completed by the Hūnua Water Safety Advisers in the previous two seasons. The observational study will report on the actual behaviours of visitors to Hūnua Falls, as opposed to their perceptions, and intended behaviours.

Observational studies can be conducted overtly, where the observers noting the behaviours are visible, or covertly, under hidden observation. Behaviours are more likely to be compromised in an overt observational study. It is therefore recommended that the research at Hūnua be completed covertly. Behaviours can be observed by video camera, where the data gathered would be an analysis of the videos observing behaviours of visitors to the Hūnua Falls, or by manual head counts and reporting of behaviours.

To eliminate any under-reporting of high-risk behaviour due to Water Safety Advisers being on-site, it was recommended that camera surveillance, being more covert, monitor behaviours. Cameras from either 24-hour cameras, or cameras on-site installed by the Advisers, would monitor behaviours and the footage then be analysed.

Due to a number of restrictions, including budget, Covid lockdown, and logistics of installing cameras, it was agreed to complete the observational study using the Water Safety Advisers.

Research Question: What are the characteristic behaviours of visitors to Hūnua Falls?

Study Design

The basic design is a cross-sectional observational study of behaviours of visitors to Hūnua Falls.

4.2 Methodology

Water Safety Advisers observed and recorded behaviours of visitors within Hūnua Falls pool area. Four recordings per day, for seven weeks were collected, anticipating a total of 196 recordings (4 x 49 days). For two hours each day, from 1.00 – 3.00pm, one Adviser collected data observing visitor behaviours around the Falls. The Advisor remained as covert as possible during these two hours to allow them to observe the behaviours of visitors to Hūnua Falls, and record behaviours.

Visitor head counts, visitor behaviours, and some demographics (gender and age) were recorded, every 30 minutes.

The two-hour time period was chosen as it is a cross-over time period during the day when two Advisers are present and will allow one Adviser to observe and collate behaviours of visitors while the other remains in the carpark/entrance. It was also envisaged this to be a busy time of the day.

Data Collection Times: 1.15pm, 1.45pm, 2.15pm, and 2.45pm.

Advisers used the following link to collate data at each time, and also use the iPad to take a photograph of the Falls at each time, ensuring the time and date is switched on.

<https://survey.alchemer.com/s3/6643815/Hunua-Observational-Study-Dec-21-Feb-22> (Appendix 3)

Limitations: The high-risk behaviours of visitors may be underreported due to the Water Safety Advisers being on-site. To minimise this, the Advisor remained as covert as possible during their recording of data.

Observational research is non-experimental because nothing is manipulated or controlled, and as such we cannot arrive at causal conclusions using this approach.

Ethical Protocols

An ethical committee review is not 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 will be 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, Water Safety Advisers will not disclose behaviours of individual people.
3. Respect for People – All people will be treated with respect
4. Māori and ethical considerations – Ngāi Tai ki Tāmaki are tangata whenua and the top of the Falls and half of the bottom of the pool have been gifted back to them. Auckland Council remains as the land manager. Ngāi Tai ki Tāmaki have been consulted and are supportive of the research.
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.
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 Hūnua 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. Water Safety Advisers should be coached in their response to this.
 - Concern from Water Safety Advisers monitoring risky behaviour that could compromise safety of individuals being monitored.
 - Water Safety Advisers present during a drowning incident.
7. Integrity – The Water Safety Advisers will collect honest and actual data and the information will be analysed in a careful and rigorous manner.
8. Diversity – The Water Safety Advisers will understand, respect and make due 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.

Requirements:

- iPad and electronic method of collecting data developed using coded behaviours and photographs
- Hūnua Water Safety Advisers – two hours per day for observational study
- Training information developed, included, and shared in the Water Safety Adviser training

- YMCA management of Hūnua Water Safety Advisers
- DPA commitment and time to oversee the study, develop the methodology analyse the data, and complete the research report.

4.3 Results

Visitors and Behaviours

The 168 observations counted 4,545 visitors in the Hūnua Falls area. Less than half of the visitors in the area (45%, n = 2,026) were male. Almost half the visitors were aged over 25 years (45%, n = 2,055). Over one-quarter (27%, n = 1,221) were aged under 15 years, and youth aged 15-24 years accounted for one-fifth (21%, n = 953) of the total visitors.

