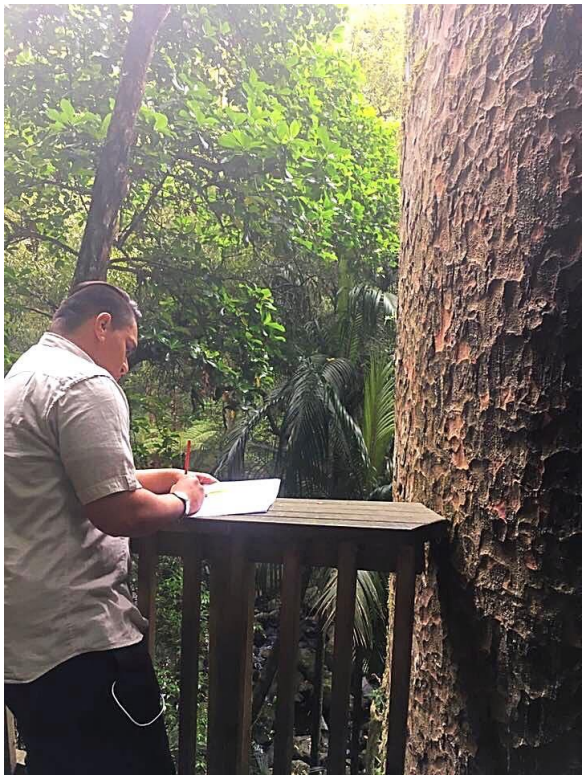

KAURI DIEBACK CULTURAL HEALTH INDICATOR PILOT PROJECT REPORT 2017

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Contents

1 Background

The Kauri Dieback Programme (KDP) continues to support cultural health indicators (CHI) research and therefore requested the submission of a proposal for further work. The Tāngata Whenua Roopū (TWR) also supports the continuation of CHI research. The KDP launched a short-term, standalone research project based on Mātauranga Māori principles, with a maximum budget of $40,000 in the 2015/16 financial year (FY). This proposal was for a 3-month project. The project was based on previously published and KDP-funded work described in two publications, “Cultural Indicators for Kauri Ngahere” (Shortland, 2011) and “Kauri Cultural Health Indicators — Monitoring Framework” (Shortland & Chetham, 2013).

Since 2010, the development of a framework to enable the use of cultural indicators in the surveillance and monitoring of kauri dieback has been a research priority for the TWR. Tangata whenua assert that the use of cultural indicators to complement scientific methodologies is desired in order to focus on assessing kauri health and building resilience to disease. In 2011, Tui Shortland and Juliane Chetham produced the report, “Cultural Indicators for Kauri”, as the initial phase of the CHI research. This work involved a literature review of national and international examples of cultural indicator research, followed by an extensive interview process with a number of cultural experts in which a robust set of values and indicators for kauri were identified.

In 2012, the second and third phases of the research were included in the annual work plan and budget, and were presented to the wider response team at the Mahi Tāhi, or “Working Together” Hui, in August 2012, which was widely supported by the KDP. The budget for phase two of this project was approved in April 2013, and Shortland and Chetham subsequently produced the “Monitoring Framework for Kauri Cultural Health Indicators” (2013). Refinement of the monitoring framework was assisted by engagement with tāngata whenua and kauri dieback experts at a Mātauranga Māori hui and at a focused TWR workshop. A peer review by kaumātua and scientists also occurred in 2014.

The purpose of the third phase of this research, a 3-month project, was to select and train mana whenua communities to undertake a field-based pilot programme to test and confirm cultural indicators and methodology for kauri health monitoring. The aim of phase three was to determine a qualitative and quantitative set of CHIs that were measurable and repeatable in other rohe. These indicators could then be used to determine the state of health of other kauri forests and to provide the flexibility to incorporate contemporary scientific data collection systems, if required or desired by mana whenua. For example, pH testing of soil, or soil testing for PA, could be incorporated. It was intended that outcomes, described in this report, could be utilised by other communities within the kauri landscape.

2 Methodology

2.1 Milestone 1: Community monitors selected — April 2016

Due to short timeframes, community monitors were selected from Ngāti Hine, who have sufficient skills and experience and a proven, practical background in cultural monitoring/Kaitiakitanga. Ngāti Hine representatives also have knowledge of and are active in the mahi (work) they are doing in the ngahere (forest).

2.2 Milestone 2: Capacity building workshop — April 2016

This stage involved a one-day workshop to build capacity of pilot communities to implement the CHI framework and to provide an opportunity to determine whether any additional training was required in specialist subjects (e.g., surveillance techniques or geographic information system [GIS] skills). This workshop was open to interested parties and was not exclusive to the selected Ngāti Hine community monitors. The workshop was a forum for the initial refinement of cultural indicators to be utilised and for testing the proposed monitoring methodology.

Participants who attended:

1. Te Warihi Hetaraka
2. Tohe Ashby
3. Tui Shortland
4. Ahuriri Nihoniho Rueben
5. Jaycee Tīpene Thomas
6. Te Aho Herrington
7. Caleb Rawson
8. Kaylem Harris
9. Tony Tautari
10. Chris McKay

Surveillance techniques discussed:

Proposed cultural health indicators and framework methodologies were discussed. Participants elected to record all things observed, rather than carrying out sample plot surveys.

Data recording/capture options:

The option of using a GIS Cloud mapping platform (giscloud.com) was presented to the workshop. It was agreed that mobile data collection would be the ideal data capture method, because GIS mobile data collection was previously adopted into the kauri CHI framework in 2013. In addition, mobile data collection was chosen because it allows the collection of data using attributes that are selected by the user and uploaded to easily accessible online maps.

Figure 1 below is a screen shot of the GIS Cloud mobile data collection application proposed and accepted at the April 2017 workshop.

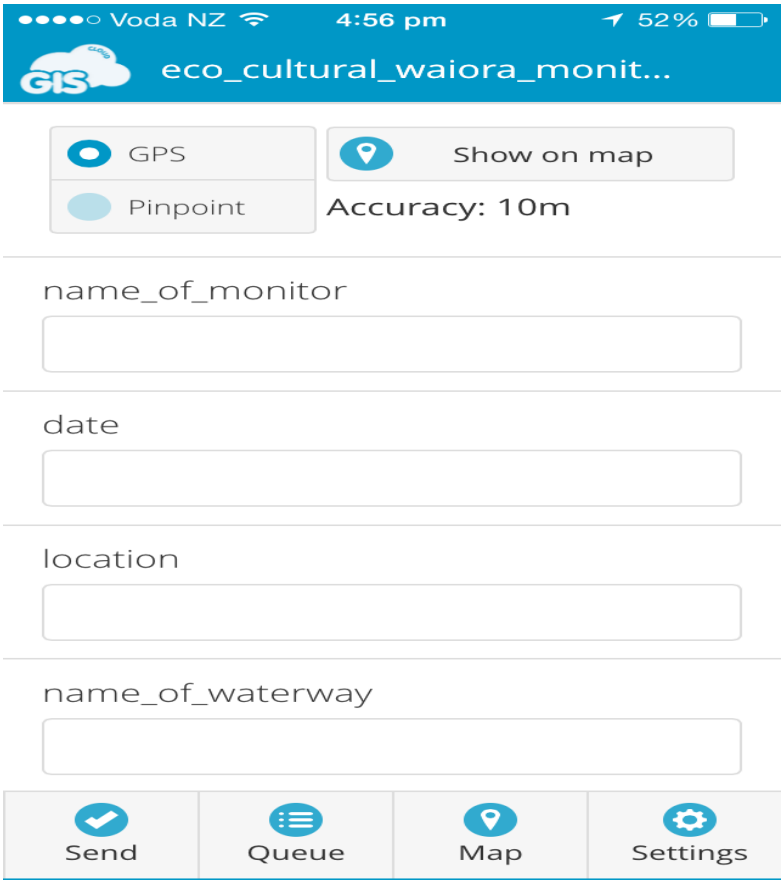


Figure 1. The proposed GIS Cloud mobile data collection platform.

