School of

Engineering and Computer Science

Te Kura Mātai Pūkaha, Pūrorohiko

CYBR 171 T1 2023

Ngā whakapūtanga o Te Haumaru rorohiko
Cybersecurity Fundamentals

Week 10 - Protection models

WHAT CAN THE PAST TEACH US ABOUT CYBERSECURITY TODAY?

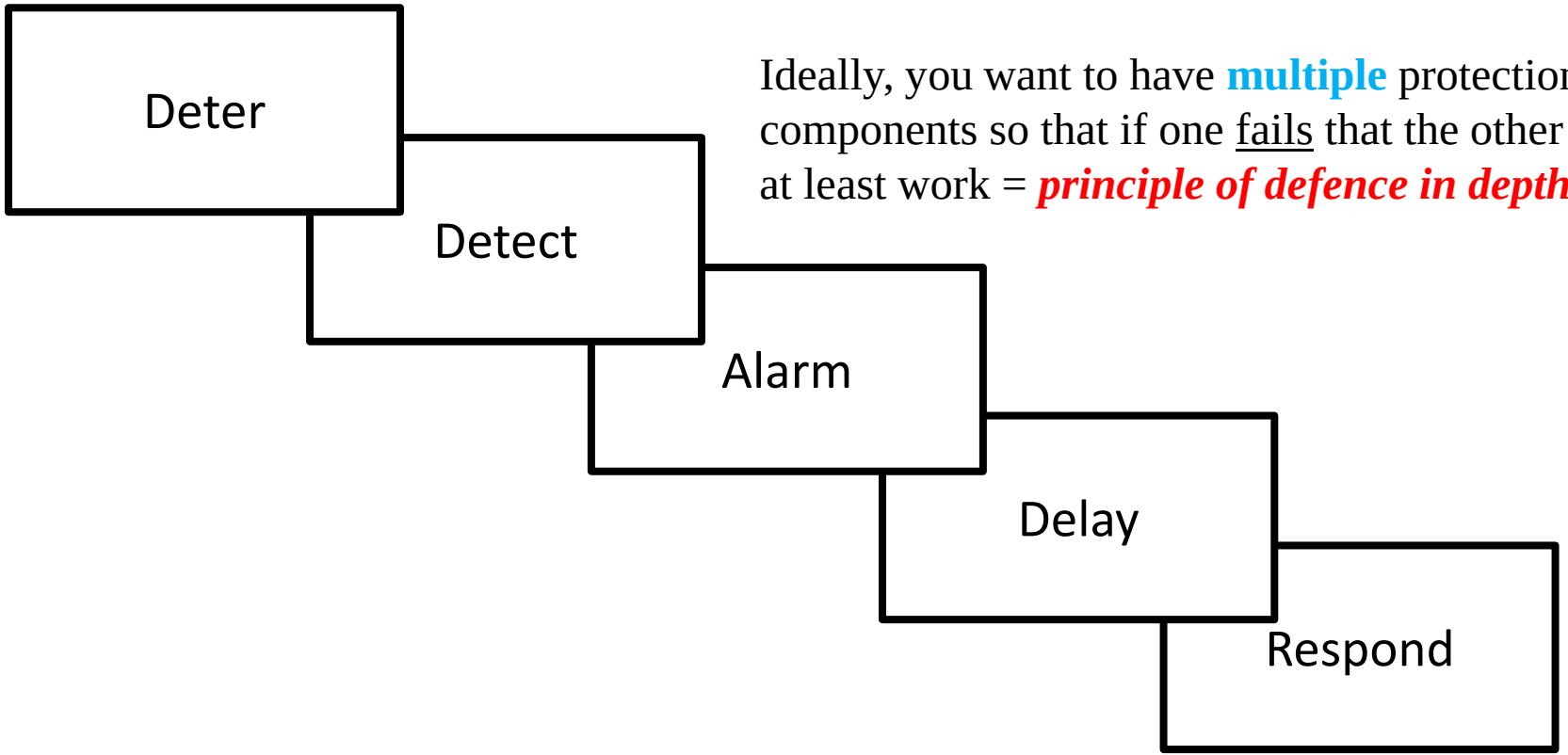
Cybersecurity inspired by design of physical protection systems

- We need to consider the **widest idea** of how we defend our systems.
- Can take inspiration from design of **military examples** of physical protection systems like castles, forts, and pā.
- *Physical protection systems* have **evolved over time** to counter **new types of attacks** and this is also seen with *cybersecurity*.
- Physical protection is also important in the context of cybersecurity because **servers and other physical assets** must be protected by locks and safes etc.

