

APPENDIX 3. DETAILS ON EXISTING AND PROPOSED NON-VOLCANIC GEOHERITAGE ONFs (all publicly available from internet site)

The high values of South Auckland Volcanic heritage ONFs is discussed all together in Appendix 2

EXISTING ONF 2. Daff Road Jurassic Plant Beds.

Most easily accessible and most robust source of extremely well reserved Jurassic plant beds of Huriwai Formation. A small farm quarry exposes a 10 m thick sequence through Huriwai Formation, including 2 m of rich plant fossil-bearing argillites. Sand beds also contain wood and other scattered plant fossils. Nominated by Prof J. Grant-Mackie (Auck), Dr B Hayward (Auck), 1993

Suggested ONF E. Small fragile geological exposures of rock

Boffa Miskell assessment *“Does not qualify as ONF - scale”*.

GSNZ response **“A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory MOST CERTAINLY DOES qualify as an ONF, as it has for the past 20 years. The RMA provides no mention that a small feature is too small to qualify as an ONF!**



EXISTING ONF 3. Kaawa Creek - Ngatutura Bay Section.

Complexly interrelated upper Cenozoic strata and faulting. Type section, Kaawa Formation. Only significant Pliocene fauna in north-west North Island. Rich, diverse and well-preserved molluscs. Good example of faulting. Most impressive coastal landforms eroded into columnar-jointed basalt in New Zealand. Spectacular outcrops of dissected eruptive centre including lava flows, dikes and diatreme.

Nominated by Prof J. Grant-Mackie (Auck), Prof P. Kamp (Ham), Late Prof P. Ballance (Auck), Dr A. Beu (LHutt), Dr B. Hayward (Auck), Prof R. Briggs (Ham), Prof K. Rodgers (Auck), 1991

Suggested ONF Category E. Small fragile geological exposures of rock and B. Small fragile landforms.

Boffa Miskell assessment *“Proposed SAL Kaawa Dunes. Identified as HNC Kaawa Creek.”*

GSNZ response *“A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory MOST CERTAINLY DOES qualify as an ONF, as it has for the past 20 years. This ONF is for the geology exposed in the coastal cliffs and rocks south of the Kaawa Valley mouth and for the spectacular coastal landforms of Ngatutura Pt – it is not part of Kaawa dunes or Kaawa valley. It would clearly also qualify as a small ONL on landscape assessment grounds, see photos.”*









EXISTING ONF 4. Kellyville Tuff Ring.

Nominated by Prof I Smith (Auck), Prof R. Briggs(Ham), late L. Kermode (Auck), 1990

Suggested ONF Category A. Large robust landforms

[See South Auckland Volcanic Field appendix]

EXISTING ONF 5. Moeweka Quarry Jurassic Fauna.

Excellent molluscan and brachiopod fossil fauna of Late Jurassic (Heterian) age.

Nominated by Prof J. Grant-Mackie (Auck), Dr D. MacFarlan (NewPlym), 1986

Suggested ONF Category E. Small fragile geological exposures of rock

Boffa Miskell assessment *“Does not qualify as ONF. Sensory/Associative values”*.

GSNZ response *“A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory MOST CERTAINLY DOES qualify as an ONF, as it has for the past 20 years.*



EXISTING ONF 6. Onewhero Tuff Ring.

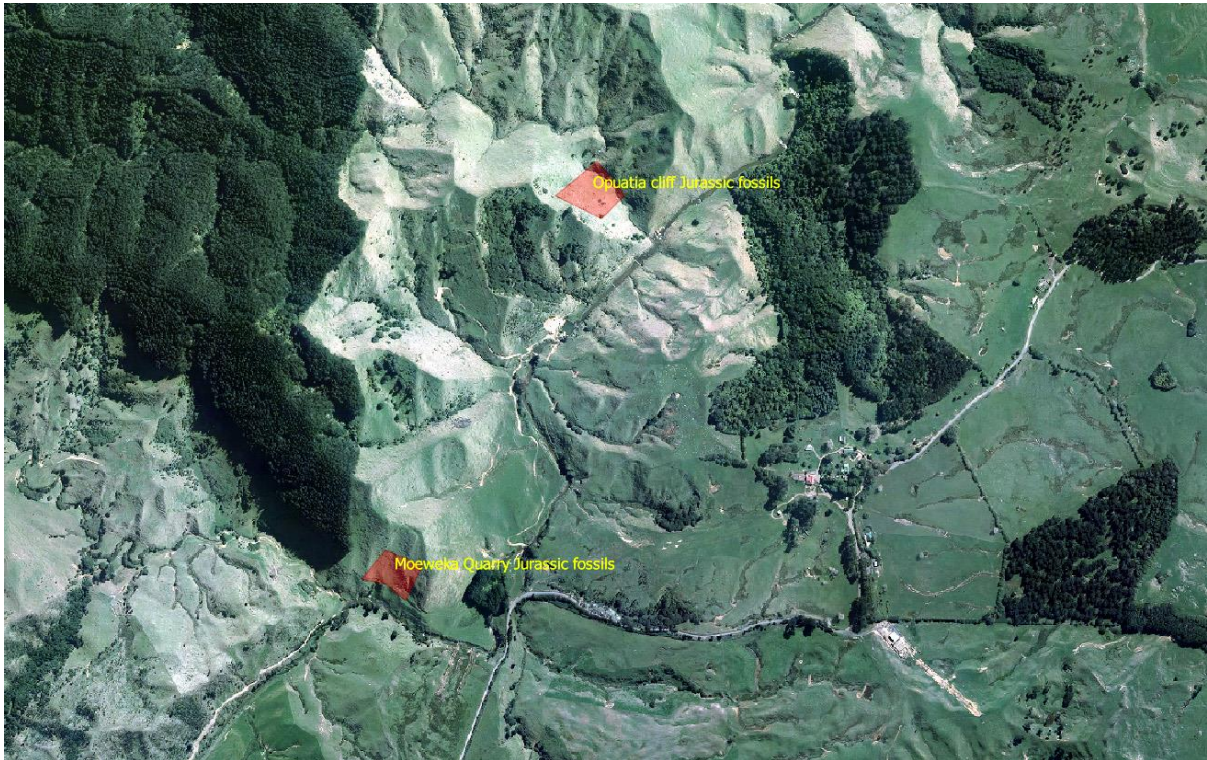
Nominated by Prof I Smith (Auck), Prof R. Briggs (Ham), late L. Kermodé (Auck), 1990
Suggested ONF Category A. Large robust landforms
[See South Auckland Volcanic Field appendix]

EXISTING ONF 7. Opuatia Cliff Jurassic Fauna.

Rich, diverse and well-preserved molluscan and brachiopod fossil fauna of mid Jurassic (Temaikan) age.
Nominated by Prof J. Grant-Mackie (Auck), Dr D. MacFarlan (New Plym), Dr H. Campbell (Wgtn), 1986
Suggested ONF Category E. Small fragile geological exposures of rock

Boffa Miskell assessment “Does not qualify as ONF at District Scale. Sensory/Associative values”.

GSNZ response “A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory MOST CERTAINLY DOES qualify as an ONF, as it has for the past 20 years. RMA makes no mention of minimum size requirement for an ONF!”