Data collation/storage and preliminary analysis options:

The Pacific Indigenous and Local Knowledge Centre, run under the He Puna Marama (HPM) Trust, was set up in Whangarei as a community data centre in 2016. It is a place where community groups undertaking environmental monitoring are able to share a central location for storing and analysing data. We used this centre as a base. Preliminary analysis options were confirmed at initial debriefs within 24 hours of field monitoring, utilising maps to assist in visualising findings.

In-depth analysis and assessment options:

It was agreed that in-depth analysis would occur once all fieldwork was completed. We took into account that this was a short term project (3 months), but that any longer-term projects should include multiple seasonal, in-depth analyses to support KDP management decisions.

General skill base and resources:

Monitors needed to have skills in identifying native flora. This training was assisted by the development of a booklet picturing the native species, including those identified as cultural indicators. Monitors also needed to have skills in the use of tablets and in mobile data collection.

A follow-up training will be held in October 2017 to ensure monitors have sufficient skills before the final CHI Wānanga is held. Monitors will also be encouraged to orientate themselves with the forest tracks prior to the wānanga. A sufficient number of tablets will need to be acquired for the final CHI wānanga.

2.3 Milestone 3: Preparatory stages — April 2017

This stage of the project involved the following steps:

2.3.1 Mana whenua engagement

Engagement involved project leaders and iwi/hapū authorities confirming with mana whenua monitors the objectives, importance of the monitoring project and the methodology to be employed. This was also a chance for parties to identify other participants such as local schools, landowners, etc. Mana whenua engagement was as follows.

Ngātiwai:

- Date/s of engagement
    - Clive Stone, Ngātiwai Trust Board resource management unit coordinator, engaged October 18th, 2016
    - Te Warihi Hetaraka & Hori Parata, Ngātiwai Kaumātua, ongoing involvement since the beginning of October 2016
- Personnel involved for each party
    - Clive Stone, project reporting
    - Te Warihi Hetaraka & Hori Parata, project oversight
- Type of engagement (phone, hui, etc.)
    - Hui
- Relationship: supportive/indifferent/against?
    - Supportive
- Primary message from stakeholder
    - Ensure ongoing communications
- Any resources offered
    - None
- Any resources committed
    - None
- Any restrictions/conditions advised to be met
    - Nil

Ngāti Kahu o Torongare:

- Date/s of engagement
    - November 16th, 2016
- Personnel involved for each party
    - Dick Shepherd, kaumātua
    - Happy for youth to represent and the elders to be involved in future planning
- Type of engagement (phone, hui, etc.)
    - Phone
- Relationship: supportive/indifferent/against?
    - Supportive
- Primary message from stakeholder
    - They give their blessings and would like us to include Pukenui Forest in the future
- Any resources offered
    - None
- Any resources committed
    - None
- Any restrictions/conditions advised to be met
    - Report on outcomes and meet with wider elders to discuss a wider programme

2.3.2 Site/s selection

An area of ngahere (forest) that mana whenua wished to ascertain the health status of was chosen for the pilot. In future, there may be a variety of sites chosen, from potentially small bush remnants through to large blocks across differing types of terrain. We recommend mana whenua choose sites they have a good understanding of, including the types of vegetation and animals generally found there; the management history of the site (for example, whether the site has been used for contemporary or traditional cultural purposes); whether the site has been logged or cleared in the past; whether the site has had pest control work undertaken; and any other relevant aspects. Once they have undertaken the initial assessment, mana whenua will be able to obtain a sense of whether the health of the site is improving or in decline, and they will then be able to measure trends or changes in ngahere/kauri health over time. We also recommend that mana whenua groups compile some background material outlining their knowledge about the area. This valuable knowledge can then become a part of their kauri ngahere health assessment and management file.

Regional and local map showing the name and location of ngahere

The AH Reed Memorial Kauri Park was chosen for this pilot project. It is located at 199 Whareora Road, Whangarei, just east of the Whangarei township. The park is administered by the Whangarei District Council (WDC). Figure 2 shows the ngahere in relation to the town. Figure 3 shows its place in the Northland region and a snapshot of the park itself (courtesy of WDC).

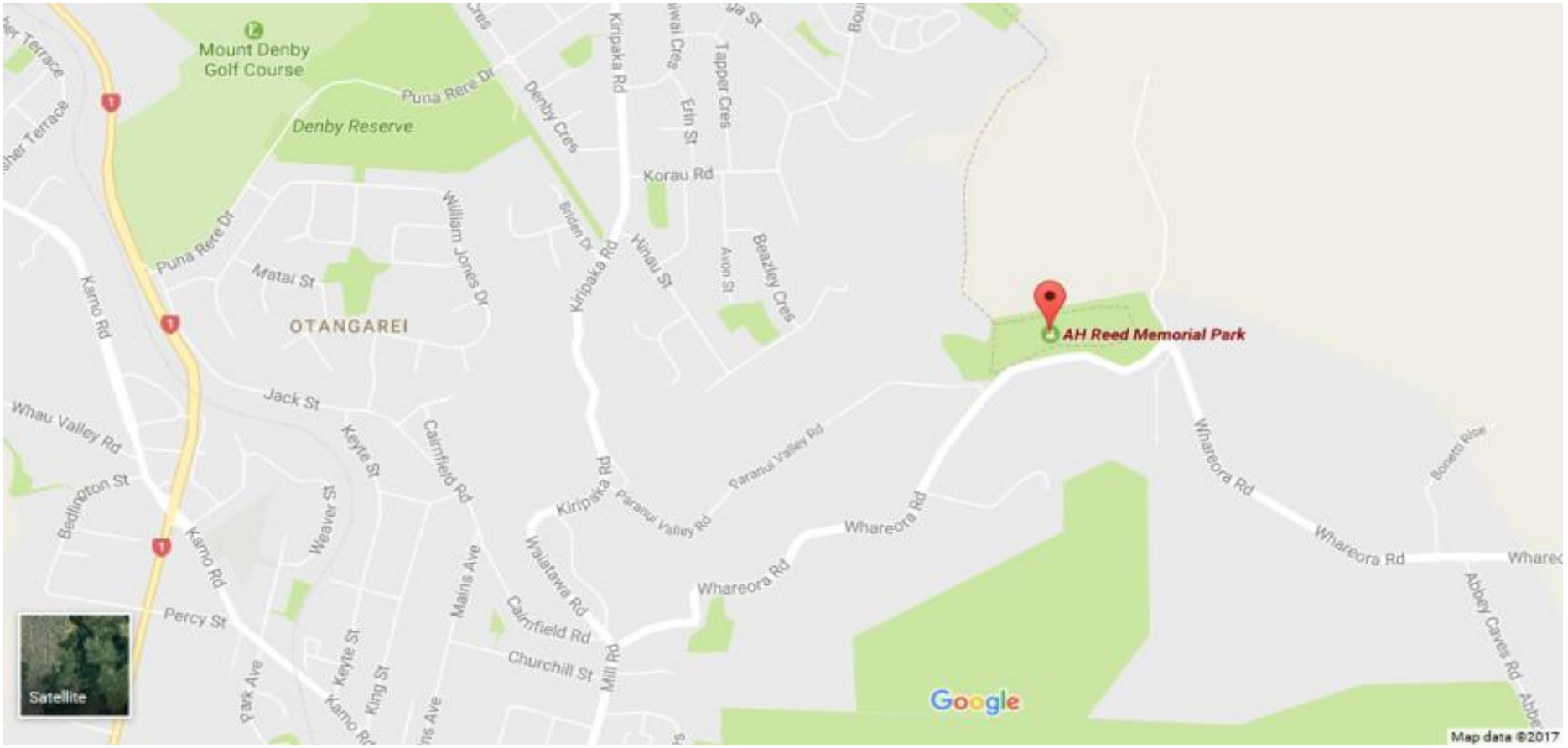


Figure 2. AH Reed Memorial Kauri Park in relation to Whangarei environs.
Note. Map courtesy of Google Maps.

