

# Outstanding Natural Features Identifying and Mapping sites in Far North District Council

## Methodology Report

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## 1.0 Introduction

This report outlines the way that 113 outstanding natural features (ONFs) in the Far North District, including those already scheduled and mapped in the Far North District Scheme and Northland Regional Policy Statement (Jan 2014), have been identified and their extent mapped. It also categorises ONFs on the basis of size and robustness to assist in protecting their differing values. Background information on each ONF's significance, description, locality and references is provided. This report is for information purposes only and does not form part of the District Scheme.

## 2.0 Background

Outstanding natural features are a matter of national importance in Section 6(b) of the Resource Management Act 1991 and are to be protected from inappropriate subdivision, use and development. This is reinforced in Policy 15 of the New Zealand Coastal Policy Statement.

In order to retain the scientific, educational and amenity values of outstanding natural features, those at risk were – where practicable - identified on the proposed Northland Regional Policy Statement maps (Jan 2014). The major source of information was the “Inventory and maps of Important Geological Sites and Landforms in the Northland Region”, Geological Society of New Zealand Miscellaneous Publication No. 83, 51 pp, compiled by Kenny and Hayward (1996). This inventory identifies the best examples of Northland's geology and landforms. It was compiled using the combined knowledge and advice of a large sector of the specialist geological, geomorphological, and speleological communities of New Zealand. The NZ Geopreservation Inventory database has been considerably refined and updated since 1996.

The Regional Policy Statement maps only included those features (larger sites only) that had been mapped in the published inventory (1996). The new Northland Regional Policy Statement (Jan 2014) included a method to address the lack of accurate maps of smaller sites by providing lists of potential additional features, mostly taken from the inventory, and recommended that they be assessed and mapped at a later date.

Appendix 1A in the operational Far North District Scheme provides a schedule listing 80 outstanding natural features also extracted from the “Inventory and maps of Important Geological Sites and Landforms in the Northland Region” (1996) with maps of larger sites extracted directly from the inventory and smaller sites not mapped.

## 3.0 Methodology for this assessment and mapping exercise

### 3.1 Significance and vulnerability rankings of the NZ Geopreservation Inventory

The scientific, educational and aesthetic significance ranking provides has three levels:

- A International
- B National
- C Regional

A vulnerability classification (1 - 4) has been assigned to each feature, depending on its perceived susceptibility to human activities:

- 1 highly vulnerable to complete destruction or major modification by humans;
- 2 moderately vulnerable to modification by humans;
- 3 unlikely to be damaged by humans; and
- 4 could be improved by human activity.

Both these classifications are periodically reviewed and modified for individual sites as new information becomes available about their scientific importance, their popularity as tourist attractions or of proposed future developments.

### 3.2 Which sites were assessed for inclusion?

Sites assessed for inclusion as ONFs in the FNDC scheme were those:

- a. scheduled in the operational Far North District Scheme;
- b. mapped or listed in the Northland Regional Policy Statement (2014); or
- c. included in the current updated version of the NZ Geopreservation Inventory

The NZ Geopreservation Inventory includes some historic man-made features and buildings associated with geology and these have been excluded from the assessment as they more properly should be protected under the historic heritage sections of the RMA.

### 3.3 Assessment methodology

To be eligible for assessment in this exercise, a site first needed to have been accepted into the NZ Geopreservation Inventory of the Geoscience Society of NZ, which aims to document all geological and landform sites of international, national or regional scientific and educational significance throughout the country. These inventories have been compiled, initially by subdiscipline categories, over the past 30 years from the collective nominations of the NZ geoscience community. The criteria used to assess whether a site or feature qualifies for inclusion in the Inventory and its importance ranking are listed below in section 3.4.

The sites outlined in section 3.2 (all from the Inventory) were further assessed for their suitability for scheduling and mapping as ONFs in the FNDS on a site by site basis. In these assessments the value of protecting sites for their scientific, educational or aesthetic importance was weighed up against such criteria as their fragility and vulnerability to damage by non-natural agents, and the possible monetary or nuisance costs of scheduling features on private land. Reasons for declining the inclusion of some suggested sites listed in the NRPS (2014) include:

- a. The scientific importance of a site was for the presence of microscopic minerals or fossils that could not be readily appreciated in the field and that were unlikely to be subject to over-collecting by commercial or recreational collectors. Some of the rock exposure that contained the significant specimens was always likely to be available for scientific collection and study without the need for ONF status and management.
- b. The scientific and educational value of a natural geological feature is in the face(s) of an active or potentially active quarry and the economic cost of protecting part of the quarry face was deemed too great compared with the value of the feature. Wherever possible an alternative, maybe somewhat inferior, replacement exposure was sought to replace the one excluded.
- c. Several of the sites in the NRPS tables lay within the mapped boundaries of existing ONFs on the NRPS maps or lay adjacent to existing ONFs, the boundaries of which could readily be extended to encompass the additional feature within the existing ONF.
- d. The scientifically important landforms were too large and owned by too many individual private landowners and likely to be subject to further major subdivisions and development in the future such that scheduling it or a small representative part of the feature was not practical nor economically justifiable.

Appendix 1 of this report lists 15 features from the NRPS Appendix 4, Tables 1 and 2, that in this assessment have been deemed not to warrant inclusion in the Far North District Scheme as ONFs. Appendix 2 of this report lists 113 features that have been here assessed as being worthy of being classified and mapped as ONFs in the Far North District Schemes with notes on their significance, location, classification and references.

### 3.4 Outstanding Natural Features Assessment criteria

The following criteria were used to identify Far North District's Outstanding Natural Features (ONFs) as shown on the newly supplied GIS aerial photos used for planning maps by NRC. These are the criteria used to identify features for the NZ Geopreservation Inventory.

- a. The extent to which the landform or geological feature contributes to the understanding of the geology or evolution of the biota in Northland, New Zealand or the earth.
- b. The rarity or unusual nature of the feature.
- c. The extent to which it is an outstanding representative example of the diversity of Northland's natural landforms and geological features.

- d. The extent to which the landform or geological feature is a component of a recognisable group of geologically associated features (e.g. Whangarei or Kaikohe volcanic fields).
- e. The extent to which the landform or geological feature contributes to the aesthetic value or visual legibility of the wider natural landscape.
- f. The community association with, or public appreciation of, the values of the feature.
- g. The potential value of the feature for public education.
- h. The potential value of the feature to provide additional understanding of the geological or biotic history.
- i. The state of preservation of the feature.
- j. The extent to which a feature is associated with a historically important natural event, geologically related industry, or individual involved in earth science research.

### 3.5 Mapping methodology

GIS mapping was done at a scale of 1:5000 using the same air photo base map as the new NRPS (2014) planning maps. The preliminary GIS maps (using Topo50 base maps) from the NZ Geopreservation Inventory recently produced in a desktop exercise by the Geoscience Society of NZ using a NZ Lottery Environment and Heritage grant (now available on the website <http://services.main.net.nz/geopreservation/>) were used as a starting point for most sites accepted for recommending to be scheduled as ONFs.

These feature map boundaries were modified using the following criteria:

- a. Where the whole or part of a recommended ONF was on public land (e.g. intertidal, esplanade reserves, road reserves, parks and reserves) the boundaries were, wherever possible, accepted or slightly modified: to better fit the air photo base map; to align with the reserve boundary; or lie within it.
- b. Where the whole or part of a recommended ONF more or less coincided with an existing Outstanding Natural Landscape (ONL) in the new NRPS, the boundary of the ONF was generally reduced to align with that of the ONL or fit inside it.
- c. Where the whole or part of a recommended ONF occurs within private land, the mapped boundaries were more carefully drawn to enclose the minimum land area for realistic protection and wherever possible to exclude areas of habitation and farming activities.
- d. Where a recommended ONF more or less coincided with the boundaries of a QE2 covenanted area, the ONF boundaries were modified to stay entirely within the covenanted area.
- e. Where the whole or part of a recommended ONF occurs within private land, but the boundaries could not be accurately determined from air photo sources or the roads, permission was sought from the owners for access on to their properties to refine the mapping to the smallest and most precise area based on the values of the features. Where requests for access permission were denied or no reply received the boundaries mapped from the literature and air photos have not been able to be refined.

## 4.0 Categories of outstanding natural features

### 4.1 Feature types

To assist management and decision-making, outstanding natural features have also been categorised by type to provide an indication of the kind of values that make them significant and how better to manage potential risks to these values. The categories described below are the same as in the Auckland Unitary Plan and differ slightly in their numbering from the new NRPS.