One-fifth (20%, n = 907) of visitors in the pools area entered the water. Of these, over one-half (60%, n = 544) were wading in the shallow pool and over one-third (36%, n = 330) were observed in the deep pool swimming or floating.

Smaller numbers were seen jumping into the pool area. Less than one-tenth (8%, n = 76) were seen jumping from the edge and a small number seen jumping from a height of over 2m (3%, n = 31).

Some of those entering the water (6%, n = 53) were seen using buoyancy.

Gender

More than one-half (56%, n = 512) of those entering the water were male. Males accounted for over one-half (55%, n = 297) of those seen in the shallow water and over two-thirds (67%, n = 222) of those in the deep water. Most observations (89%, n = 68) of visitors jumping from the edge were male, and all jumpers (100%, n = 31) from a height of over two metres were male.

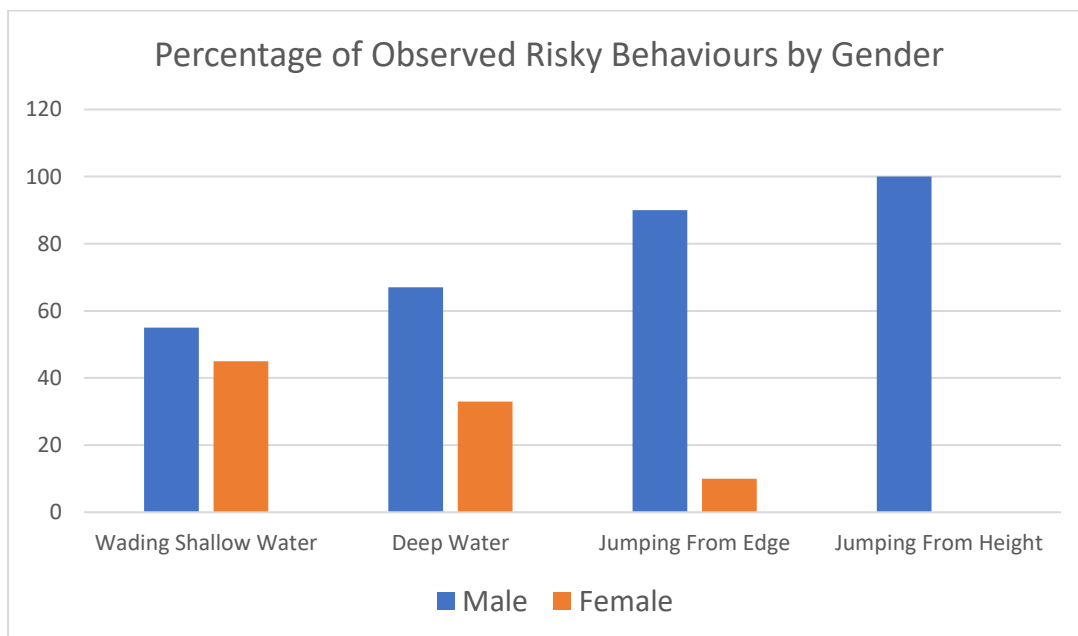


Figure 12 Observation Study Behaviours by Gender

Conversely, females were more likely to use buoyancy in the pools area with males only accounting for one-third (36%, n = 19) of all those observed with buoyancy.

Age

Almost one-half (46%, n = 421) of those entering the water were aged under 15 years. Over one-quarter of others observed in the water were each aged 15-24 years (28%, n = 253) or over 24 years (28%, n = 251).