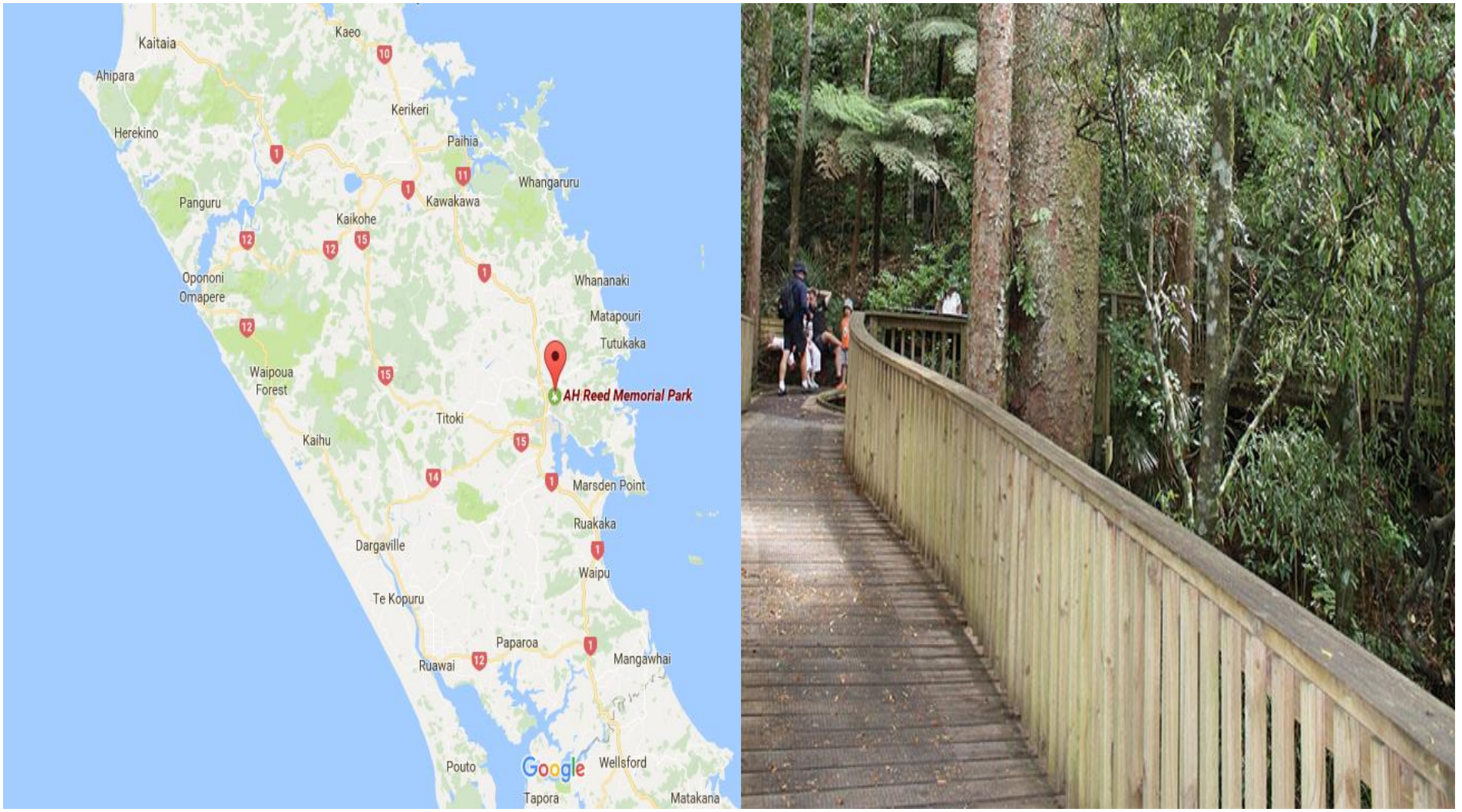


Figure 3. Location of AH Reed Memorial Kauri Park in the wider Northland region (left); a snapshot of the park's canopy walkway, with kauri standing to the right of the walkway handrail (right).

Notes. Map courtesy of Google Maps; photo courtesy of Whangarei District Council (WDC).

Boundary of ngahere

The specific site surveyed by our pilot team is designated as an area of “large kauri” (Figure 4). There were no physical points/objects or tapu impacting on survey design.

Figure 4. Area of “large kauri” surveyed by pilot monitoring team (circled in red).
Note. Map courtesy of Whangarei District Council (WDC).

Survey area

The Parihaka and Hatea River Reserves are part of a series of linked reserves that include AH Reed Memorial Kauri Park. They all lie to the eastern side of the Whangarei city centre. The area is characterised by a series of valleys dissected by steep, sharp ridges and narrow streams, which flow into the Hatea River. Topography differs widely across the reserve area, kauri density varies, and both healthy and symptomatic kauri are present within the ngahere (WDC, 2009). The pilot survey area is indicated in Figure 4 above.

- **Reasons why this area is being recommended for sampling/surveying**

    - Convenience of access and genealogical associations of team, kaumātua and youth monitors dictated the selection of AH Reed Memorial Kauri Park for the pilot project.

- **Previous historical management, e.g. past pest control, logging, etc.**

    - The existing forested area is a mere remnant of an extensive kauri forest, which in the past spread eastward towards Whareora and south to Whangarei Harbour. Much of the original forest has been removed, either as a result of fire or during the early days of gum digging.

- **Current site management, e.g. pest control, track use, etc.**

    - The vision for the area as set out in the "Parihaka and Hatea River Reserves Management Plan" is "the natural, scenic and cultural heritage values of the Parihaka and Hatea River reserves are restored and protected and opportunities provided for compatible public recreational use and enjoyment of the reserves" (WDC, 2009). Here are some extracts from the Plan:
    - The restoration of Parihaka Forest, when combined with the Parihaka Reserves, will in time form a continuous tract of forest some 364 ha in size. The creation of additional wildlife corridors is especially important for species such as the endangered North Island brown kiwi (WDC, 2009).
    - There is a range of pest plants present in the reserves. During 2005/06, the initial phase of a weed control and associated vegetation restoration programme was carried out on the western slopes of Parihaka and Mair Park, covering 103 ha. Weed control efforts are set to continue and expand in area coverage up to and including Whangarei Falls under the WDC's natural area maintenance contract for Parihaka (WDC, 2009).
    - Possums are known to be present throughout the Parihaka and Hatea River reserves. Mustelids and rats are also present, but there is no information on population size or distribution. Feral cats may also be present. It is intended that a survey be undertaken so that a targeted pest animal control programme can be conducted (WDC, 2009).
    - The reserves provide extremely popular tracks for walkers and joggers of all ages, particularly during the summer months.
    - There is a sterigene station near the bridge at Mair Park.