EXISTING ONF 8. Port Waikato To Tuakau Bridge Road Jurassic Section.

New Zealand holotype section of the Late Jurassic Waikatoan Substage of Puroan Stage. South side Waikato River, section alongside Port Waikato - Tuakau Bridge road between points 0.5 km east of Daff Road and 2 km west of Daff Road.

Nominated by Prof J Grant-Mackie (Auck), the late Dr B. Challinor (Ngaruawahia), Dr G. Stevens (LHutt), Dr H. Campbell (Wgtn), 1986

Suggested ONF Category D. Large geological exposures

Boffa Miskell assessment *“Does not qualify as ONF. Currently mapped as SNA”*.

GSNZ response *“A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory MOST CERTAINLY DOES qualify as an ONF, as it has for the past 20 years. Presence within a SNA will not protect most of the values of this ONF which rely on continued clean exposure of the rocks.”*



EXISTING ONF 9. Pukekawa I Scoria Cone.

Nominated by Prof I Smith (Auck), Prof R. Briggs (Ham), late L. Kermode (Auck), 1990
Suggested ONF Category V. Volcano landform
[See South Auckland Volcanic Field appendix]

EXISTING ONF 10. Huriwai Beach Jurassic Plant Beds.

Extremely well-preserved and historically significant late Jurassic fossil flora. Type locality of several species.
Nominated by Prof J Grant-Mackie (Auck), Dr I Raine (LHutt), Dr H. Campbell (Wgtn), 1986
Suggested ONF Category E. Small fragile geological exposures of rock

Boffa Miskell assessment “*SNA overlay to Huriwai (west) coast. Within coastal environment – but not identified as HNC or ONC*”.

GSNZ response “A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory **MOST CERTAINLY DOES** qualify as an ONF, as it has for the past 20 years. Its values all revolve around the amazing fossil leaves and ferns and have nothing do to with natural character of the landscape, so not HNC or ONC which would not protect the fossil values of this small site.





ADDITIONAL ONFs SUGGESTED TO BE ADDED TO PWDP

1. Port Waikato sandspit

Largest sandspit of active sparsely vegetated dunes on the west coast of New Zealand, with the exception of Farewell Spit.

Large area of mobile sand dunes on a growing sandspit at the mouth of the Waikato River, where long-shore drift is greater than river discharge rates. The sandspit has extended northwards by more than 1.5 km in the last 150 years. Nominated by Dr J Kenny (Auck) 2011 – assessed as of national importance in the NZ Geopreservation Inventory. Suggested ONF Category A. Large robust landforms

Boffa Miskell assessment “Include unmodified part of sandspit in Waikato River Delta ONF”

GSNZ response “A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory MOST CERTAINLY DOES qualify as an ONF based on its geoheritage values.” We are happy that it is to be included as it should have always been in an ONF.





2. Ngapuriri natural arch and surrounding Waikawau Valley karst

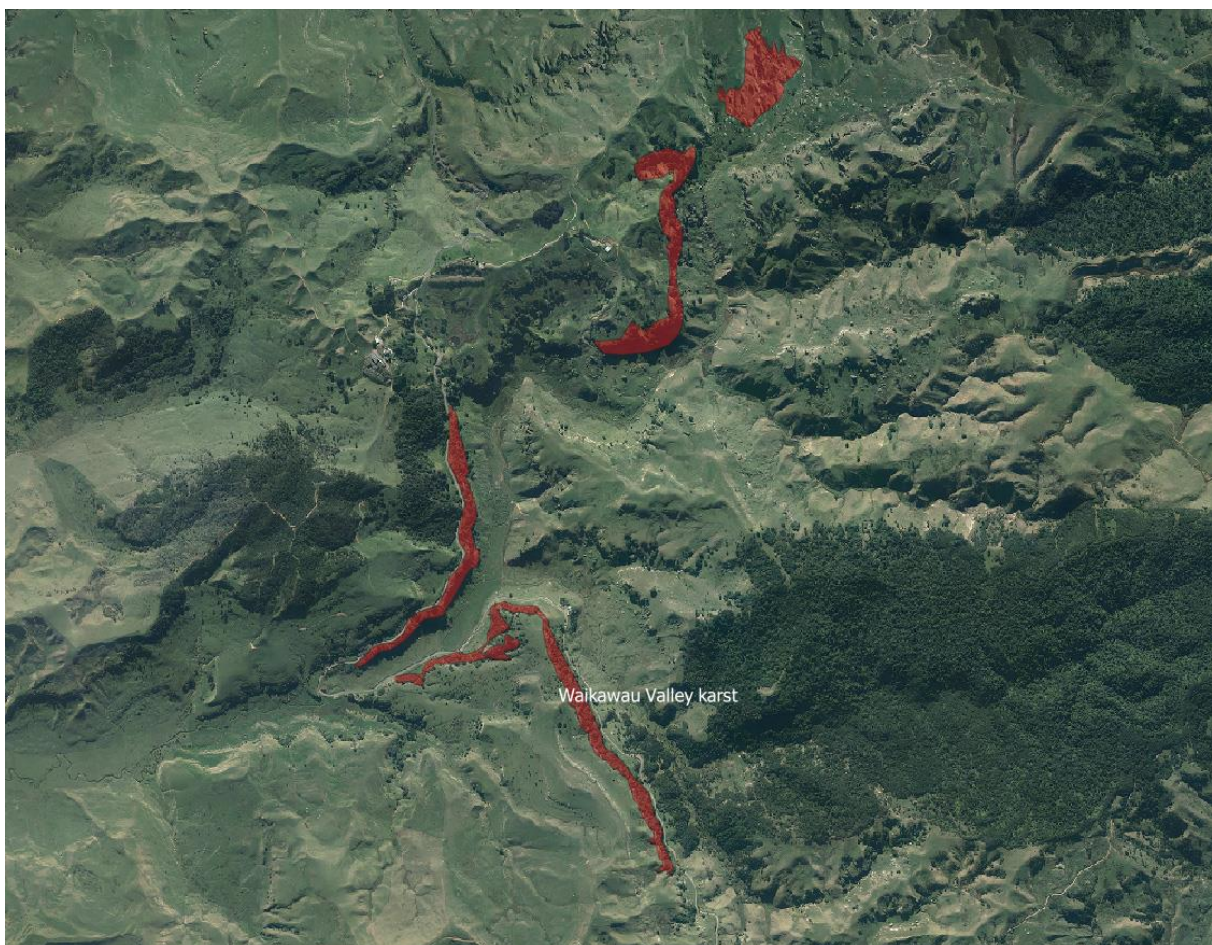
Only known inland example in New Zealand of a natural arch (ie. formed by wind erosion unlike natural bridge formed by water erosion). Within a small area of spectacular joint-controlled karst.

Natural arch in calcareous sandstone (Glen Massey Formation), in an area of parallel, joint-controlled clints (blocks isolated by solution fissures). Spectacular grikes, clints and fluting. One of sites used in filming of Lord of Rings because of its spectacular limestone karst landforms – best in Waikato District and among best karst areas in New Zealand. Nominated by Dr H Grenfell (Auck), Dr B Hayward (Auck), 2008. Assessed as of national importance in the NZ Geopreservation Inventory.