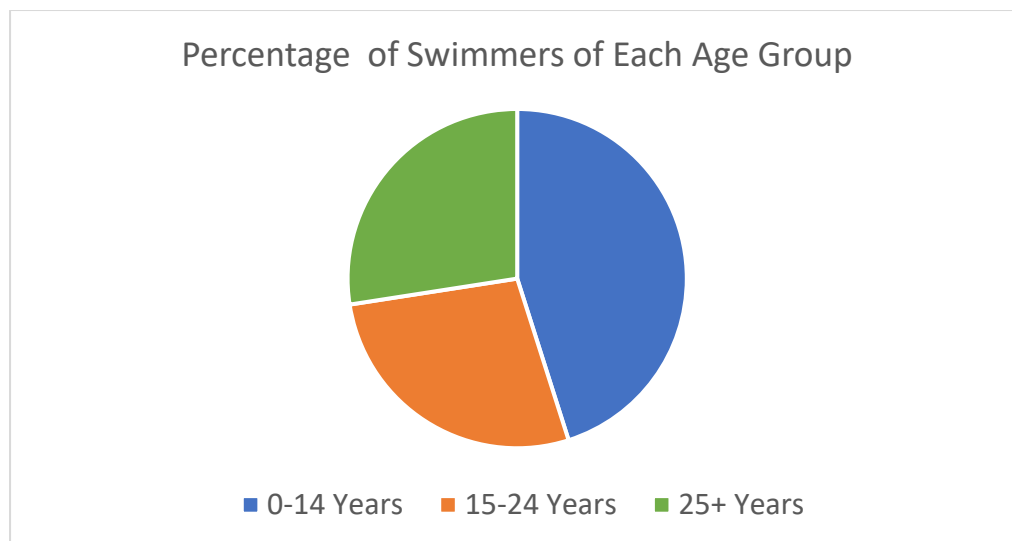


Figure 13 Observation Study Behaviours by Age

Youth aged 15-24 years were more likely to swim in deep water than shallow water (53%, n = 135 vs. 43%, n = 107). Younger age groups (less than 15 years) and older aged groups (over 25 years) were more likely to wade in the shallow areas than swim in the deep pools (0-14 years 40%, n = 168 vs. 23%, n = 18%; 25+ years 56%, n = 141 vs. 43%, n = 107).

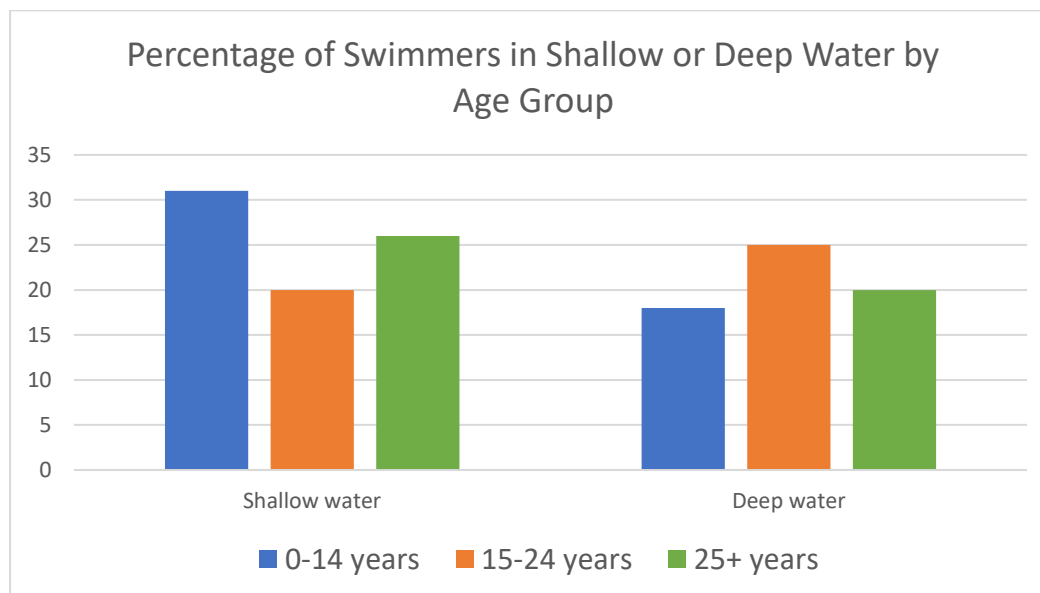


Figure 14 Observation Study Shallow vs Deep Water

Observations of the risky behaviour of jumping was also dependent upon age. Over one-half (57%, n = 43) of all seen jumping from the edge were aged 15-24 years. Furthermore, most of those observed jumping from a height over 2m were youth (71%, n = 22).