- **General ecosystem health of the site**

    - The area is characterised by poorly drained and highly podzolised Pukenamu silt and Parihaka sandy and silt loam soils. These soils are of low natural fertility and are classified as low suitability for plantation forestry. These clay soils have high erodibility (WDC, 2009).

- The reserves on the western side of Parihaka are comprised of podocarp–mixed broadleaf associations, and some large remnant kauri, rimu, miro, tānekaha and tōtara form the large majority of canopy trees, along with taraire, tawa and kohekohe (WDC, 2009).
- AH Reed Memorial Kauri Park contains the forest's largest surviving kauri. This tree is approximately 7 m in girth and about 15 m to the lowest limb. Close to the largest tree is a second kauri with a girth of approximately 6 m. These trees may well be 1,000 years old, having reached perhaps half their span of life (WDC, 2009).
- Birds frequently observed include kūkupa, kāhu, pīpīwharauroa, ruru and tūī. Other smaller birds including pīwakawaka, tauhou, riroriro and miromiro are also present (WDC, 2009).
- The green gecko is present in the native bush areas too.
- A thriving community of native bees has been observed on Parihaka during 2005. Large numbers of bees were found nesting in the white clay banks in areas of regenerating forest at the Memorial Drive entrance into Parihaka Forest (WDC, 2009).

- **State of kauri on site:**

  - Known to be dead from kauri dieback disease/*Phytophthora agathadicida*
    - None
  - Known to be dead for reasons not known
    - None
  - Known to be alive and symptomatic (samples from KDP tested positive for *P. agathadicida*)
    - None
  - Known to be alive and symptomatic (but not confirmed by KDP as positively having *P. agathadicida*)
    - Testing undertaken in AH Reed Memorial Kauri Park; however, none found positive
  - Known to appear healthy with no positive samples in vicinity
    - Numerous healthy kauri exist

2.3.4 KDP partner and stakeholder engagement

Pilot project leaders confirmed participation and/or support of the Ministry for Primary Industries (MPI), the Northland Regional Council (NRC), the Department of Conservation (DOC) and other stakeholders. Stakeholder engagement was as follows.

Whangarei District Council (WDC):

- Date/s of engagement
  - November 18th, 2016
- Personnel involved for each party
  - Spencer Jellyman (Reserves manager)
  - Stewart Jackson (Kauri dieback contact)
- Type of engagement (phone, hui, etc.)
  - Phone
- Relationship: supportive/indifferent/against?
  - Supportive
- Primary message from stakeholder
  - If we do choose to go off formed tracks in future, let them know
- Any resources offered
  - None
- Any resources committed
  - None
- Any restrictions/conditions advised to be met
  - If we do choose to go off formed tracks in future, let them know

Northland Regional Council (NRC):

- Date/s of engagement
  - November 18th, 2016
- Personnel involved for each party
  - Don McKenzie
- Type of engagement (phone, hui, etc.)
  - Phone
- Relationship: supportive/indifferent/against?
  - Supportive
- Primary message from stakeholder
  - Supportive encouragement
- Any resources offered
  - Sterigene pack
- Any resources committed
  - None
- Any restrictions/conditions advised to be met
  - None

The Department of Conservation (DOC):

- Date/s of engagement
    - November 18th, 2016
- Personnel involved for each party
    - Richard Balm (Manager, Kauri Dieback Programme)
- Type of engagement (phone, hui, etc.)
    - Phone
- Relationship: supportive/indifferent/against?
    - Supportive
- Primary message from stakeholder
    - None
- Any resources offered
    - Sterigene pack
- Any resources committed
    - None
- Any restrictions/conditions advised to be met
    - Quarantine shoes using sterigene on entry and exit to the site

2.3.5 Assembly of technical and monitoring team

Forest monitoring models reviewed (such as National Vegetation Survey/permanent plot reconnaissance [NVS/RECCE]) stipulate that monitors should have sound ecological and technical knowledge to be able to carry out forest assessments. An advantage mana whenua have is an intimate knowledge of their whenua, ngahere and other important sites based on Mātauranga Maori, kaitiakitanga and their regular use of these sites for other purposes.

Ngāti Hine already have other monitoring projects underway within their rohe, for example catchment management monitoring and mapping of sites of significance. Nevertheless, based on our pilot project experience, we recommend teams should contain at least one member who has a robust knowledge of forest ecosystems, can identify the majority of plant and animal species and has had prior experience with monitoring. A sound grounding in Mātauranga Maori is also appropriate.

The decision needs to be made by each team as to whether GIS will be utilised, in which case team member/s with appropriate skills will be required. Each team will require a team lead or coordinator/project manager to oversee the logistics of the monitoring, particularly during the data analysis phase. The remainder of the monitoring team should also be confirmed at the same time the team lead is selected.

For our pilot project, we selected the following participants.

- Lead/coordinator
    - Tui Shortland

- Team members with key skills
    - Juliane Chetham — quality assurance/peer review
    - Te kāpehu whetū teachers
    - Ahuriri Nihoniho — GIS

- Other team members
    - Kaylem Harris — support
    - Jaycee Tīpene — support
    - Students — monitors

Community monitors from the HPM Trust, who had sufficient skills and/or experience and/or a proven, practical background in cultural monitoring/kaitiakitanga, were selected. Monitors were also selected for their knowledge of and/or active participation in mahi within the ngahere.

The following six traditional knowledge experts and monitors participated in the pilot.

1. Name — Te Warihi Hetaraka
   Mahi — Tohunga guidance
   Experience — Tohunga whakairo (master carver)

2. Name — Hori Parata
   Mahi — Kaitiakitanga guidance
   Experience — 35 years' experience managing ngahere, including Parihaka

3. Name — Tohe Ashby
   Mahi — Tohunga rongoā guidance (traditional medicine practitioner)
   Experience — 30 years' experience in applying treatment plans and teaching rongoā, including at Parihaka

4. Name — Tui Shortland
   Mahi — Cultural indicator and framework guidance
   Experience — 10 years' experience in resource management, including Parihaka

5. Name — Ahuriri Nihoniho Rueben
   Mahi — Monitor
   Experience — Bachelor of applied science student at NorthTec

6. Name — Jaycee Tīpene Thomas
   Mahi — Monitor
   Experience — Bachelor of applied science student at NorthTec

The following is a list of year 10 and 11 students who were involved in the pilot project and who will potentially be involved in future endeavours.

1. Te Aho Cherrington
2. Caleb Rawson
3. Kyneval Mokaraka
4. Raiha Keerako
5. Jade Rata
6. Te Aranga Hopa
7. Puhoro Kaka
8. Kiriwai Hepi
9. Hadassah Wharewhare
10. Kaharau Pickering

2.4 Milestone 4: Wānanga on monitoring framework — May 2017

Milestone 4 involved allowing all participants the opportunity to customise the CHI framework. The CHI indicators were sampled, and sampling methodology was described in tabular format as per Tables 2–5, Appendix B and Section 2.2.5(d) of the *Kauri Cultural Health Indicators — Monitoring Framework* report (Chetham & Shortland, 2013). This stage of our pilot project included field testing of indicators and methods.