Suggested ONF Category B Small fragile landforms and F Caves

Boffa Miskell assessment “Does not qualify as ONF at District Scale”

GSNZ response “A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory MOST CERTAINLY DOES qualify as an ONF Should well exceed threshold for nationally outstanding ONF and ONL – see photos.













3. Huriwai-Waikawau coastal section

Oligocene rocks and unconformity; diverse topmost Jurassic macroflora. Deltaic Upper Jurassic (and perhaps basal Cretaceous) indurated siltstones, sandstones and conglomerate with diverse floras overlain with marked Great New Zealand Unconformity by Oligocene to Lower Miocene calcareous sandstone, flaggy limestone and marl.

Nominated by Prof J Grant-Mackie (Auck), late Prof P. Ballance (Auck), 1987

Suggested ONF Category D. Large geological exposures

Boffa Miskell assessment “*In coastal environment*” and “*SNA overlay.*” No comment on ONF.

GSNZ response “A site assessed as regionally significant for its scientific values in the NZ Geopreservation Inventory should exceed threshold for ONF at district level using Geoheritage criteria.



4. Waiwiri Beach unconformity and basal Waitemata group

Well exposed transgressive basal Waitemata sequence on eroded and bored Te Kuiti Group. Transgressive Waitemata Group sequence overlying a bored and eroded unconformity on the Te Akatea Limestone. The sequence contains inner shelf fossiliferous siltstones, outer shelf glauconitic phosphatic cast beds and bathyal sediments of the Waikawau Sandstone.

Nominated by Dr F Brook (Nelson), Dr B Hayward (Auck), 1987

Suggested ONF Category E. Small fragile geological exposures of rock

Boffa Miskell assessment “High Natural Character .. SNA overlay”

GSNZ response “A site assessed as regionally significant for its scientific values in the NZ Geopreservation Inventory should exceed threshold for ONF at district level using Geoheritage criteria. HNC and SNA do not recognise the geoheritage values of these rock exposures.





5. Pukeotahinga scoria cone

Suggested ONF Category V. Volcano landform
[See South Auckland Volcanic Field appendix]

6. Onewhero scoria cone

Suggested ONF Category A. Large robust landforms
[See South Auckland Volcanic Field appendix]

7. Kauri Rd scoria cone

Suggested ONF Category A. Large robust landforms
[See South Auckland Volcanic Field appendix]

8. Onepoto volcanic cone

Suggested ONF Category A. Large robust landforms
[See South Auckland Volcanic Field appendix]

9. Te Kohanga tuff ring and Tikorangi cone

Suggested ONF Category V. Volcano landform
[See South Auckland Volcanic Field appendix]

10. Rasmussen Rd tuff ring

Suggested ONF Category A. Large robust landforms
[See South Auckland Volcanic Field appendix]

11. Waiuku volcanic cone

Suggested ONF Category A. Large robust landforms
[See South Auckland Volcanic Field appendix]

12. Pokeno scoria cone

Suggested ONF Category V. Volcano landform
[See South Auckland Volcanic Field appendix]

13. Serpell Rd tuff ring

Suggested ONF Category V. Volcano landform
[See South Auckland Volcanic Field appendix]

14. Puketoka conglomerate

Type locality of Puketoka Formation and best exposed section through rhyolitic sedimentary rocks and conglomerate containing clasts of flow-banded rhyolite, chalcedony and rare, silicified wood derived from Coromandel Peninsula. Provides a time constraint on the foundering of the Hauraki Graben.

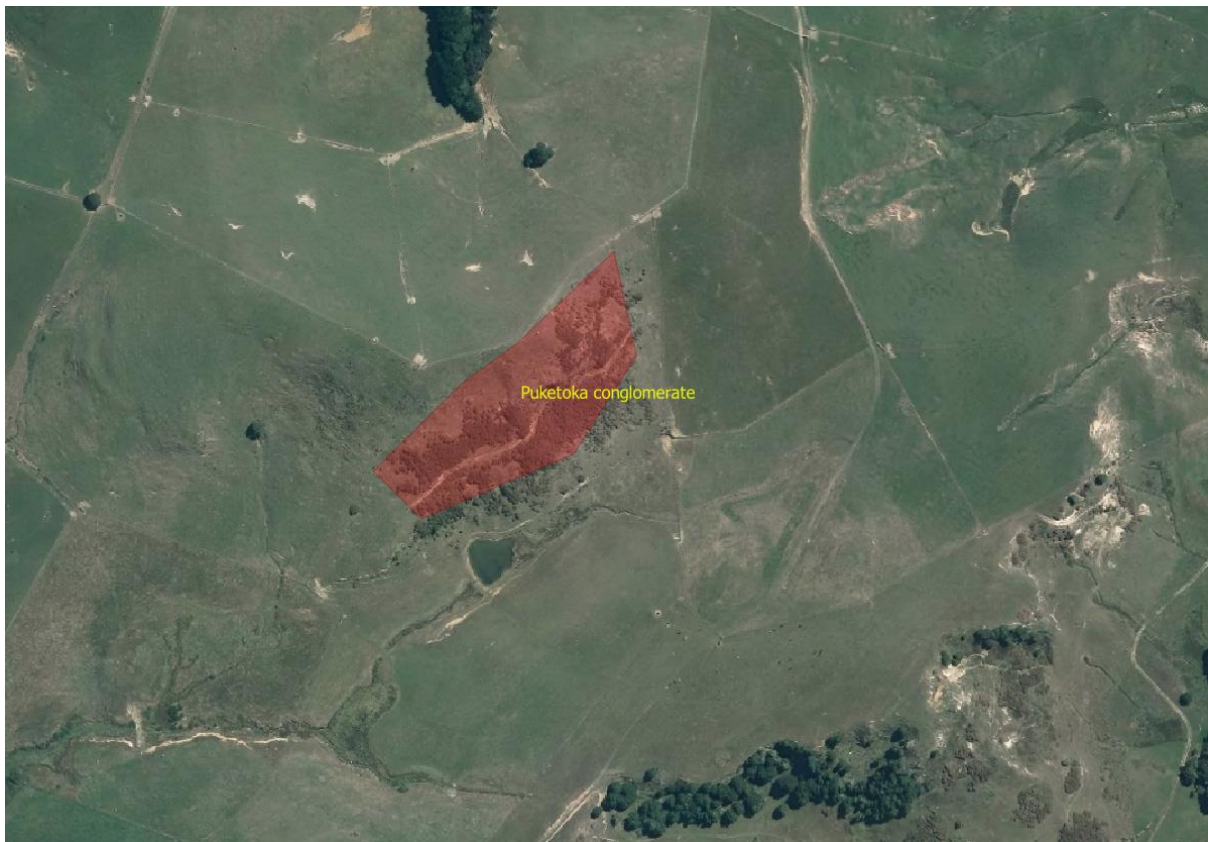
30 m sequence with rhyolitic ignimbrite and tuffs at base and conglomerate at top, exposed in bluffs on farm, and down farm track.

Nominated by B. Hayward (Auck), 2007. Assessed as Nationally significant in NZ Geopreservation Inventory.