Design a protection system

- We need to know what are we trying to protect the system **against** before we choose how to defend.
- What are the potential attacks i.e. threats.
- Define the ***threat model***:
  a) Who are our attackers?
  b) What are their goals?
     - ***what assets are they targeting***
     - ***what do they intend to do to the assets***
  c) What are their capabilities?
     - ***what is their level of skill***
     - ***what equipment can they use***

Model of the components of a protection systems



Ideally, you want to have **multiple** protection components so that if one fails that the other might at least work = ***principle of defence in depth***

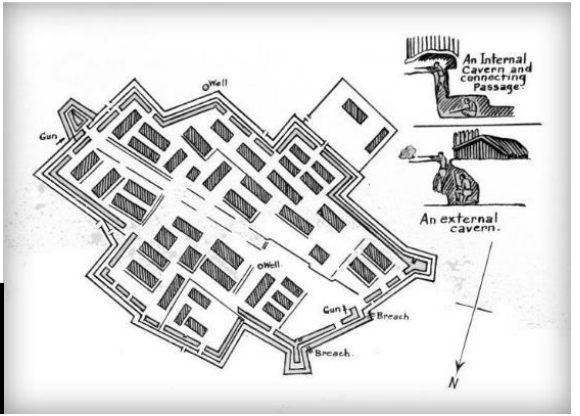
CASE STUDY: BATTLE OF RUAPEKAPEKA

Case study

- Going to talk about a military case study from Aotearoa – the Battle of Ruapekapeka.
- This was over 176 years ago but from Northland Māori point of view, this is not the distant past.
- Many Ngāpuhi today can recount stories of their own ancestors during the Northern War and the battle of Ruapekapeka.
- There are resources at the end for anyone who is affected by the discussion that follows.

Battle of Ruapekapeka

- British aimed to **kill** or **capture** the leaders of the "rebels" Heke and Kawiti.
- **Was not achieved** even though British outnumbered their forces by ratio of **4:1** and used cannons, howitzers, mortars and rockets.
- Success substantially due to design of Kawiti's ***pā*** that ***mitigated*** the effect of the British numbers and weapons.
- https://www.radionz.co.nz/programmes/nz-wars/story/2018619186/nz-wars-the-stories-of-ruapekapeka



Cybersecurity is also a story of evolution of attacker and defensive tactics (see CYBR 471 – Offensive and Defensive Security)

Context: the Northern War (1845-6)

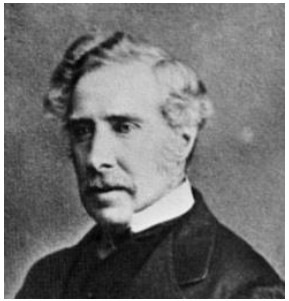
- Ngāpuhi went to war because British not honouring the spirit of the 1840 **Treaty of Waitangi/Te Tiriti o Waitangi**.
- Māori fighting for rights guaranteed under **Te Tiriti o Waitangi**.
- The British were attempting to suppress the "natives" **rebelling against the Crown**. Assisted by factions of Ngāpuhi.
- **Five campaigns** against Māori pā – twice destroying undefended pā, failed to take one, defeated at another and finally **the Battle of Te Ruapekapeka** (31 December 1845- 11 January 1846).

https://teara.govt.nz/en/map/393/traditional-lands-of-ngapuhi

https://www.ruapekapeka.co.nz/the-northern-war/

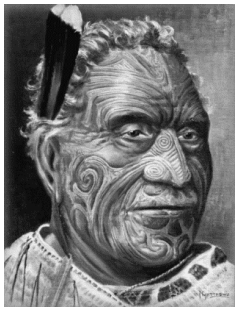
Attackers and defenders

- Attackers were British troops (***Colonel Despard*** commissioned by ***Governor Grey***) assisted by Ngāpuhi allies (led by ***Wāka Nene***)



George Grey
1812-1898
intelligent,
ambitious,
ruthless

Henry Despard
1784-1859
prejudiced,
old fashioned,
incompetent?