Based on our experience in this pilot project, we recommend each community chooses indicator species of relevance and assesses these species against elements across the table at chosen site/s within their rohe. We further recommend they then decide whether they are going to set up fixed plots, transects, or selected walkthrough/s, hotspot/s, etc. The aim is to test the monitoring framework as a ngahere survey technique based on Mātauranga Maori principles and to collect relevant data in order to assess ngahere health, with the eventual goal of making management decisions in the future.

2.4.1 Participants

The following participants were selected for customisation of the CHI framework we used in the AH Reed Memorial Kauri Park.

Tohe Ashby — Kaumātua
Tui Shortland — Project facilitator
Jade Tīpene — Te Kāpehu Whetū teacher
Kay Harris — Te Kāpehu Whetū administrative and logistical support
Poai Tīpene — Monitor
Tui Poutu — Monitor
Heremaia Shortland — Monitor
Jayden Harris — Monitor
Michala Davis — Monitor

Susan Ra — Monitor
Billie Peita — Monitor

It should be noted that a buddy system of teachers, forest experts and Kaumātua was established for the student monitors.

2.4.2 Indicators observed

Cultural indicators are described by the publication, “Cultural Indicators for Kauri Ngahere” (Shortland, 2011), upon which this research pilot is based. AH Reed Memorial Kauri Park monitors agreed to observe the cultural indicators as set out in this publication.

> *Cultural indicators have not previously been applied to PA as a new to science disease and research found that indicators of health were better applied to the ngahere as a whole rather than to kauri as a distinct species, with cultural indicators intertwined with the health of the forest as an entity. Indicators of health were more often connected to the lifecycle of species and when one would normally expect to see certain types of activity in a health forest (e.g. fruiting of trees etc.). Kauri is a cornerstone species in the ecosystem with many species dependent on healthy kauri in order to flourish themselves and research did not reveal any particular weighting of indicators nor produce a ‘highlights’ list of factors which, if present, would indicate healthy kauri.*

This pilot project was specifically designed to carry out one method of CHI data collection only. However, there is potential to undertake several additional methods of data collection in future, in conjunction with the method piloted in this phase of the project.

Each monitor selected a single kauri tree and surveyed an approximately 5 m area around that tree. Monitoring was restricted to this size area to ensure manageability due to time constraints, but it was adequate. In fact, the survey area of 5 m ensured that monitors made assessments up to and beyond the drip line of the kauri. The original framework recommended a wider scope. A wider scope can be tested in a larger programme that allows for monitors to dedicate more time to the actual survey.

All indicator species within the 5-m areas under kauri were observed and noted on the monitoring forms. Indicators were tested by observing the health of species according to traditional knowledge. The abundance and representation of age diversity amongst indicator species were noted by using the tables suggested by the CHI monitoring framework. All species identified during the monitoring were recorded. In addition, the absence of important cultural indicator species was discussed during the monitoring debrief, which allowed for the group to come to conclusions about the overall health of the ngahere. The tables received minor formatting changes to make them more user-friendly.

The pilot study group also had in-depth discussions on the following indicator species and their roles as species with special meaning to the group.

1. Akeake
2. Angiangi
3. Black mamaku
4. Hangehange
5. Harakeke

6. Puka
7. Pōhutukawa
8. Paewhenua/Runa
9. Pūriri
10. Poroporo
11. Pukatea
12. Houheria
13. Horopito
14. Karamū
15. Karo
16. Kānuka
17. Kawakawa
18. Kohekohe
19. Kopakopa
20. Koromiko
21. Kōwhai
22. Kūmarahou
23. Rangiora
24. Māhoe
25. Manono/Raurēkau
26. Matipo/Māpou
27. Mānuka
28. Mingimingi
29. Ngaio
30. Tānekaha
31. Tarata
32. Tutu/Tūpākihi
33. Patete

Qualitative assessments of the health of the ngahere were facilitated by kaumātua in discussing reflections on proverbs, songs, etc. in relation to the forest. These were all widely discussed in a wānanga-type setting. It should be noted that future monitoring could include tables that note these types of discussion.

Indicators not utilised

This section is not applicable (N/A), as all indicators were observed.

Hygiene Protocols

a. *Existing hygiene stations nearby/useful*

We chose the survey site based on the convenient location of a hygiene station; however, it was not functional. We therefore used the boot wash located in the carpark. In future, we will use our own supply of sterigene.

b. *Points where hygiene cleaning will be undertaken*

In future, we will undertake hygiene cleaning on entering and exiting the ngahere (which will be done from the lower carpark).

c. *Alternative/additional hygiene measures which would need to be implemented.*

As above, we will carry our own supply of sterigene (and perhaps will add brushes, etc.) in the future. Taking this precaution will enable us to enter other forest areas where there may not be stations installed.

2.4.3 Site information

Ngahere name:	**GPS/Grid reference**:	**Landowner (e.g. iwi/hapū, DOC, council, private)**:	**Kaitiaki names**:
Kauri	Refer to map	WDC	Tohe Ashby — Kaumātua Tui Shortland — Project facilitator Jade Tīpene — Te kāpehu whetū teacher Kay Harris — Te kāpehu whetū administrative and logistical support Poai Tīpene — Monitor Tui Poutu — Monitor Heremaia Shortland — Monitor Jayden Harris — Monitor Michala Davis — Monitor Susan Ra — Monitor Billie Peita — Monitor
Site name:	**Date:**	**Site description**:	**Tikanga protocols observed**:
N/A as this site is small and has no specific name	29/11/2017	Reserve used as recreation with some kauri aged around 500 years old	• Karakia • Wairua/self-examination
Site reference/number:	**Time of day (e.g., dawn or evening — for monitoring kiwi calls)**:	**Weather/climate**:	**Hygiene/quarantine protocols**:
N/A	Mid-day	Fine day Good visibility	Cleaned shoes prior Entered via hygiene station, which was empty Cleaned shoes at wash station by toilets