Suggested ONF Category E. Small fragile geological exposures of rock

Boffa Miskell assessment *“Does not qualify as ONF at District Scale. Sensory/Associative values”.*

GSNZ response *“A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory MOST DEFINITELY does exceed threshold for ONF at district level.*





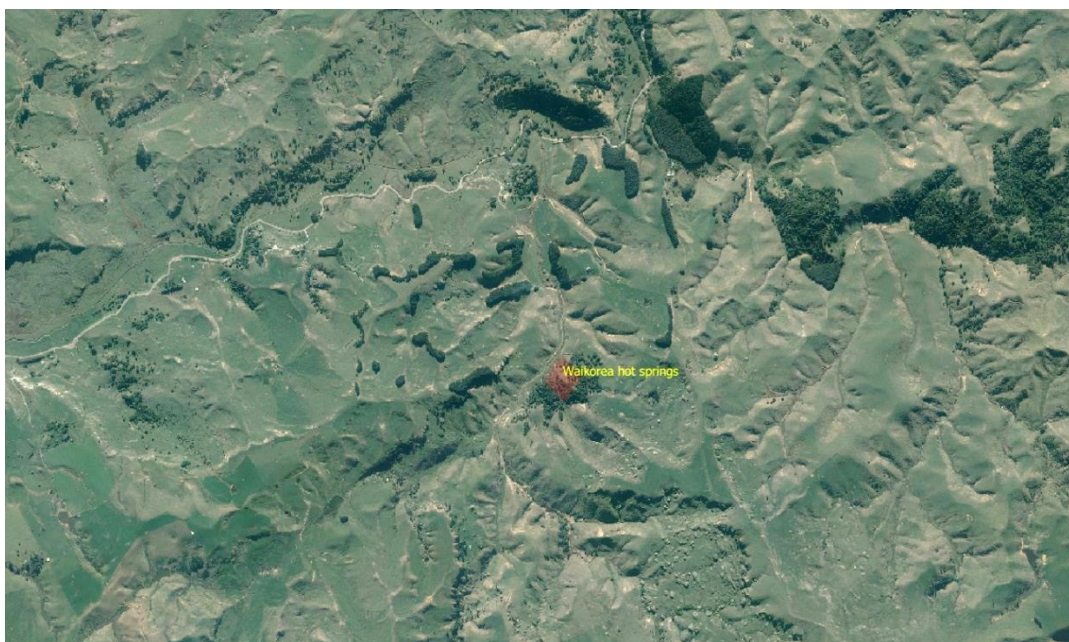


15. Waikorea hot springs

Suggested ONF Category C. Dynamic landforms and natural systems.

Boffa Miskell assessment *“Does not qualify as ONF at District Scale. Scale”*

GSNZ response **“Needs more detailed assessment to see if underground hot water system needs protection as ONF or using policies under 9 Geothermal of WRPS. RMA does not indicate a minimum size for ONFs.”**



16. Gibsons Beach unconformity and fossil karst

Excellent exposure of channelled unconformity, sitting on paleokarst.. Nearby is a small mushroom rock. Coarse sandstone and conglomerate of the Kawau Subgroup filling 5 m deep channels in the Te Kuiti Group, in some places directly overlying a paleokarst surface. Also nearby is a 4 m high mushroom rock of Otorohanga Limestone in the intertidal zone.

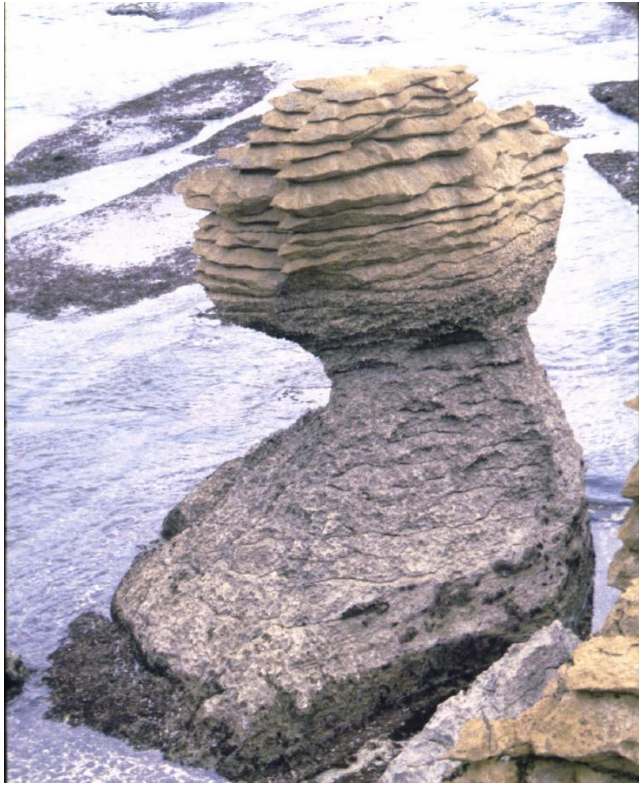
Nominated by Dr F Brook (Nelson), late Prof P. Ballance (Auck), Dr B Hayward (Auck), 1987

Suggested ONF Category E. Small fragile geological exposures of rock and Suggested ONF Category B Small fragile landforms.

Boffa Miskell assessment “Identified as SAL. Te Kotuku Dunes”.

GSNZ response “A site assessed as regionally significant for its scientific values in the NZ Geopreservation Inventory should exceed threshold for ONF at district level using Geoheritage criteria. A sand dunes SAL does not provide recognition or protection for rock exposures in the cliffs and small rocky shore landforms.”





17. Taupiri Gorge

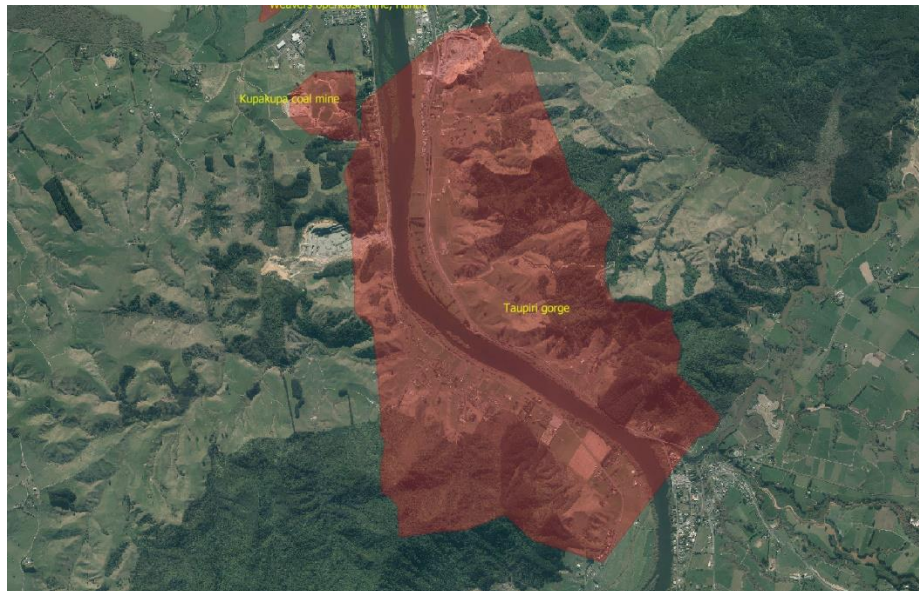
Largest and best example of an antecedent gorge in the northern North Island. The Waikato River has eroded the gorge down as the greywacke range has been pushed up through it.