Wāka Nene
1780-1871
astute,
diplomatic,
misunderstood?

- Defenders were Māori warriors led by the generals ***Hōne Heke*** and ***Te Ruki Kawiti***

Hōne Heke
1807-1859
charismatic, fiery,
intelligent

Te Ruki Kawiti
1774-1854
distinguished,
honourable, talented

Ruapekapeka threat model

a) Who are our attackers?
   - British troops and allies

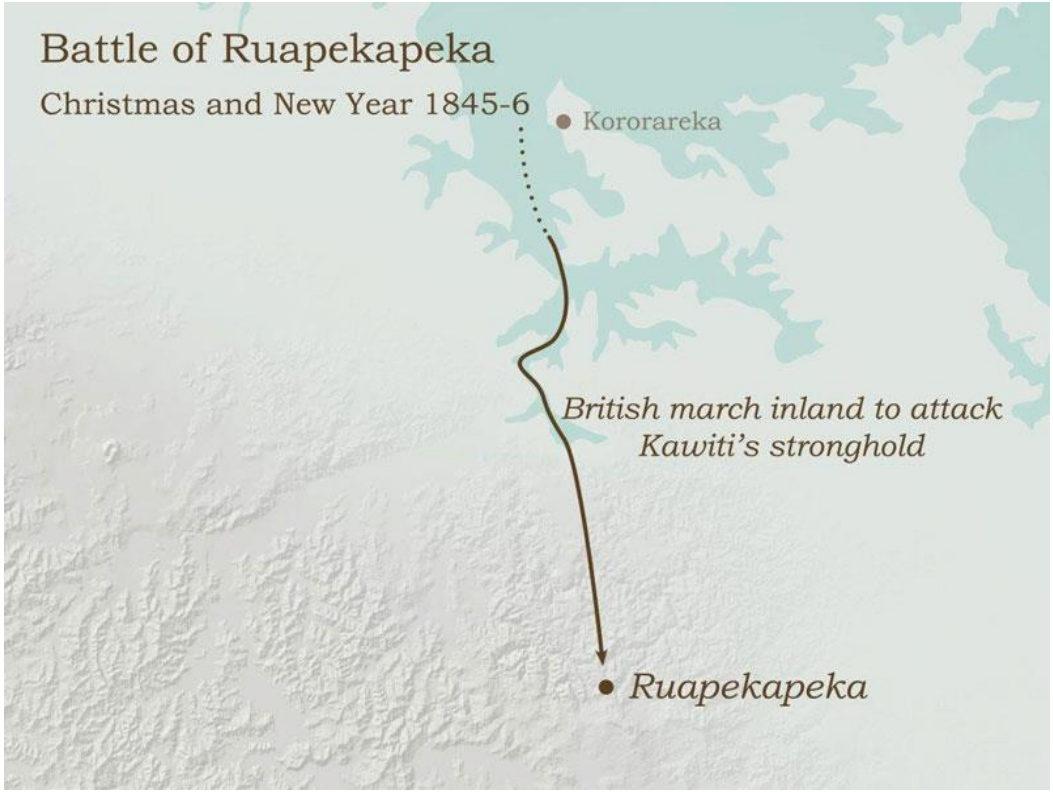
b) What are their goals?
   - Kill or capture Heke and Kawiti.
   - Annihilate the “rebel” forces.
   - Capture the land occupied by the “rebel” forces

c) What are their capabilities?
   - 4:1 advantage – 1600 British versus 400 Māori.
   - Use of heavy artillery to blast the pā defences.
   - Use of coordinated musket fire (“volley” fire).

DETER THE ATTACKER: PREVENT THEM FROM BREAKING INTO YOUR SYSTEM

Deterring the attacker (cont.)

- Hide your asset or make it inaccessible
  - 15 km from the sea.
  - No track.
  - Dense forest.
  - Took 3 weeks to get there.
  - Site has no strategic value to the defenders
    - Purely a fighting pā



Deterring the attacker (cont.)

These men of Ngāti Tūwharetoa are performing a haka peruperu (war dance with weapons) on Waitangi Day 1934. The haka peruperu was traditionally performed immediately before a battle. Its purpose was to inspire warriors to feats of strength and bravery, and to terrify their opponents.

Psychological warfare approach: **scare them**

Deterring the attacker (cont.)