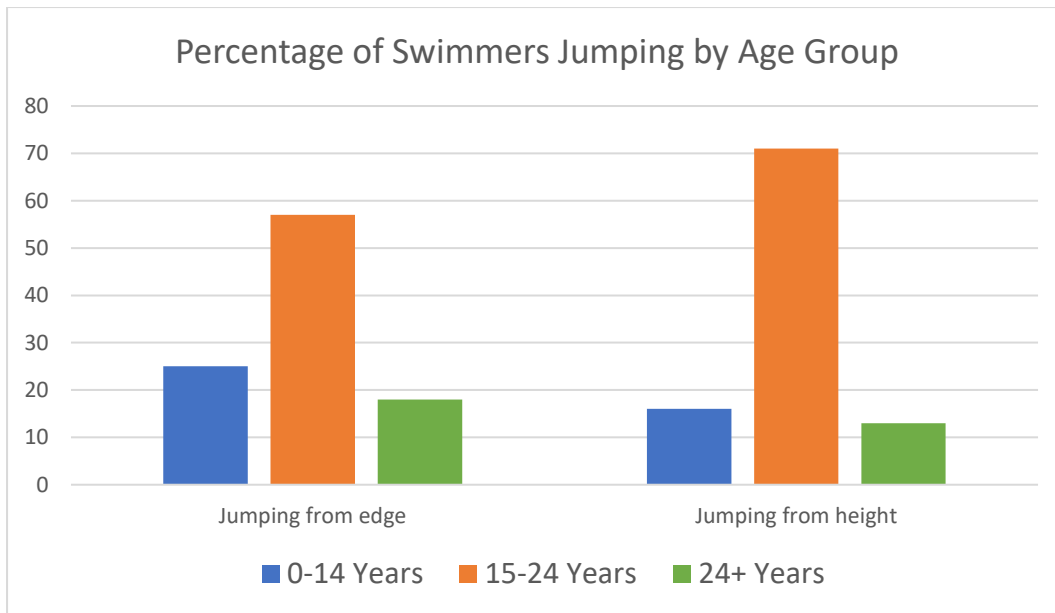


Figure 15 Observation Study Percentage of Jumpers

In contrast, three-quarters (75%, n = 42) of those observed using flotation aids for buoyancy were aged under 15 years, one-fifth (20%, n = 11) were aged 15-24 years and 5% (n = 3) were 25 years or older.

The Water Safety Advisers noted other risky behaviours observed and these are listed below.

Other risky behaviours observed	Frequency
Lack of adult supervision	7
People using PRE for fun	1
Swimming close to or under waterfall	8
Consumption of alcohol	1
Dad getting his daughter in crutches to walk over slippery rocks	1
Female youth encouraging risky behaviours	1
People walking / piggybacking others across rocks to cross river	2
Using logs as buoyancy aids	2
Adult male 25+ encouraging teens to jump from edge	1

Figure 16 Observation Study Other Risky Behaviours

4.4 Discussion

Around 19,128 visitors were recorded entering the Hūnua Falls tracks from the carpark while the Water Safety Advisers were in place. One-quarter of visitors to Hūnua entered the waterfall/pool area, and one-fifth of those entered the water. The 168 observations counted 4,545 visitors in the Hūnua Falls pool area, just under one-quarter (24%) of the total visitor head count. One-fifth of all visitors in the pools area were observed in the water. The current research suggests that five per cent of all visitors enter the water, corroborating previous research studies at Hūnua (Auckland Council, 2014; Stanley, 2021) that very few participants had a primary visitation reason to enter the water (2021, 5%; 2020, 6%; 2014, 7%).

Previous studies have shown that males perceive their swimming and water competency to be greater than that of females (Moran, 2008a; McCool et al., 2008; Moran & Stanley, 2013). Not surprisingly, and despite males comprising less than one-half of visitors in the pools area, males were more likely to enter the water, and far more likely to enter into the risky behaviours of entering the deep water, jumping from the edge, and jumping from height. Most jumpers were male, and all those jumping from a height of over 2m were male. No females were seen jumping from height, very few jumping from the edge and females were more likely to use buoyancy.