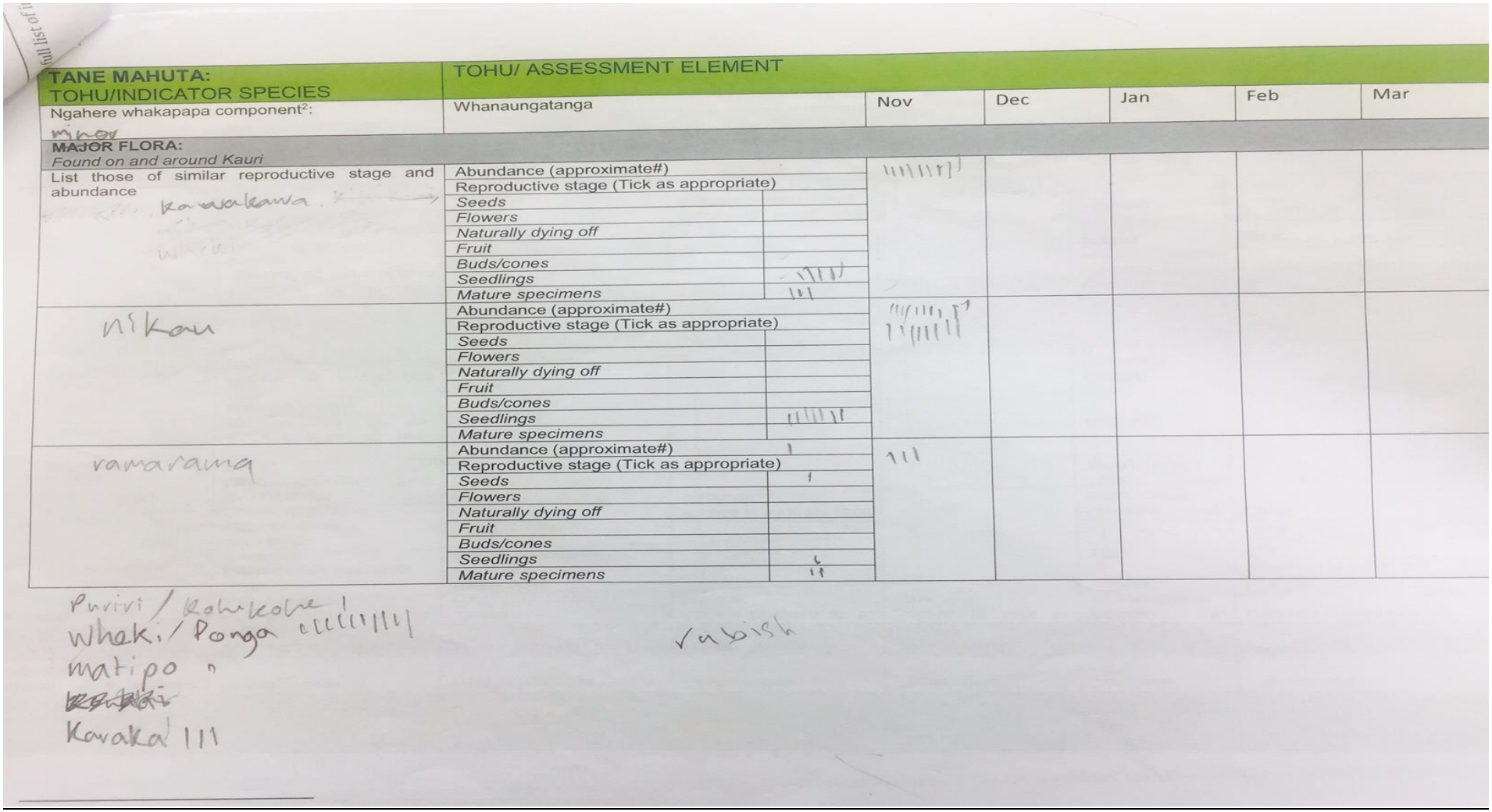
Note. Red font indicates text written by monitors. It was decided that Table 1 would be completed as a group together before departing to the monitoring site.

2.4.4 Ngahere health assessment: Whanaungatanga

TANE MAHUTA: TOHU/INDICATOR SPECIES	TOHU/ASSESSMENT ELEMENT					
Ngahere whakapapa component:	Whanaungatanga	Nov	Dec	Jan	Feb	Comment
MINOR FLORA: *Found on and around Kauri*						
List those of similar reproductive stage and abundance Kauri	Abundance (approximate #)					Only Nov assessment No new seedlings observed — not a good sign Not seed season but saw old cones on ground A lot of kauri in one area of forest
	Reproductive stage (tick as appropriate)					
	Seeds					
	Flowers					
	Naturally dying off					
	Fruit					
	Buds/cones	IIIIIIIII				
	Seedlings					
	Mature specimens	IIII				
	Abundance (approximate #)					
	Reproductive stage (tick as appropriate)					
	Seeds					
	Flowers					
	Naturally dying off					
	Fruit					
	Buds/cones					
	Seedlings					
	Mature specimens					
	Abundance (approximate #)					
	Reproductive stage (tick as appropriate)					
	Seeds					
	Flowers					
	Naturally dying off					
	Fruit					
	Buds/cones					
	Seedlings					
	Mature specimens					

Notes. Red font indicates text written by monitor. A full list of indicator species is available in the "Cultural Indicators for Kauri Ngahere" report (Shortland, 2011). Abundance counts have been made using the tally marks technique for counting.

Figure 6 is an example of raw data illustrating findings about other CHIs.



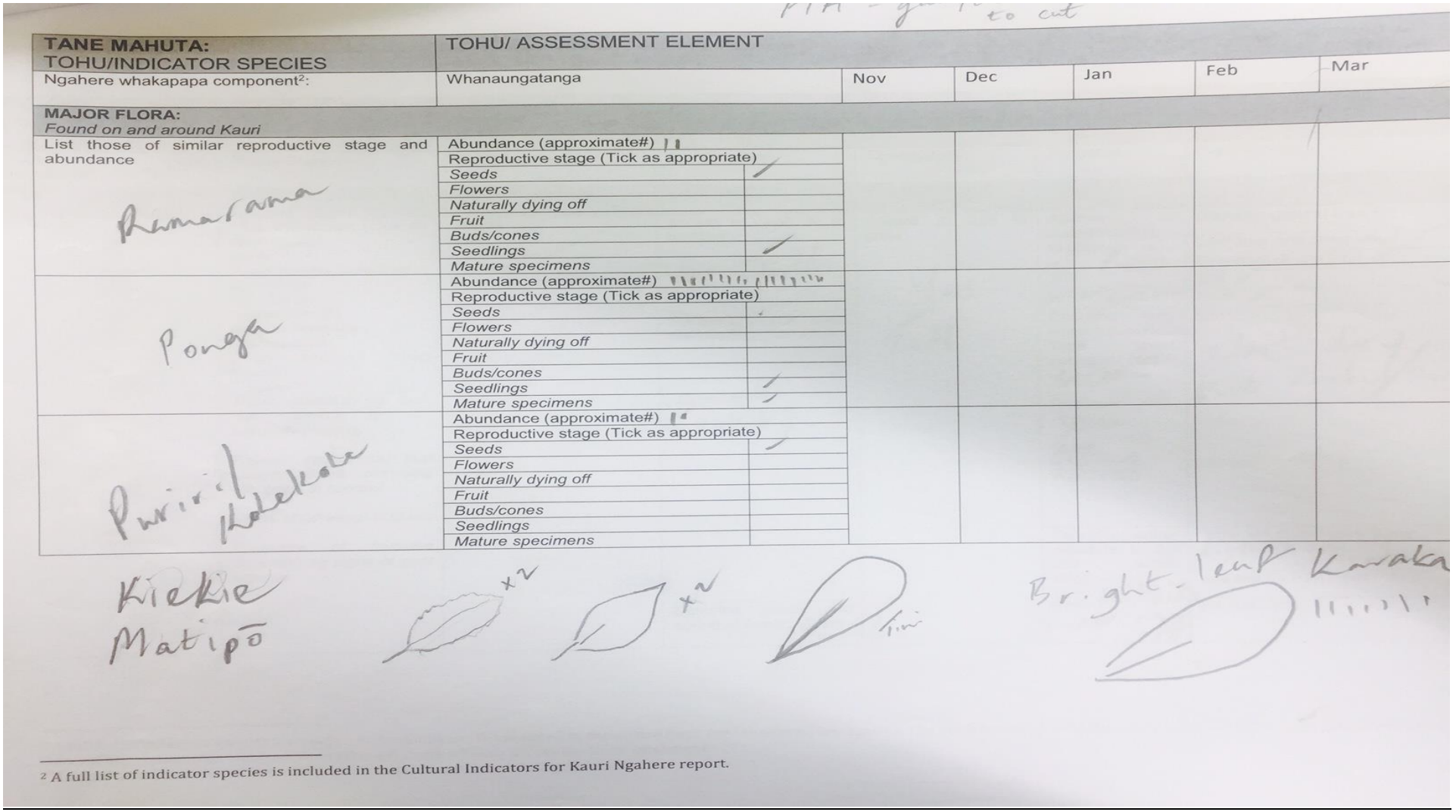
TANE MAHUTA: TOHU/INDICATOR SPECIES	TOHU/ ASSESSMENT ELEMENT					
Ngahere whakapapa component[2]:	Whanaungatanga	Nov	Dec	Jan	Feb	Mar
MAJOR FLORA: *Found on and around Kauri*						
List those of similar reproductive stage and abundance kawakawa	Abundance (approximate#)					
	Reproductive stage (Tick as appropriate)					
	Seeds					
	Flowers					
	Naturally dying off					
	Fruit					
	Buds/cones					
	Seedlings					
	Mature specimens					
nikau	Abundance (approximate#)					
	Reproductive stage (Tick as appropriate)					
	Seeds					
	Flowers					
	Naturally dying off					
	Fruit					
	Buds/cones					
	Seedlings					
	Mature specimens					
ramarama	Abundance (approximate#)					
	Reproductive stage (Tick as appropriate)					
	Seeds					
	Flowers					
	Naturally dying off					
	Fruit					
	Buds/cones					
	Seedlings					
	Mature specimens					