#### A. Large landforms

Landforms that are sufficiently large and robust to withstand moderate to small-scale earthworks or constructions without significant impact. The values of such features typically relate to the underlying geology which tells of the history of their formation and the resulting outstanding large-scale landforms, rather than or in addition to their visual amenity or landscape type factors. Major multi-storey developments, intense urban and industrial subdivisions or large scale earthworks (e.g., a commercial quarry or major motorway cuttings) can significantly detract from the integrity of these landforms and their geological features.

Examples include Whangape Harbour entrance gorge.

#### B. Smaller more fragile landforms

Small landforms or other features that could be damaged or destroyed by relatively small-scale earthworks or constructions. The values of these often spectacular, localised landforms relate to their visual and aesthetic appeal and/or scientific interest. Most earthworks, buildings, constructions or plantings would adversely impact on the visual and aesthetic appeal or scientific value of these fragile features.

Examples include Koutu giant concretions.

#### C. Dynamic landforms and features

Landforms or features that rely on the continuation of natural physical processes beyond the feature for their continued existence. Because of this, these dynamic landforms or features are not only susceptible to direct damage, but to more distant actions that may impact the continuation of the natural processes (e.g. sand supply; dune stabilisation; groundwater levels; soil erosion in cave catchments). Permanent earthworks, building construction, vegetation plantings, extraction of nearby groundwater or other actions could adversely affect the functioning and appearance of these features.

Examples include Runaruna mud volcano and Te Werahi sand dunes.

#### D. Exposures of geological material

Natural or man-made exposures that are sufficiently large and robust that small-scale earthworks or rock sampling will have no significant impact. Their values relate to the natural geological features that can be seen within the rocks and the information they contain about the history of their formation, the geological origins of the region or the fossil history of the biota of New Zealand. Large-scale earthworks, construction of buildings, vegetation plantings or constructions of walls or erosion barriers could adversely impact the visual, educational or scientific values of these exposures.

Examples include Whatuwhiwhi Cretaceous sedimentary rocks, Cape Karikari.

#### E. Fragile exposures of geological material

Small, natural or man-made exposures or high value portions of exposures that could be damaged or destroyed by small-scale earthworks or construction. Their values relate to the information they contain about the history of their geological formation or the fossil biota of New Zealand. Most earthworks, building constructions, vegetation plantings or constructions of walls or erosion barriers could adversely impact the visual, educational or scientific values of these exposures. Periodic vegetation clearance may improve their values.

Examples of these include Hokianga Miocene "Orbitolite Bed".

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## F. Caves

Caves, such as lava and sea caves and their entrances, may, depending upon their depth underground, be susceptible to damage from significant earthworks constructions above them, or from changes in their catchments that may fill them with eroded soil.

Examples are Waiomio (Kawiti) Caves

## V. Volcanic cones

Scoria cones, tuff cones and volcanic domes that are sufficiently robust to withstand small-scale, localised earthworks or constructions without significant impact. They derive their values from their distinctive conical form and prominence in the wider landscape setting. Structures in prominent positions, significant permanent earthworks such as farm roads across steep slopes, and rectangular exotic forest plantings can detract from or compromise these natural features, particularly where they protrude significantly into the skyline, alter the cone form or disguise the underlying landform.

Examples include Te Ahu Ahu scoria cone.

### 4.2 Example of activity table that relates to categories of ONF

This activity table comes from the Auckland Unitary Plan and the operative Hauraki Gulf Islands District Plan. The table relates to resource consent requirements for land use and development on ONFs.

Table 1: Activity table – Outstanding natural features overlay - Land use and development

Activity	A	B	C	D	E	F	V
<b>Construction</b>							
Buildings and structures	D	NC	NC	NC	NC	D	D
<b>Earthworks</b>							
Removal, fill, modification of more than 2 cu m	D	Pr	D	D	Pr	NC	D
Removal, fill, modification of less than 2 cu m	P	RD	RD	D	NC	RD	RD
<b>Rural</b>							
Grazing of sheep and goats	P	RD	RD	P	RD	P	P
Grazing of other stock	RD	RD	RD	P	RD	P	D
Farm or forestry quarries	Pr	Pr	Pr	RD	Pr	Pr	Pr
Forestry	RD	D	D	D	NC	D	D
Conservation planting	P	RD	D	D	NC	NC	RD

Fences - post and wire	P	RD	RD	RD	D	NC	P
Fences - except post and wire	RD	D	D	D	D	NC	D
<b>Utilities</b>							
Minor infrastructure upgrading	P	RD	RD	RD	NC	NC	D