Encouragingly, children under 15 years were almost twice as likely to stay in the shallow pool area rather than the deep pools. Adults aged over 25 years were also more likely to stay in the shallow pool area, suggesting a degree of parental supervision.

Previous research detailing the diving risk practices and perceptions of New Zealand youth (Moran, 2008c) has noted the activity as predominantly a male youth activity. Most of the jumpers at Hūnua, over one-half from the edge and almost three-quarters from height, were youth ages 15-24 years. Messages to combat this dangerous activity should be targeted at the youth age group.

Two other risky behaviours were observed numerous times. Lack of adult supervision of children was noted on seven occasions and people swimming close to or under the waterfall were observed eight times. Education around these two behaviours should be improved and included in the water safety initiative.

It was heartening to see only one occasion of alcohol use being observed.

4.5 Conclusions and Recommendations

This observation study has endorsed anecdotal data of risky behaviours undertaken at Hūnua Falls. The riskiest behaviours of entering deeper water and jumping from height were most likely to be males aged between 15-24 years. Lack of appropriate adult supervision of young children was also observed.

Signage and education messages around the need for constant adult supervision should be considered to assist in the safety of young children around the Falls area. Supervision should include the requirement for close proximity. In addition, messages regarding the dangers of jumping from height targeting youth aged 15-24 years and the dangers of swimming close to or behind waterfall should be considered.

5. Recommendations

Visitor Numbers:

Further initiatives involving the Water Safety Advisors should be on-site at least between 10.30am and 4.30pm to enable interaction with the majority of visitors. The use of CCTV cameras would assist in providing information about visitor numbers after 6.30pm and before 10.30am.

Investigation into the car counting data could provide further clarification regarding visitors outside of daylight hours.

Signage:

The site in its current form contains an excessive amount of visual signage conveying several different messages. The excessive signage should be removed to enable clear, concise messaging about the site's history, the no swimming recommendation status, dangers, flooding potential, how to use the emergency phone, AED and life rings, and their locations in an emergency.

DPA recommends four sources of signage at this location. These include the Western and Eastern current Standards NZ compliant water safety stands. A new digital sign in the main carpark to include site history and tikanga, no swimming recommendation, current flood risks, seasonal hazards, how to use the emergency phone, how to use the angel rings in an emergency and the location of the AED in proximity to the carpark is strongly recommended. Additional fixed signage with the same information should be erected at the old signage stand near the toilets. Signage should comply with the Australia Standards and New Zealand Standards 2416 Water safety signs and beach safety flags standards.

Signage should be raised to facilitate reading at eye level/line of sight for ease of message delivery.

All other signage should be removed to mitigate the visual pollution, mixed messaging, and information overload of safety messaging at the site.

The main message which should be conveyed at this site is the no swimming policy.

This message should also be added onto the SafeSwim website to enable people to locate and identify this information prior to travelling to the site. At present, the site on SafeSwim has a 'Swimming not advised' pin. This is providing the public with conflicting information. Clarity should be made to change this to a 'No swimming' pin to avoid any confusion.

The importance of implementing multiple layers of risk management strategies, such as continued provision of public rescue equipment (PRE), is highlighted by the number of visitors who did not see or read the water safety signage.

Further data collection and research on recall of messaging from new and existing signage should be implemented to evaluate signage improvement.

Observations:

Signage and education messages around the need for constant adult supervision should be considered to assist in the safety of young children around the Falls area. Supervision should include the requirement for close proximity. In addition, messages regarding the dangers of jumping from height targeting youth aged 15-24 years and the dangers of swimming close to or behind waterfall should be considered.

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Appendices

Appendix 1: Visitor Count Data Collection Tool

Hunua Falls Head Count of Visitors 2021-2022

1. Date

2. Time

10.30am - 12.30pm
12.30 - 2.30pm
2.30 - 4.30pm
4.30 - 6.00pm

3. Complete the following for each person/group that arrives at Hunua Falls*

Total number in group

0
1
2
3
4
5
6
7
8
9
10
11-15
16-20
21-25
26-30
31+

Appendix 2: Visitor Signage Interview Questions

Hunua Falls Signage Interview 2021-2022

1. How many times have you visited Hunua Falls? *

- First time
- Up to 5 times
- More than 5 times

2. Have you read any of the signage around Hunua Falls today? *

	Yes	No	I read the signage but not water safety information
Carpark signage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Track entrance signage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hunua Falls pool area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. What water safety information do you recall reading?