Puriri / Kohukohu
Whaki / Ponga
matipo
Kawaka

rubbish

Figure 6. Raw data from pilot project field work completed at AH Reed Memorial Kauri Park. Note how kawakawa, nikau and ramarama are described.

Another example of raw data can be seen in Figure 7 below.



TANE MAHUTA: TOHU/INDICATOR SPECIES	TOHU/ ASSESSMENT ELEMENT					
Ngahere whakapapa component[2]:	Whanaungatanga	Nov	Dec	Jan	Feb	Mar
MAJOR FLORA: *Found on and around Kauri*						
List those of similar reproductive stage and abundance	Abundance (approximate#)					
	Reproductive stage (Tick as appropriate)					
	Seeds					
	Flowers					
	Naturally dying off					
	Fruit					
	Buds/cones					
	Seedlings					
	Mature specimens					
	Abundance (approximate#)					
	Reproductive stage (Tick as appropriate)					
	Seeds					
	Flowers					
	Naturally dying off					
	Fruit					
	Buds/cones					
	Seedlings					
	Mature specimens					
	Abundance (approximate#)					
	Reproductive stage (Tick as appropriate)					
	Seeds					
	Flowers					
	Naturally dying off					
	Fruit					
	Buds/cones					
	Seedlings					
	Mature specimens					

[2] A full list of indicator species is included in the Cultural Indicators for Kauri Ngahere report.

Figure 7. Raw data collected from the sampling area in AH Reed Memorial Kauri Park for several indicator species.

2.4.5 Ngahere health assessment: Kauri

TANE MAHUTA: TOHU/INDICATOR SPECIES	TOHU/ASSESSMENT ELEMENT					
Ngahere whakapapa component:	Tinana oranga	Whanaungatanga	Tawhirimatea	Tamanuiterā	Tangaroa	Papatūānuku
TREES (SUBCANOPY OR CANOPY)	Tick as appropriate, or approximate #	Tick as appropriate	Y/N or comment	Y/N or comment	Y/N or comment	Tick as appropriate
Kauri	PA Symptoms None √ Basal lesions Defoliation/sparse canopy Severe defoliation Branch death Dead canopy Trunk condition — bark not weeping or un-naturally peeling, found some gum but very limited and seemed normal — tasted normal too! Foliage — proper leaf colour, shape and size, etc.; no gaps in canopy No signs of disease/dieback Presence of invasive species — signs of pest browse on trees and no seedlings on forest floor coming through	Seeds - No Fruit — N/A Buds/cones — Not right season Seedlings — None! Not a good sign Mature specimens — Numerous mature trees	Access to clean air to breathe — Y Access to wind for seed dispersal - Y Describe smell and sound of forest: Quiet, only limited birds, smelt dry	Access to light to grow — Y	Access to water/moisture to grow Y Describe any water course: Awa downhill approx. five metres away. Quality observed — yellowish colour, downstream from farms — Waikino. Spring could be heard in upper area close by Describe water/ moisture in the soil within dripline	Describe ground type: Leaf litter and dead wood Greenery of any kind N Soil — Dry, very compact Rock — Some Other Note soil disturbance if any None Soil test for PA? N pH test? N

Notes. Red font indicates text written by monitor. A full list of indicator species is included above. Those noted on the form are considered key species. The full list is intended to be flexible to allow for differences in both ecology and cultural understandings and traditions amongst mana whenua across the kauri catchment.

2.4.6 Ngahere health assessment: Ngāngara

TANE MAHUTA: TOHU/INDICATOR SPECIES	TOHU/ASSESSMENT ELEMENT						
Ngahere whakapapa component	Tinana oranga *Describes the bodily health and integrity of key species*	Whanaungatanga *Describes abundance of life/reproductive cycle, e.g. eggs, mature ngāngara, etc.*	Kaumātuatanga *Describes the age*	Tawhirimatea *Atua of wind and rain*	Tamanuitera *Atua of light/personification of the sun*	Tangaroa *Atua of sea, rivers, lakes, water*	Papatūānuku *Earth Mother Access to soil to grow*
NGĀRARA: *For the purposes of the Framework refers to insects and reptiles living on or near Kauri*							
Pungaweriweri	Good	Good range	Many babies and mature spiders	Y	Y	Y	Y
Notes	Not enough ngāngara observed, not a good sign of forest health						

Notes. Red font indicates text written by monitor. A full list of indicator species is included in above. Those noted in the form are considered key species. The full list is intended to be flexible to allow for differences in both ecology and cultural understandings and traditions amongst mana whenua across the kauri catchment.

2.4.7 Ngahere health assessment: Manu

TANE MAHUTA: TOHU/INDICATOR SPECIES	TOHU/ASSESSMENT ELEMENT						
Ngahere whakapapa component:	Tinana oranga	Whanaungatanga	Kai	Calls	Behaviour	Tangaroa	Papatūānuku
MANU *Found on or near kauri*							
Tūī	One mature healthy tūī observed	Only one	Food supply for birds and insects (0/-/+) Not many trees in berry	Bird calls/song (0/-/+) Some calling heard	Curious usual behavior	Good access to water	Earth quite dry and compact
Kukupa	Not observed, however are known to inhabit here — regular monitoring could identify						
Tīrairaka	Not observed however known to inhabit here						
Notes	The abundance of manu was very low, which is a poor indicator of health						

Notes. Red font indicates text written by monitor. A full list of indicator species is included above. Those noted on the form are considered key species. The full list is intended to be flexible to allow for differences in ecology, cultural understandings and traditions amongst mana whenua across the kauri catchment. Observations of birds were made either by direct sightings or hearing calls/song. With respect to birds, it is likely that the best time for monitoring is either at dawn ("dawn chorus") or at dusk, 1 hour each side (especially for kiwi calls).

2.4.7 Ngahere health assessment: Alien invasive species

WEEDS:	ABSENT Tick as appropriate	PRESENT Tick as appropriate	ABUNDANT Tick as appropriate
Wandering Jew			
Wild ginger			
Pampas			
Wattle			
Climbing asparagus			
Notes	No pest plants observed, which may be a result of spraying – to check with WDC		
PESTS	ABSENT Tick as appropriate	PRESENT Tick as appropriate	ABUNDANT Tick as appropriate
Possums		Signs of possum grazing on trees observed	
Goats	√		
Pigs	√		
Stock	√		
Rodents			Signs of rodents due to no seedlings coming through
Stoats			Signs of stoats due to no seedlings coming through
Notes	Alien invasive species could be impacting negatively on the health of this forest		

Notes. Red font indicates text written by monitor. Animal pest observations were based on direct sightings or "sign", e.g. possum faeces, pig tracks, browse, etc.