P = permitted

RD = restricted discretionary

D = discretionary

NC = non-compliant

Pr = prohibited

### Assessment criteria

The council will consider the relevant assessment criteria below for the restricted discretionary activities listed above:

1. Whether the nature, form and extent of the proposed works or activity adversely affects the ONF for which the item was scheduled:
  - a. whether the activity will result in increased erosion of the ONF
  - b. for grazing applications, whether the proposed stocking intensity will result in increased compaction or erosion of the ONF, or will result in changes to the vegetation on site in ways that will affect the values for which the ONF is scheduled e.g. grazing effects on dune vegetation resulting in changes to the nature and form of the dunes
  - c. for fencing applications, whether the proposed fence requires ground disturbance or earthworks that will affect the values for which the ONF is scheduled
  - d. whether the activity will interfere with natural processes e.g. forestry or vegetation planting effects the natural dynamic supply of sand to wind-blown dunes.
2. Whether the proposed works or activity cause adverse visual effects or adversely affect visual appreciation of the ONF.
3. The degree to which the ONF has already been modified so that further modification will not cause significant additional loss of geological value.
4. The extent to which the modification is necessary.
5. The purpose of the proposed works or activity and whether it has specific connections or relevance to the scheduled ONF.
6. What alternative methods and locations are available to the applicant for carrying out the work or activities that do not affect a scheduled ONF.
7. The extent to which the proposed works will protect the ONF from further damage, such as erosion protection, or remediate it from previous damage. This excludes potential damage from the activity for which consent is sought.
8. In the case of the subdivisions, the extent to which the resultant sites can be developed without affecting the values for which the ONF is scheduled.

## Appendix 1

List of features in proposed NRPS (2014) Appendix 4, Tables 1 and 2 that have been assessed as not being suitable for recognition and mapping as ONF's in the Far North District Scheme.

Feature name	NRPS Appendix 4	Reason for non-inclusion
Puhipuhi cinnabar	Table 1 Nationally significant	Visually insignificant in area of potential mineral exploitation on private land.
Puhipuhi stibnite (Mt Mitchell)	Table 1 Regionally Significant	Visually insignificant in area of potential mineral exploitation on private land.
Rangiahua basalt proto-karst, Ōkaihau	Table 1, Regionally significant	Scattered karst boulders visible from road but deemed insufficiently well-developed compared with the outstanding values of Waiere Boulders and Lake Manuwai.
Rehia hornfels with mineral larnite	Table 1 Nationally significant	Visually insignificant in farm lime quarry on private land.
Taipa garnet andesite plug / dike	Table 1 Regionally Significant	Quarry is periodically active and privately owned and examples of the garnet are likely always able to be found in rubble nearby.
Te Pene weathered rhyolite dome	Table 1 Regionally Significant	Landform and rock cover a large area of private land and are not sufficiently outstanding to justify inclusion.
Tokerau Beach dune field	Table 1 Regionally Significant	Huge landform feature mostly in hundreds of private properties - not practical to protect all or any significant part.
Tom Bowling Bay dune field	Table 1 Nationally significant	Already included in Waikuku tombolo dunes and dune-dammed swamp ONF
Waikuku Beach dune field	Table 1 Regionally Significant	Already included in Waikuku tombolo dunes and dune-dammed swamp ONF.
Waimamaku, Pinehill Stream Miocene fossil molluscs	Table 1, nationally significant Scheduled in Far North District Scheme	Site no longer exposed.
Lodore Rd obsidian source	Scheduled in Far North District Scheme	Reportedly a small area with obsidian cobbles now hidden beneath pine tree plantation; not as important as other recently discovered obsidian sources to the north.
Motukokako (Piercy) Island skarn and sea arch	Scheduled in Far North District Scheme	Added to Motukokako skarn ONF of NRPS.
Perforated Point overturned fold	Scheduled in Far North District Scheme	Combined with Mt Camel Cretaceous volcanoclastic sedimentary rocks ONF of Far North District Scheme.
Taupo Bay flow	Scheduled in Far North District Scheme	Combined with Whangaroa Nth Head ring plain ONF of NRPS.
Taupo Bay ring plain deposits	Scheduled in Far North District Scheme	Combined with Whangaroa Nth Head ring plain ONF of NRPS.



## Appendix 2

Documentation for features recommended for scheduling as Outstanding Natural Features for Far North District. See accompanying GIS layer for maps. \* = sites that have not had permission to visit on private land and therefore their mapped extent is preliminary.