Nominated by Dr S. Edbrooke, 1986

Suggested ONF Category A. Large robust landforms

Boffa Miskell assessment *“Some of the ONF areas of Taupiri Range and Hakarimata Range fall into this area”*.

GSNZ response *“A site assessed as regionally significant for its scientific values in the NZ Geopreservation Inventory should exceed threshold for ONF at district level using Geoheritage criteria. We are pleased that the upland parts of this important landform feature are in proposed ONFs even of they are identified from a landscape point of view. This does not give any recognition of the high landform value for the lower parts of the gorge and river as it flows and erodes through it. We assert only part of this geoheritage ONF is therefore covered by the landscape ONFs.*



18. Dunphail Bluffs Oligocene sandstone

Type section for Glen Massey Formation and its members.

Eroded bluff composed of a prominent sandstone overlying siltstone and a basal limestone. Bluff forming Glen Massey Formation overlies Mangakotutu Siltstone which erodes to a hummocky surface prone to slumping.

Nominated by DR S. Edbrooke (LHutt), 1987

Suggested ONF Category D. Large geological exposures

Boffa Miskell assessment *“Does not qualify as ONF at District Scale. Scale, Sensory/Associative values”.*

GSNZ response *“A site assessed as regionally significant for its scientific values in the NZ Geopreservation Inventory should exceed threshold for ONF at district level using Geoheritage criteria.*

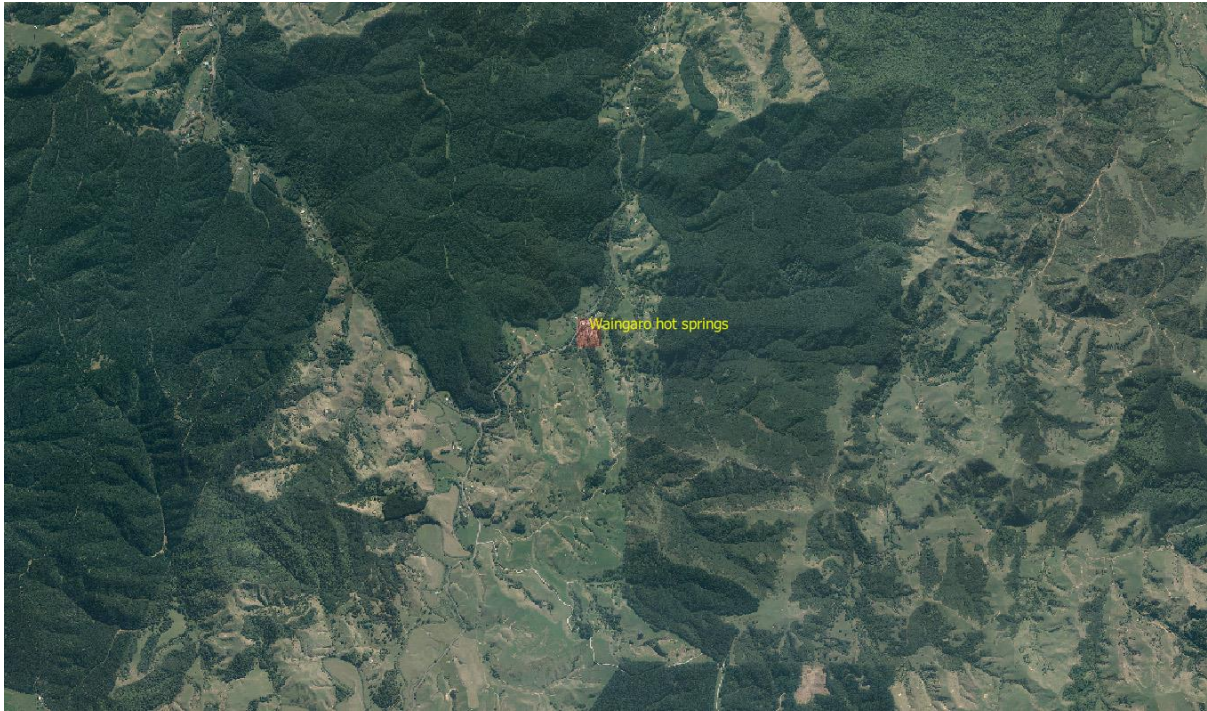


19. Waingaro hot springs

Suggested ONF Category C. Dynamic landforms and natural systems.

Boffa Miskell assessment *“Does not qualify as ONF at District Scale. Scale, Sensory/Associative values”*.

GSNZ response *“Needs more detailed assessment to see if underground hot water system needs protection as ONF or using policies under 9 Geothermal of WRPS.”*



20. Carters Beach shore platforms

One of the best examples in New Zealand of a remnant Holocene highstand shore platform, also an excellent example of an eroding rectangular shore platform in silty limestone.

Partly eroded remnant of seaward-dipping shore platform eroded in silty limestone and cut by 1-2 m spaced eroding joints forming a spectacular rectangular paving pattern. The remnant shore platform is 1.5-2 m above the level of the modern shore platform at high tide level and in many places forms small flat-topped stacks.

Nominated by B. Hayward (Auck), 2014. Assessed as of national scientific importance in the NZ Geopreservation Inventory.

Suggested ONF Category B Small fragile landforms

Boffa Miskell assessment “*Within coastal environment, but not as HNC or ONC*”.

GSNZ response “A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory **MUST EXCEED** the threshold for ONF at district level using Geoheritage criteria. Being in the Coastal Environment is not enough to protect the small landform values of this feature.”





21. Raglan coastal karst

Most easily accessible and well-known example of spectacular coastal karst on west coast North Island. Well-developed pavement with clints and grikes. Some low pinnacles.

Four areas of coastal karst in intertidal zone and low vegetated cliffs. In several places the karst extends up onto the land as areas of extensive limestone rocky outcrops or discontinuous bluffs. Numerous small pinnacles, and areas of pavement with joints. Flaggy Oligocene limestone formed into high towers. Intertidal solution runnels well developed in places. Solution notches reflecting current and former sea levels.

Nominated by the late B. Waterhouse (Auck), Dr J. Kenny (Auck), 2009.

Suggested ONF Category B Small fragile landforms and F Caves

Boffa Miskell assessment “Parts identified as HNC in Rangitoto Point”.

GSNZ response “A site assessed as regionally significant for its scientific values in the NZ Geopreservation Inventory should exceed threshold for ONF at district level using Geoheritage criteria. Should also exceed the threshold for a small ONL on landscape grounds. HNC for Rangitoto Pt does not provide the recognition for this rare coastal karst nor for the other areas of coastal karst beyond Rangitoto Pt.”







22. Te Toto Gorge lava and pyroclastic sequence

Sequence of lavas and intercalated pyroclastics, site of a parasitic vent of the Karioi Volcano.

Nominated by Prof R. Briggs (Ham), 1990

Suggested ONF Category D. Large geological exposures

Boffa Miskell assessment *“Identified as very high natural character, ONL and SAL”*.