Haka was composed for the battle making clear consequences of an attack

Haka clip from 175th anniversary mass haka https://video.link/w/E32qc

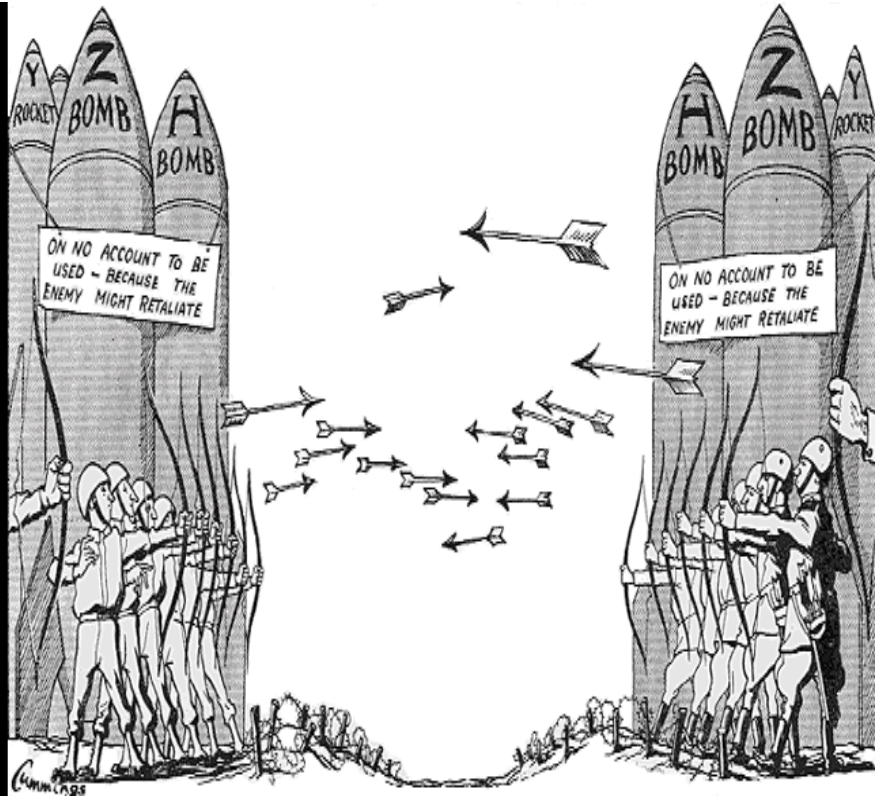
Deterring the attacker (cont.)

Make the **cost** of winning too high

MUTUALLY ASSURED DESTRUCTION:

(MAD)

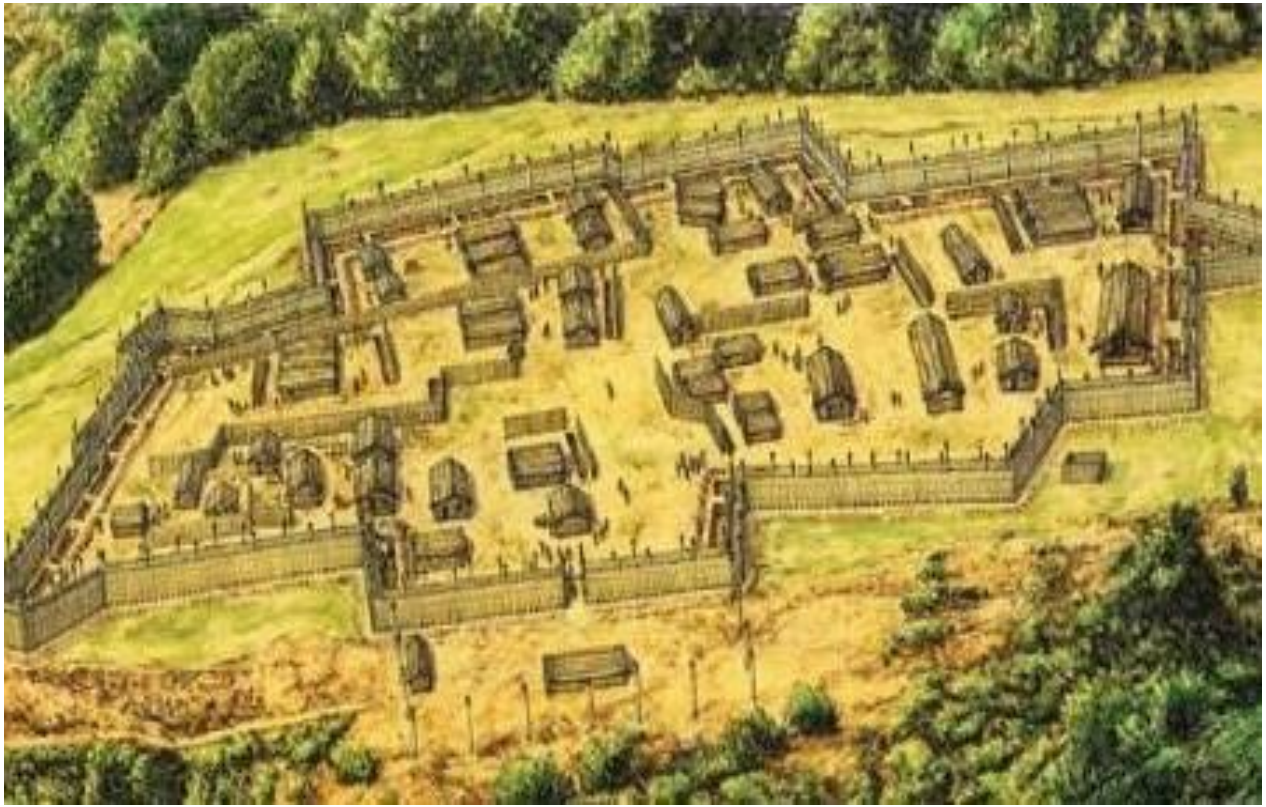
Military theory of nuclear deterrence holding that neither side will attack the other if both sides are guaranteed to be totally destroyed in the conflict.