Name	Cat	Significance statement	Brief description	Location	I	V	Ref
Ahipara basal Tangihua melange	D	Best exposure in Northland of the basal melange of the Tangihua obducted ophiolites (ocean floor volcanic rocks).	Exposures of complexly faulted and sheared basaltic lavas and dolerites.	3 km of coastal rocks centred on Mokorau Beach, east of Tauroa Point, Ahipara.	B	2	L1
Ahipara Pliocene lignite	E	Oldest dated sand dunes and lignitic swamp deposits in Northland.	Exposure of sequence through lignite bed near base of Pliocene-Holocene dune sequence.	Exposed in inland bluffs high above Shipwreck Bay, Ahipara.	C	2	B22
Arrow Rocks Permian-Triassic boundary	E	One of the few exposures of the Permian-Triassic boundary in the Southern Hemisphere. This boundary records one of the largest extinction events on Earth.	Structurally complex sequence of greywackes with Permian-Triassic boundary identified using microfossil radiolaria and conodonts.	In shore platform of Arrow Rocks, 1 km NNE offshore from Marble Bay, Whangaroa.	A	2	T1
Aurere Beach allochthon, pillow lavas and tombolo, Taipa	D	One of the best exposed sequences showing relationships within the Northland Allochthon. Excellent exposure of displaced pillow lava. One of best small tombolos in Northland.	Here Tangihua Volcanics nappe is sheared over folded Cretaceous Awapoko Formation sandstone overlying a thick sheared melange dominantly of late Cretaceous conglomerate and mudstone (Ngatuturi Siltstone).	From 50 m inside Awapoko River mouth, around Aurere Beach to Puketutu Island and the west side of Otenga Bay..	B	2	I3
Black Rocks columnar basalt, Bay of Islands	B	One of the best examples of small columnar-jointed basalt islets in New Zealand.	Columnar-jointed basalt flow remnants from a cluster of black rocky islets just above high water level with subtidal reefs that are mostly steep-sided, and extend to between about 4 m and 30 m depth. Subtidal caves, tunnels, shafts, pinnacles and very large boulders are common. Eroded distal remnants of a long lava flow.	500 m off the east coast of Moturoa Island, at the entrance to Kerikeri Inlet, Bay of Islands.	B	2	
Camp Bay mylonite and schistose Tangihua rocks	D	The only well-exposed area of schistose Tangihua Volcanics anywhere. These are inferred to be mylonites formed in an oceanic transform fault within the ancient Pacific Plate.	Coastal section of schistose sheeted dike complex and other igneous rocks with a complex suite of dikes overlying less deformed pillow lavas; inferred to be formed in a mylonitised oceanic transform fault zone.	Coastal section at Camp Bay, north of Taupo Bay.	A	3	B19, H1
Cone Rock, Whangaroa	B	Spectacular conical coastal pinnacle. Well known landmark for boats.	Large conical pinnacle of flow-banded dacite. Part of a volcanic dome that was intruded and erupted about 20 million years ago.	400 m north of headland between Motukahakaha Bay and Whangaroa Bay.	C	3	B19
Haruru Falls, Waitangi	B	An outstanding 12 m high waterfall plunging over the eroding face of a columnar-jointed basalt flow. Easily accessible and viewed by thousands every year.	A scenic waterfall, eroding part of a 5 km long columnar jointed basalt flow that was confined by the Waitangi River valley.	3 km up Waitangi River from the coast, W of Paihia, just off Haruru Falls Road, Bay of Islands.	C	3	A1, K3
Hihi Beach, Manganui Lignite Formation	E	Best exposure of Manganui Lignite Formation. Well-exposed valley fill alluvial sequence of mid Miocene age.	Non-marine conglomerate and thin carbonaceous sandstone fill a valley eroded into underlying Tangihua Volcanics rocks.	In cliffs and foreshore at the west end of Hihi Beach.	C	3	B19
Hokianga Miocene "Orbitolite" bed	E	One of only two examples in New Zealand of sedimentary rocks made of large foraminifera. Largest fossil foraminifera in New Zealand.	A small (5x 5 m) exposure first reported by Hochstetter in 1864. The larger foraminifera are of international biostratigraphic value.	At east end of small beach 500 m inside Hokianga South Head and accessed by a public track from near the end of Signal Station Rd.	B	1	B12
Hokianga sand dunes	C	One of just a few large remaining areas of active sand dunes in New Zealand. Provides spectacular vista from Omopere Hill across the harbour.	Quaternary sand dunes form the northern barrier across the entrance to Hokianga Harbour and rise to an elevation of 200 m.	A 5 x 3 km area on the north side of the entrance to Hokianga Harbour. Not stabilised by planted vegetation or exotic pine forestry.	B	1	I1