GSNZ response *“A site assessed as regionally significant for its scientific values in the NZ Geopreservation Inventory should exceed threshold for ONF at district level using Geoheritage criteria. Natural character and amenity landscape classifications do not recognise and necessarily protect the high heritage value of the rock exposures.”*



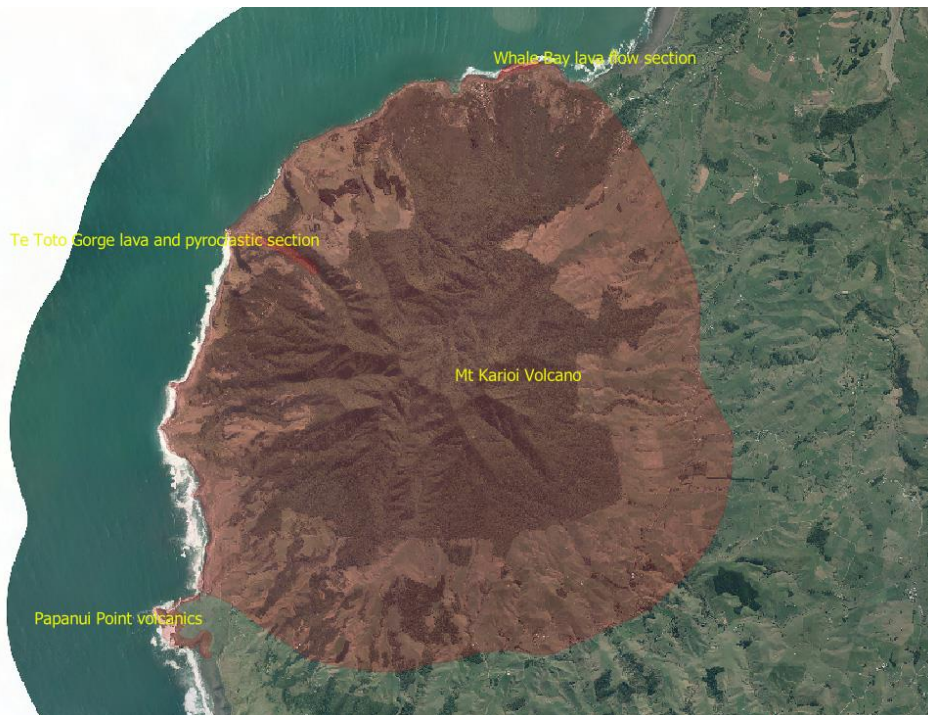
23. Mt Karioi

Large prominent volcanic cone visible from large surrounding area.

Nominated by Prof R Briggs (Ham), Dr B Hayward (Auck), 2005. Assessed as nationally important in NZ Geopreservation Inventory.

Suggested ONF Category A. Large robust landforms

GSNZ response “A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory EXCEEDS threshold for ONF at district level using Geoheritage criteria. We are pleased to note that the upper parts of Mt Karioi are recognised as a proposed ONF and that most of the lower parts are at least recognised as SAL.”



24. Papanui Pt volcanics

Well exposed section through Okete Volcanics. A sequence of olivine tholeiite lava flows exposed along the shoreline. Nominated by Prof R. Briggs (Ham), 1990.

Suggested ONF Category D. Large geological exposures

Boffa Miskell assessment “*Identified as SAL*”.

GSNZ response “A site assessed as regionally significant for its scientific values in the NZ Geopreservation Inventory should exceed threshold for ONF at district level using Geoheritage criteria. Being included in a Significant Amenity Landscape does not necessarily recognise nor provide for the protection of the heritage values in the rock exposures.



25. Bridal Veil Falls columnar jointed basalt

A spectacular single drop waterfall over edge of eroded lava flow. Excellent example of a columnar jointed basalt lava flow.

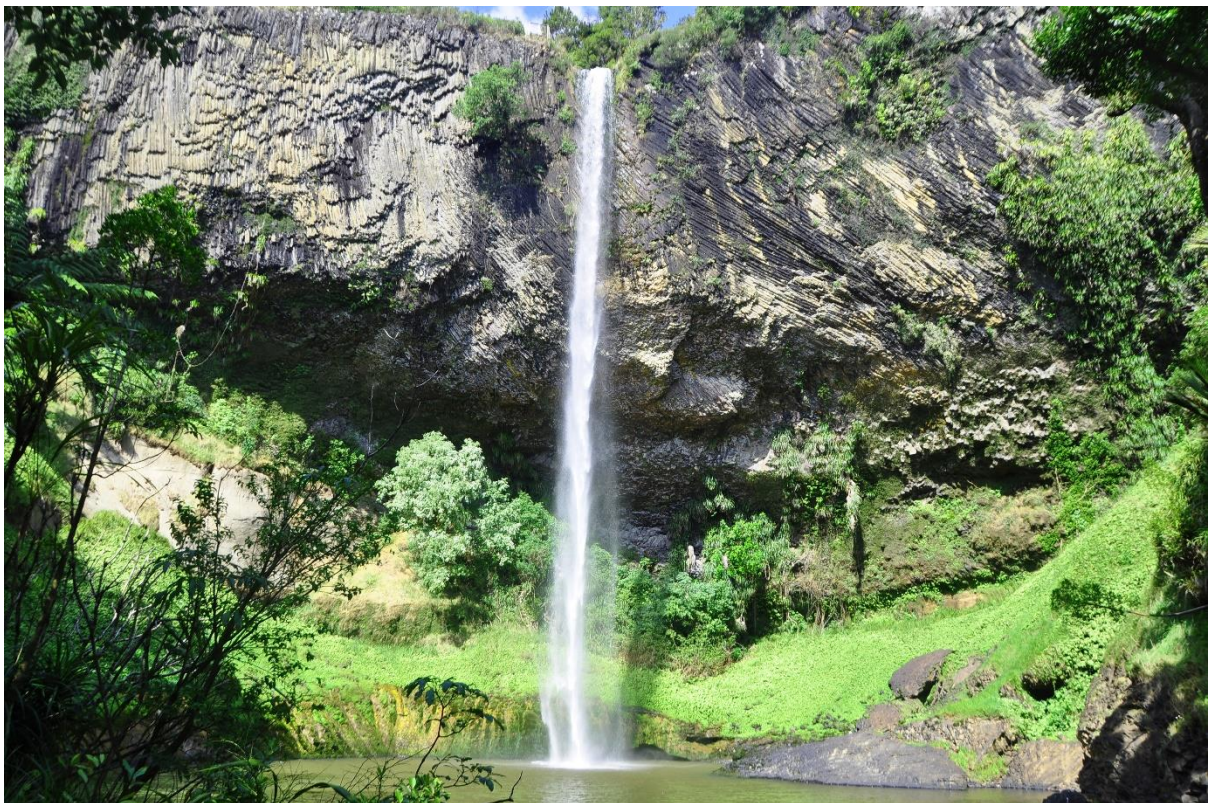
Nominated by Dr B. Hayward, Prof R. Briggs, 1990

Suggested ONF Category B Small fragile landforms.

Boffa Miskell assessment “*Identified as ONF Waireinga*”.