Walls and Barriers

- Deter/stop/slow the attackers using **walls** and **barriers**.
- Establish a **perimeter** around the **protected asset**.
- **More than one perimeter** used, should be strong as needed to slow/stop the attacker.

Walls and Barriers (cont.)



Two timber palisades (3m high).

Tree trunks against heavy fire, bundles of green flax to deaden the impact of musket fire

Walls and Barriers (cont.)

Use of bunkers to defend against heavy artillery.

https://www.rnz.co.nz/programmes/nz-wars/story/2018619172/nz-wars-animation-the-palisades

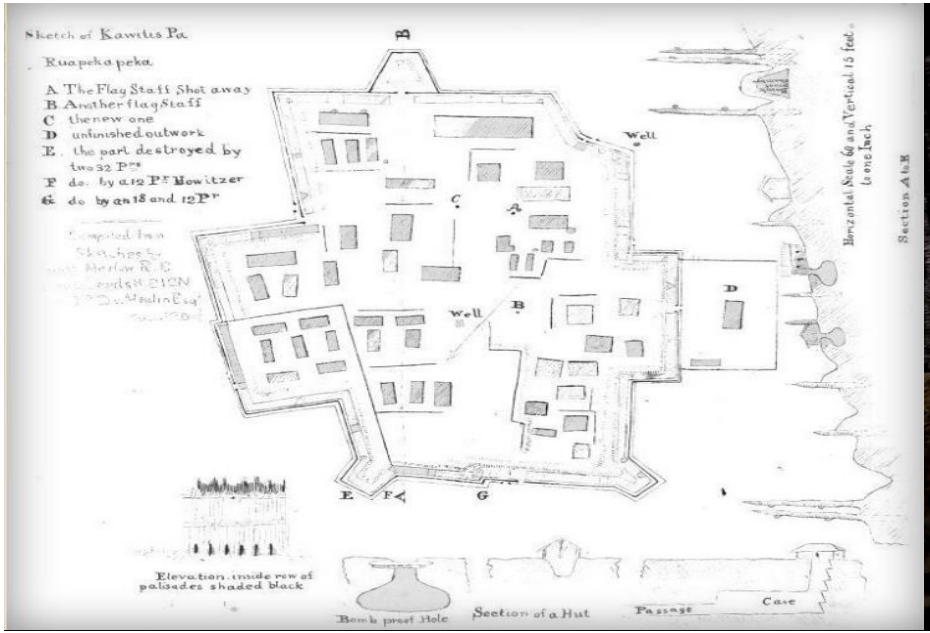
DETECT THE ATTACKER: A MECHANISM FOR DETECTING THE ATTACKER'S ATTEMPT TO BREACH PROTECTION

Detection

View of Pā on the hill from British encampment.