2.4.8 Overall ngahere health assessment

Mauri/Hau o Te Kauri assessment				
Ngahereora	Ngaheremaori	Ngaherekino √	Ngaheremate	Comments: After group debrief, it was confirmed that due to the lack of indicators that contribute to forest health that Ngaherekino is the Mauri assessment
Tumatauenga Describe access to site Easy, visitor car parks and toilet on site Describe use of site (e.g. contemporary or traditional customary use, tourism, etc.) Recreational, traditional and customary use — particularly at the falls				Photo record/site sketch listed here

Notes. Red font indicates text written by monitor. Monitors indicated health by ticking applicable categories.

3 Recommendations

3.1 Sampling period

This project was for one sampling wānanga (session) only; however, during school term, we propose to monitor sites on a monthly basis to be consistent with the traditional lunar calendar, and to hold special two-day wānanga on a seasonal basis.

3.2 Estimated costs (or hours) required for annual survey

We recommend two days per month, including planning and reporting.

3.3 The impact or any potential to reduce costs

We have been consistent with the CHI monitoring framework for the most part, and we consider it possible to apply our refined data collection methodology across multiple ngahere, thus streamlining operations. Empowering students to be monitors is our way of reducing costs.

3.4 Fit or customisation of the CHI framework undertaken

Effort involved in each instance

The monitoring included a preliminary orientation and a thorough training in data sampling techniques. After field work was completed, the team participated in a debrief. Effort involved was approximately 4 hours in total, not including travel time. Future monitoring of sites could be a similar half-day effort, including the debrief with monitors to reflect on data collected.

3.5 Replication at additional sites

This pilot methodology could be replicated at additional sites. There is opportunity to monitor the entire Parihaka Scenic Reserve cluster. Local mana whenua also requested that Pukenui Forest be monitored in the future. There is potential to replicate this methodology in other hapū areas throughout the kaurilands region.

3.6 Potential for future customisations with other mana whenua or different ngahere to require less effort, if so, approximately how much?

There is potential for other mana whenua to carry out similar monitoring in their own ngahere, if they have existing functioning environmental management units.

3.7 Practicality of creating pre-customised templates for monitoring of similar kauri sites or ngahere

This pilot was practical. The templates we have used have been vetted by wānanga and have been reviewed by TWR, so they are unlikely to require significant change from rohe to rohe or for other mana whenua groups. In fact, this pilot demonstrated the breadth of indicators that can be captured in templates. Minor additions can be made in comment boxes we have supplied, or fields can be left blank if a topic is not relevant at a particular location. Therefore, we feel CHI framework templates lend themselves well to further customisation. However, they do not replace the need to wānanga/hui with mana whenua, although the number of wānanga required may less because the templates are universally applicable.

3.8 Gaps or constraints, etc. of the CHI framework: make recommendations if appropriate

Plant identification cards were supplied to ensure integrity of recording of other species assessed. These cards are the intellectual property belonging to Kaumātua and are therefore examples are not included in this report.

3.9 List advantages and disadvantages of each sampling approach (with respect to CHI monitoring of kauri dieback) and provide points to guide future decision making.

Advantages

- Potential for long-term data on kauri ecosystem health to be collated
- Potential for community data to be aggregated into national reports
- Education and advocacy opportunity for youth. Students being able to focus on one tree provides a sense of “ownership”, and they will likely be keen to return to assess health of the tree and ngahere.

Disadvantages

- Monitors need to know a wide range of species; however, this could be managed by ID sheets.

4.0 Other

a. *Performing another similar exercise with different mana whenua, or*
b. *Scoping a long term study.*

A long-term study was scoped in the original proposal for CHI monitoring and should be revisited by the KDP. This trial field work demonstrated the survey could be completed easily (by school students no less) and could easily be transferred to other locations.

This site was easy to access, but access may be a constrained in other locations. Therefore, travel time should be taken into account in future planning.

4.1 Likelihood of each ngahere utilising the CHI framework as customised above

Discussions with various hapū who were all supportive of utilising the CHI framework have been carried out via the TWR meetings. It is recommended that a wider hapū programme be carried out and an expression of interest (EOI) process be followed to confirm where the other monitoring sites could be. Since the TWR reviewed the original proposal/framework, there has always been a very high level of support by mana whenua for trialling this methodology on the ground.

4.2 Comment on the final list of indicators produced: how would they (or their analysis) provide a measure of current (or changing) kauri tree, or kauri ngahere mauri?

If gathered monthly over a long enough period of time, data about changes in health of individual kauri trees can be observed, as can the health of the surrounding ngahere. The data could be used to inform interventions and management decisions, such as some of those proposed during previous Tangata Whenua Roopu workshops, to improve kauri forest health. In addition, assessments could be made after the interventions to measure changes and the effectiveness of interventions.

4.3 Feasibility of implementing a CHI programme, and how this would add value to either the management of the ngahere and/or kauri dieback per se

This project becomes more feasible when it is combined with school activities/assessments/curriculum, as has been done in this pilot. This combination may keep long-term costs low (e.g., for paid monitors, administrators, etc.), and has the potential to be replicated in other rohe/mana whenua groups.

This pilot could be an option used in selecting participants for future ngahere to be monitored. The mana whenua ability to align with school or tertiary research programmes and or other activities already occurring, e.g. pest management/surveillance/other mahi in forests takes advantage of existing capability while building capacity at the “flax-roots” level, without creating a costly and time consuming exercise. Effort still needs to be applied to kickstart initial wānanga, etc. to ensure mana whenua leadership as appropriate.

4 Report review

On completion of our initial pilot wānanga, feedback from monitors was sought to assess their thoughts on the framework. Each spoke highly of the experience, and many comments described the excitement of spending time in the forest and looking forward to returning. It should also be noted that when school term opened in the New Year, students sought out the project facilitator and asked when the next monitoring session would happen. Also, good feedback from teachers was received, and another wānanga is being planned for this term.

This report was reviewed by Juliane Chetham via tracked changes she made to the draft report on November 30th, 2016. Any suggestions not incorporated into the report were resolved by phone discussion. Discussion included: differences in indicators used as opposed to the original CHI framework; adaptability of monitoring tables; students' ability to fill out the forms; recommendations around frequency of monitoring; total hours required for monitoring; applying the monitoring methodology in other forests; and education and advocacy opportunities for students.

This report was also reviewed by Te Warihi Hetaraka during the month of November (2016) with a view to protecting traditional knowledge and intellectual property of those involved in the project. It was agreed that the level of information shared in the report was appropriate. Furthermore, this report was reviewed by the TWR at a meeting held December 7–8th, 2016 and was endorsed by way of resolution. No review report was produced.

The endorsed report was provided to the KDP on December 9th, 2016 and was reviewed by the Planning and Intelligence team on March 9th, 2017. Feedback was provided on the report on March 20th, 2017. Additional feedback was provided on March 23rd, 2017.

The report was endorsed by the Planning and Intelligence team on 31 May 2017.

5 Bibliography

Council, W. D. (2009). *Parihaka and Hatea River Reserves Management Plan.* Whangarei: Whangarei District Council.

Shortland, T. (2011). *Cultural Indicators for Kauri Ngahere.* Whangarei: Repo Consultancy Ltd.

Shortland, T., & Chetham, J. (2013). *Kauri Cultural Health Indicators - Monitoring Framework.* Whangarei: Repo Consultancy Ltd.