GSNZ response “A site assessed as regionally significant for its scientific values in the NZ Geopreservation Inventory should exceed threshold for ONF at district level using Geoheritage criteria. We are pleased to see this amazing landform is in a proposed ONF.”





26. Lake Disappear blind valley

27. Lake Disappear karst

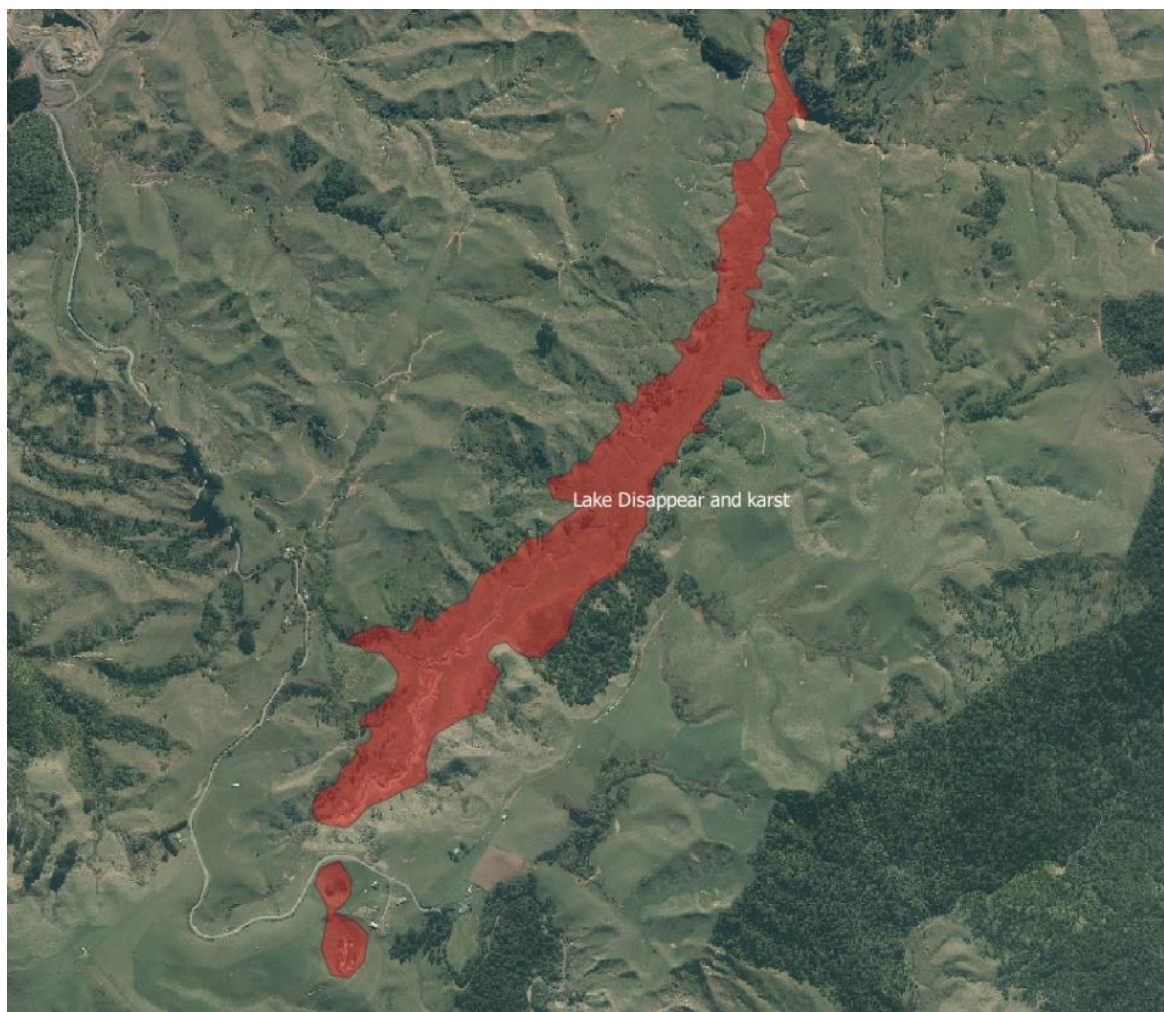
Best documented blind valley in New Zealand. Periodically floods then drains. Largest polje in North Island. Its maximum length is 1.5 km, and maximum depth is 15 m but the polje extends further up the valley. Across the road to the south are several dolines and further south are limestone bluffs.

Nominated by Prof T Worthy (Adelaide), Dr J. Kenny (Auck), 1989

Suggested ONF Category B Small fragile landforms and F Caves

Boffa Miskell assessment *“Does not qualify as ONF for District Scale”*.

GSNZ response *“A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory MUST EXCEED the threshold for ONF at district level using Geoheritage criteria. The RMA does not state that ONF must be of a certain minimum size!! These are quite large ONF. The absence of these from the ONF is a travesty.”*





28. Taranaki Pt karst

Spectacular coastal karst features outcropping on storm battered coast.

Numerous limestone pinnacles and outcrops with variously developed fluting and solution features forms middle and lower cliffs and intertidal rocks. In a few places the limestone extends further inland into farmland.

Nominated by B. Hayward (Auck), 1989. Assessed as of national significance in the NZ Geopreservation Inventory.

Suggested ONF Category B Small fragile landforms and F Caves

Boffa Miskell assessment *“Identified in coastal terrestrial area – but does not qualify as ONF”*

GSNZ response *“A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory MUST EXCEED the threshold for ONF at district level using Geoheritage criteria. Could very well also exceed threshold for small ONL on landscape grounds.*



29. Taranaki Pt volcanics

Sequence of Okete Volcanics lava flows (olivine tholeiite) overlying Te Kuiti Group flaggy limestone
Nominated by Prof R. Briggs, 1990.

Suggested ONF Category D. Large geological exposures

Not addressed by Boffa Miskell.

GSNZ response “A site assessed as regionally significant for its scientific values in the NZ Geopreservation Inventory should exceed threshold for ONF at district level using Geoheritage criteria.



30. Aotea dune field

A large area of mobile dune fields - the biggest example on the west coast of the North Island.

A 590-ha transgressive dune field on the northern head of Aotea Harbour. It includes tall (120 m) migrating dunes, dune slacks, deflation plains and a small dune lake.

Nominated by Prof V. Moon (Ham), Prof W. de Lange (Ham)

Suggested ONF Category C. Dynamic landforms and natural systems

Boffa Miskell assessment “*Identified as Outstanding Natural Character and ONF Oioroa*”.

GSNZ response “A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory **MUST EXCEED** the threshold for ONF at district level using Geoheritage criteria. We are pleased to see that this outstanding dynamic landform is proposed to be an ONF.”