Hoopers Point basal Waitemata sequence	E	Only good exposure of the basal Waitemata sequence deposited on top of Northland Allochthon rocks. Provides constraints on timing and environment of emplacement of Northland Allochthon in northern Northland.	20 m thick sequence from basal limestone up into mudstones of earliest Miocene (Lw) sediments deposited on top of allochthonous Tangihua Volcanics. Oldest known Waitemata Group sedimentary rocks.	On north side of saddle that joins Hoopers Point (east end Spirits Bay) to mainland. Section exposed in upper half of steep cliff/partly grassed slopes.	C	2	T1
Houhora pillow lavas	E	Excellent example of elongate-lobed pillow lava.	A small seacliff exposure of a Tangihua Volcanics lense of pillow lava with beautifully displayed elongate lobes.	In low cliffs close to the south point of Mt Camel (Perpendicular Pt) at the entrance to Houhora Harbour.	C	2	
Jellicoe Sea Cave, Whangaroa	F	Unusual narrow, navigable sea cave, linked historically to Lord Jellicoe who holidayed there.	50 m long, 1-2 m wide, 3-8 m high "keyhole" cave that passes right through small point and is navigable by small dinghy. Eroded along joint through Wairakau Volcanics breccias. Joined by second passage midway along with underwater link to surging ocean.	Through small point on seaward side of Whangaroa North Head.	C	3	
Kaiaraara old hat islet, Russell	B	First "old hat" islet in the world to be described (Dana 1849) and used as the classic example by Prof Bartrum to describe the "old hat" phenomenon in New Zealand and world-wide.	Kaiaraara Island (Mill Island) was first brought into scientific prominence by Professor J. D. Dana, who visited the Bay of Islands district in 1840 as a member of the United States Exploring Expedition of 1838-42. He first commented on their occurrence in northern New Zealand, sketching Kaiaraara Island in his 1849 report, and initiating a debate on their origin that has continued to the present time, including important papers (with Kaiaraara Island pix) by Auckland's Professor J.A. Bartrum (1916, 1924, 1925).	Off the southern tip of Tahapuke Bay, c. 500 m south of southern Kororareka Bay, Russell.	A	2	D1, B3, B4, B5, K4
Kaikohe Hill scoria cone	V	Prominent volcanic cone at west end of Kaikohe	A 30 m high scoria cone with a 5 m deep crater, breached to the E, sitting in the NW corner of the Kaikohe volcanic field.	Due W of Kaikohe (Centre).	C	1	
Karai Point Miocene dacite dome	E	Excellent coastal exposure of small eroded flow-banded dacite dome of early Miocene age.	200 m diameter intrusional neck of dome with circular flow-banding parallel to margins.	In coastal exposures around Karai Point, 1.5 km southeast of Cone Rock.	C	3	B19
Kawerua lava-flow reefs, Waipoua coast	B	Most significant basalt reefs (Waipoua Basalt) between Maunganui Bluff and Kaikai Beach. Shape of reefs and tidal rock lagoons determined by west-dipping sequence of flows.	Prominent point on exposed west coast, formed by west-dipping sequence of basalt lava flows, producing the seaward tilt of some large reefs.	Shore platforms extending up to 1.5 km south of Kawerua, 13.5 km south of Hokianga Harbour entrance.	C	2	H5
Kawiti scoria cone	V	Prominent peaks of the partly quarried, southeasternmost scoria cone in the Kaikohe Volcanic Field.	The Kawiti cone has been considerably modified by railways quarrying, but the two peaks on the western side are still largely intact and form a prominent feature when viewed from the west.	Tui Pa Hill, 120 m high, on north side of Ngapipito Rd, 5 km WSW of Moerewa.	C	1	A1, B23
Koutu giant concretions, Hokianga	B	Some of largest and most accessible spherical concretions that have been eroded out of their host rocks in New Zealand. Major tourist attraction.	Numerous spherical concretions line the foreshore and intertidal zone for c. 1 km. Largest are in excess of 4 m across. Erode out of Late Cretaceous Punakitere Sandstone which is exposed in the foreshore and low cliffs.	Between 300 m east of end of Cabbage Tree Bay Rd and just south of Mahina Rd point. Foreshore and intertidal area in strip.	B	1	H13
Lake Manuwai basalt proto-karst, Kerikeri	B	One of two best developed and most extensive examples of fluted basalt proto-karst in New Zealand and possibly in the world. Produced by solution of the basalt rock. Majority of karst is on basalt that is still in-situ where the lava solidified.	A large area of fluted basalt lava flow rock. Best developed around the northwestern end of the flooded valley - best seen when lake level is 1-2 m below full. Seen by using water craft in amongst them. Flutes extend the full height (5-10 m) of most cliffs and boulders along the foreshore and are up to 60-80 cm deep and sometimes 50 cm wide. Some have basins etched out of their upper surfaces. An enclosed flooded basin on the northwestern side is almost completely surrounded by fluted cliffs and boulders. An area above the lake on the NW side has numerous well fluted boulders sticking out above ground level.	In two areas - the best is along northwestern shores of Lake Manuwai, but also one area along shoreline on eastern side of lake.	A	1	K5, H16
Lake Ohia Pleistocene fossil forest	E	Well preserved and now partly exhumed buried late Quaternary kauri forest. 30,000 years old.	Numerous tree stumps stick up out of the lake bed.	On south east fringe of Lake Ohia, often partly submerged. Visitor area is one kilometre along road to Whatuwhiwi from Highway 10 turnoff, on west side of road.	C	1	