Tick as many as they can recall. *

- No recall
- No lifeguards present
- Deep water
- Reduced buoyancy
- Agitated/turbulent water
- Slippery rocks
- Submerged objects
- PRE / life ring instructions
- No diving/jumping/bombing
- Swimming not recommended
- Sudden drop in water depth
- Unstable cliff edge
- Flood hazard after rain

4. Finally, what would make the signage more appealing to you to read?*

Appendix 3: Respondent Signage Recommendations

Non English

More interesting facts

Brighter colours, more eye catching

Obvious info about walk times

Make it bigger like letters and other and a universal sign

More appealing to the eyes like colours and that

Signage at the bridge leading to the falls

More signs

More visible

Bigger signs, clearer info

More pictures

Making sure the sign are clearer and more aware

More appealing

Red colour

More centrally places to the water and noticeable

Make it more obviously suggestive rather than appearing as a rule

Pictures much more important than the words, make them larger for foreigners

Bigger writing

Signs closer to water's edge, where swimmers will sit. Signs further away get walked past and forgot

N/A. Said they knew about the dangers already

More info at carpark

Signs closer to water.

Signs visible from where people will sit by near the water. I head straight to a place to sit.

More colour.

Nope it is perfect

Put closer to the water

Bigger pictures

More in the way before you get to water

Bigger

Closer to falls

Less words, more pictures

Make signs bigger

Colours

Bigger lettering

Bigger, more noticeable

Bigger font

More of it

Covid scanner

Pictures

Maybe centralise it

Make the info bigger

Black and white

Lights

Tell people swimming is prohibited

Colour

Free chocolate

Bold letters

Appendix 4: Other Behavioural Observations

Not much adult supervision for the children in the area

Lack of adult supervision for the children in the area

People using the emergency floating devices for fun swimming around

Lack of parental supervision

Young adult males swimming near shallows, cooling off

Consumption of alcohol whilst sitting in shallows/swimming in shallows from male adults 20-45y old

Adult women jumping from 1-meter-high ledge on waterfall side

Young children splashing water from shore.

Youth dangling feet in water from edge. People walking across rocks to cross river. Man with go-pro swimming by waterfall.

People piggybacking each other across river. Young children splashing at water's edge.

Many small children playing on rocks by water's edge. Small children wading while holding hands with adults/youth.

Just people observing the falls

People swimming close to falls. 1 person paddling on air mattress.

Using logs as buoyancy aids

Man, swimming behind waterfall.

Lack of adult supervision and children playing too close to the water's edge

No supervision of children

Children playing very close to water

Dad getting his daughter in crutches to walk over slippery rocks

Someone swimming under waterfall.

Female youth encouraging risky behaviours.

No adult supervision of children

No adult supervision of children

Standing very close to waterfall

All supervising themselves for they are adults

Guy swimming right up to the falls for a photo

Guys swimming under and around waterfall and theft/use of falls angel rings

Swimming extremely close/under falls

Hunua Observational Study Dec 21 - Feb 22

(untitled)

1. Date: *

2. Time: *

3. Fill in the boxes with your most exact numbers. *

	Approx head count in area	Total in water	No. in shallow pool - Wading	No. in deep pool - Swimming/Floating	No. jumping from edge	No. jumping from height over 2m	No. floating using buoyancy
Total	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Male	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Age 0-14 years	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Age 15-24 years	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Age 24+ years	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

4. What other behaviours did you observe at this time?

- Male youth encouraging risky behaviours
- People being threatened by others to perform risky behaviours
- Risky behaviours associated with consumption of alcohol or other drugs
- People trying to stop risky behaviours
- Adult supervision of young children
- Youth supervision of young children
- Other - Write In (Required)

*

5. Any other comments?

6. Upload the photo of the pool area.

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