Good visibility from all sides because pā looks down.

Detection (cont.)



Design of the walls allowed those inside to observe (and fire) through gaps and loopholes.

ALARM: ALERT THE DEFENDERS OF THE ATTACK

Alarm

- Pūtātara (shell trumpet)
- Person observes and alerts.
- Heard over long Distances

https://video.link/w/IPro

Alarm (cont.)

Use a stealthy signalling system

Ruapekapeka has good visibility to surrounding maunga (mountains)

Used korowai (cloaks) with white on one side for signalling over a distance of up to 15km

Alarm (cont.)

Use runners.

WW1 trench runners shown.

Note trench design maybe influenced by pā design.

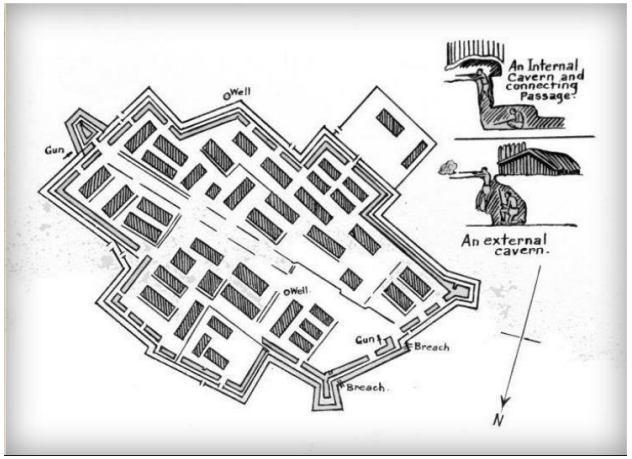
Alarm (cont.)

- Potentially alert using a secondary channel.
- Your email etc. might be compromised.

DELAY: SLOW DOWN THE ATTACK TO PROVIDE TIME TO RESPOND

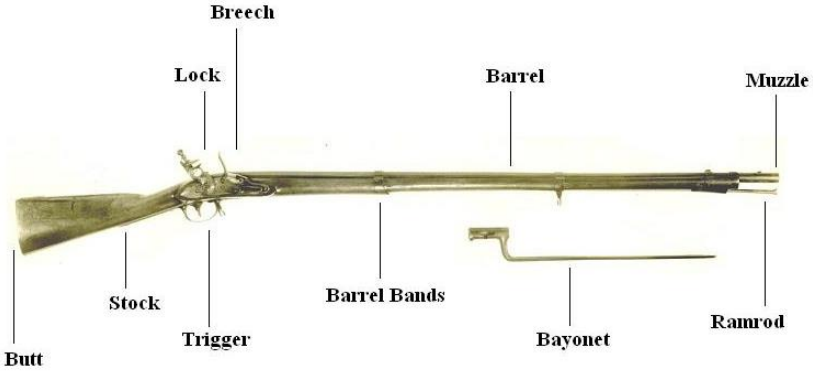
Delay

- Multiple barriers to get past:
  - Pallisades
  - Trenches
- No clear line of sight down the trenches to slow attackers once inside.
- Interior has multiple lines of defence to slow attackers.
- Maze of felled timbers at the back of the pā.