Lake Omapere lava-flow-dammed lake	A	Largest lake in New Zealand formed by a lava flow damming a valley.	4 x 4.5 km roughly circular shallow lake dammed by a lava flow across its northwestern side and now overflowing to the west.	5 km north of Kaikohe.	B	3	E1
Mangonui Miocene coconut beds, Coopers Beach	E	Best known and best preserved fossil coconuts in New Zealand. Of historical and paleoclimatic importance.	Outcrops of fossil forest, siderite flower concretions and coconut-bearing lignites periodically exposed beneath beach sands and in low cliffs behind Coopers Beach.	From 200 m west of stream mouth to 200 m west of east end of beach.	B	2	B7, B19, E2
Marble Bay Permian fusulines, corals, spilite and melange	E	Best exposure of very few known localities of Permian age in the North Island. Best of only three known New Zealand localities containing the biostratigraphically important, tropical, larger foraminiferal group called fusulines. Extremely important for reconstructing the paleogeographic history of NZ at this time. Shows the association of seafloor pillow lava with Permian Tethyan facies and melange.	Spilitic basalt, Tethyan fossils and marble in complicated melange association. Also contains Permian corals. Melange exposed in the coastal rocks from Te Anina Point, west end of Marble Bay.	In shore platform and maritime zone of Wherowhero Point, at east end of Marble Bay, East of Whangaroa Harbour entrance.	A	2	H23, S6
Matai Bay beaches	A	Unusual double bay formation. One of the most scenic gems in Northland, the beach and bay setting is unspoiled by development, in a near pristine condition.	A 2 km by 1 km bay with narrow entrance to the open sea. The Bay is divided into two semicircular beaches by a central headland.	On the NE coast of Karikari Peninsula, 6 km NE of Whatuwhiwhi.	C	2	
Matapia Island sea arch, Ninety Mile Beach	B	Iconic sea arch visible from Ninety Mile Beach.	Sea arch eroded into steeply dipping conglomerate and sandstone of Matapia Formation.	Matapia Island, located 1.5 km offshore of Ninety Mile Beach and about 10 km south of Te Pahi Stream mouth.	C	3	B20
Maungakawakaw a scoria cone	V	A very good example of small breached scoria cone in the Kaikohe Volcanic Field. Prominent on the skyline when viewed from the east.	A complex elongate scoria cone 60 m high, 340 m ASL; breached to the NE, and twice on the southern flank; covering an area of 2.2 square km. The cone is centrally located with flows running radially from the vent.	2 km E of Lake Omapere; 2 km S of Te Ahuahu on Hairu Rd.	C	2	A1, M8
Maungapiko conglomerate dome, Spirits Bay	B	Most prominent example of an exfoliation dome of bedded conglomerate in northern Northland.	165 m high dome of bedded Kaurahaupo Conglomerate (early Miocene) surrounded on all its upper sides by bluffs with a rounded profile on top.	500 m north of the Spirits Bay carpark.	C	2	B15
Maungaturoto volcanic cone	V	Well preserved scoria cone with unbreached crater. Prominent volcanic peak near main highway.	A small scoria cone 100 m high, 285 m ASL, 500 m in diameter, with a circular, unbreached central crater 10 m deep. Flows cover 6.5 square km of surrounding land. This cone is a well preserved volcanic land form, at present being farmed. Slightly altered by Maori terracing.	2 km South of Ohaeawai, on north side of Waitaheke Rd.	C	2	A1, M8
Motuarohia Island tombolos and tide pools, Bay of Islands	C	Best example in Northland of a tombolo linking together two islands and a rock stack forming deep tidal pools, widely used for recreation.	Two greywacke islands (either end of Motuarohia) and a rock stack in between have been linked together by a sand tombolo across the south side, creating two large tidal pools with mouths opening north. An unusual coastal landform.	Eastern end of Motuarohia Island (Robertson Island), 5 km ENE of Tapeka Point, eastern Bay of Islands.	C	2	M6
Motukawanui pillow lava, Cavalli Islands	E	Best preserved pillow lava sequence in Waipapa greywacke basement in Northland.	50 m thick sequence of pillow lavas conformably within a sequence of multicoloured argillite and chert.	South end of 'Pillow Bay', on east side of Motukawanui.	C	3	M7, R1, S7
Motukokako (Piercy) Island skarn and sea arch	B	One of New Zealand's most spectacular and most visited sea arches. Well exposed example of Pb-Zn skarn. New Zealand's best ilvaite exposure occurs with the best of three babingtonite occurrences.	Sea arch with deep water passage that tourist boats pass through. Large crystals (3-5 mm) of babingtonite in a Pb-Zn skarn in Tertiary limestone with associated ilvaite, garnet, hedenburgite, epidote and axinite.	Skarn in northern half and arch southern half of Motukokako (Piercy) Island, a steep rocky island just off of Cape Brett in the Bay of Islands.	A	2	B13
Mt Camel Cretaceous volcanoclastic rocks	D	Excellent coastal exposure of Mt Camel Volcanics rocks and associated flysch.	Well-exposed thin bedded flysch interbedded with pyroclastic beds of Mt Camel Volcanics, demonstrating that they were deposited together.	South end of Kowhai Beach, north east side of Mt Camel.	C	3	H3, I4