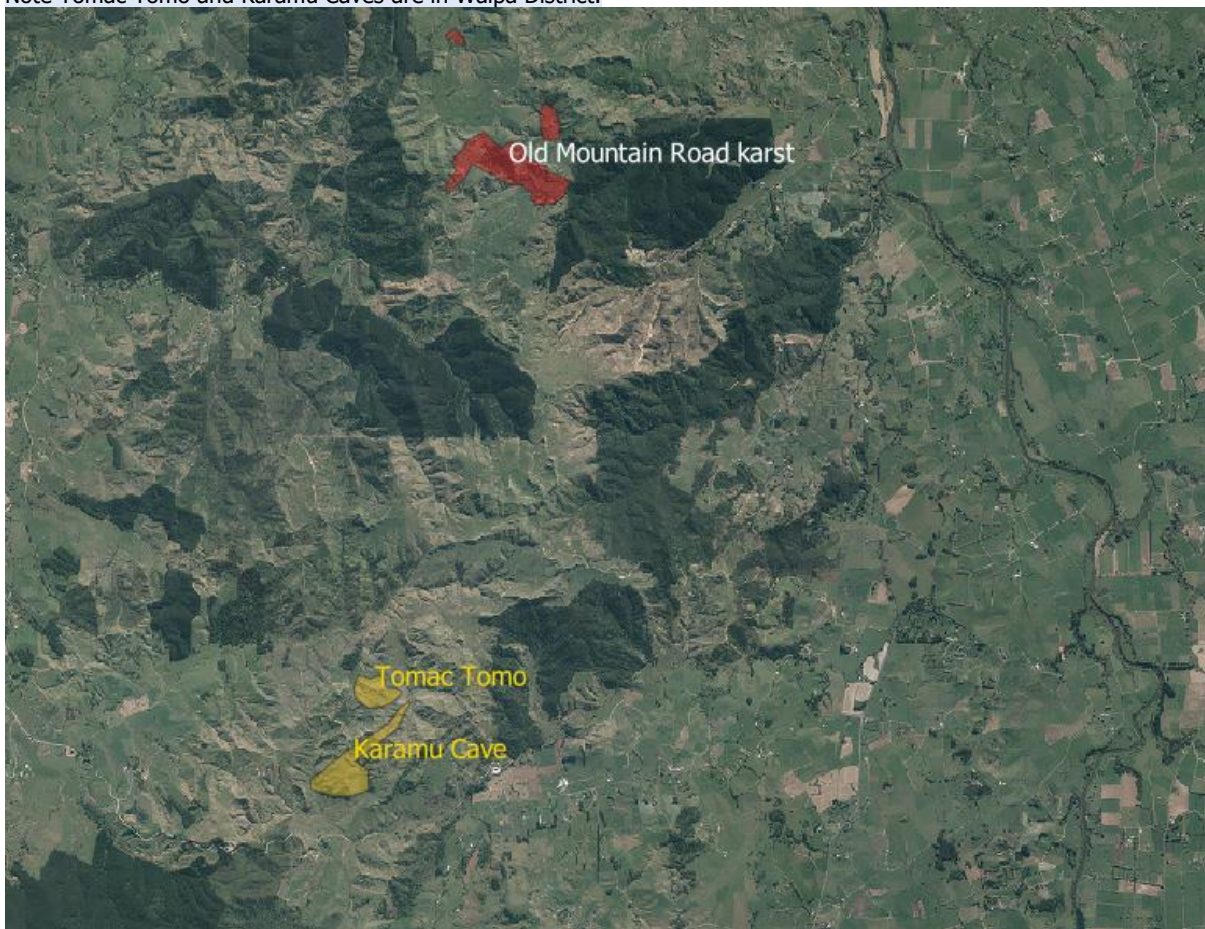
31. Helectite Hole karst = Old Mountain Rd karst

Karst, numerous caves and helectites. Helectites are nationally rare. Vegetated limestone bluffs, weakly developed surface karst with many small caves (Helectite Hole) and several longer stream passage caves (Rat Race, Folies Bergere), some with nice speleothems and rare helectites (Helectite Hole). Nominated by D. Smith (Auck), P. Crossley (Auck), 2018. Suggested ONF Category B Small fragile landforms and F Caves

Boffa Miskell assessment “Does not qualify as ONF for District Scale”.

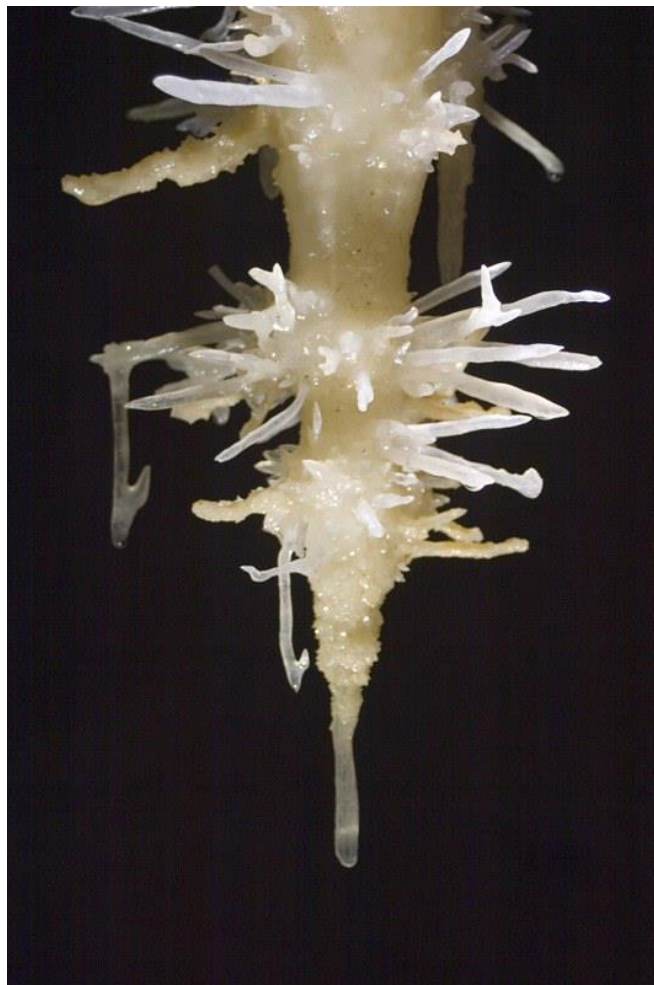
GSNZ response “A site assessed as nationally significant for its scientific values in the NZ Geopreservation Inventory MUST EXCEED the threshold for ONF at district level using Geoheritage criteria.

Note Tomac Tomo and Karamu Caves are in Waipa District.





Among the more bizarre speleothems (cave formations) are helictites – thin sticks of calcite (calcium carbonate) that grow out from cave walls and ceilings. While it's easy to understand the growth of stalagmites and stalactites, helictites appear to defy gravity by growing sideways (inset). It is not certain how they form. One theory is that on a small scale, capillary action (the attraction of tiny drops of water to the surface of the helictite) may be greater than the force of gravity, allowing it to grow sideways



Nikau Cave and karst

Best speleothems in Waikato District. Limestone and sandstone bluffs; stream passage cave. Spectacular speleothems. Areas of calcareous sandstone bluffs and rocks with cracks and crevices. Native forest over some of them and over both entrances to the commercial Nikau Cave (previously known as Mannerings Cave). Stream passage with some spectacular speleothems.

Nominated by B. Hayward, 2019.

Suggested ONF Category B Small fragile landforms and F Caves

GSNZ response “A site assessed as regionally significant for its scientific values in the NZ Geopreservation Inventory should exceed threshold for ONF at district level using Geoheritage criteria.