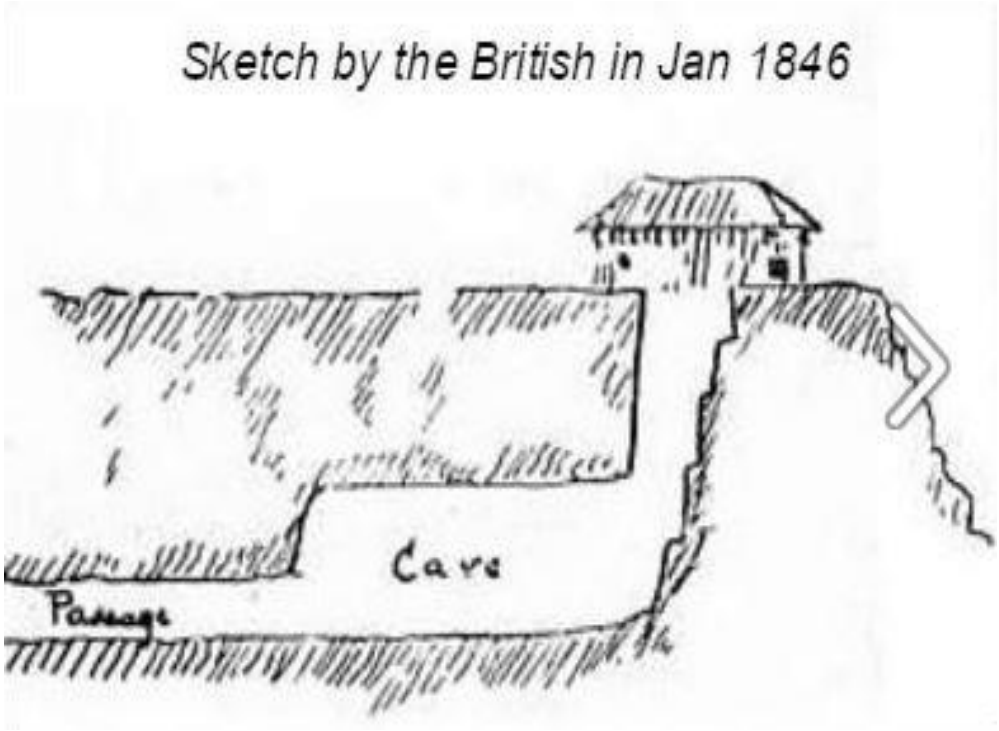
RESPOND: DEFEND AGAINST THE ATTACK OR PROTECT THE ASSETS

Respond



- Fire from the underneath the walls and gun pits.
- Trained warriors firing in unison (volley fire).
- Māori artillery (use of them hampered by lack of projectiles).
- Shown is Kawiti's restored 18 pound carronade that had been damaged during the battle.

Respond (cont.)



Besides responding with fire, alternative is to have an exit strategy – possible using tunnels

Protect the assets (Heke, Kawiti and warriors).

Small force left behind to cover retreat and draw out British.

Respond (cont.)

Defenders drew the British into an ambush for those following.

Defenders took all ammunition with them **indicating a planned retreat**.

THE LEGACY

Who won the battle?

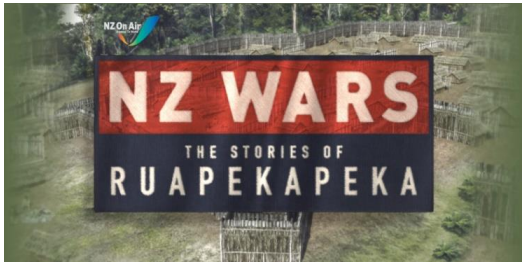
- In the context of the size of country at that time, this was an important, brutal and costly event.
- British has 12 killed and 29 wounded, defenders had perhaps 9 to 25 casualties.
- British took the land and claimed victory, **but** it held no significant value.
- Ngāpuhi protected their leaders and most of the warriors were able to retreat to fight another day.
- Following the Northern War, breaches of the treaty continue - Māori lost land due to manipulative land purchases and denied opportunities to participate in governance of the colony.

Want to find out more

Kevin Shedlock (ECS) lecturer and researcher working with indigenous communities to better understand technology from within an indigenous lens (https://people.wgtn.ac.nz/kevin.shedlock)

Te Ruapekapeka Trust website and app (https://www.ruapekapeka.co.nz)

NZ Wars: The Stories of Ruapekapeka (https://www.rnz.co.nz/programmes/nz-wars)



WRAPPING UP

What we covered

- Model of understanding protection – threats, walls and barriers.
- Discussed each element with real-world example from case study.
- Next: we will look at some other aspects of protection in the physical world such as locks, safes and alarms used to protect data centres.

Resources

Coping with grief and distress following a critical incident. (https://www.wgtn.ac.nz/student-health-counselling/resources/coping-with-grief-and-distress-following-a-critical-incident)

The following services external to the University may also be useful, and are available 24 hours a day, seven days per week:

- Need to talk: free call or text 1737 any time to speak to a trained counsellor
- Lifeline: call 0800 376 633 or text 4357
- Youthline: call 0800 376 633, free text 234, or email talk@youthline.co.nz
- Suicide Crisis Line: 0508 828 865
- Te Haika/Crisis Resolution Services: 0800 745 477.