Ngahuha scoria cone, Kawakawa	V	A distinctive small scoria cone in the Kaikohe Volcanic Field. Source of extensive lava flows.	A small scoria cone, 62 m above the surrounding basalt plateau. Earthworks of Ngahuha Pa on top. Source of lava flows. Visible from state highway 1, 4 km north of Moerewa. Four identifiable craters - one in NE near trig has been breached to SE with rafted scoria mounds towards Marshall Rd; two central craters coalesce and form large depression breached to the W and source of lava flows. This double crater has had some quarrying of crater floor; shallow southern crater with low arcuate southern scoria rampart with scoria ramparts on SW side quarried away by present quarrying.	2.5 km SE of Pakaraka.	C	2	A1, B23
Ngawha Springs geothermal field	C	Largest and hottest geothermal field in northern New Zealand. Surface features include hot and cold springs, gas vents, sinter and altered rocks and hydrothermal explosion craters now forming small ponds. Formerly mined for cinnabar (mercury mineral).	The field consists of a number of hot and cold springs, with the cold springs, sinter deposits, fumaroles and stagnant acidic pools. Mercury deposits (cinnabar) occur in lake sediments and is also being currently deposited. Two hot pools complexes are included in the field. There are three NE-oriented lines of small hydrothermal explosion craters now filled with water as ponds. The following ponds are included in this feature: Waitetera, Waiapawa, Tuwhakino, Waiparaheka and Ngamokaikai.	6 km east of Kaikohe at Ngawha Springs tourist attraction.	B	2	B24, B25, F2, P1
Ninepin sea pinnacle, Bay of Islands	B	Well known iconic rock pinnacle sticking out of the sea at the northern entrance to the Bay of Islands. An unusual landform, particularly in greywacke rocks.	About 20 m high conical pinnacle of greywacke sticks out of the water, which is over 50 m deep at this location.	2 km east of Cape Wiwiki, Purerua Peninsula northern entrance to the Bay of Islands.	C	3	
North Cape ultramafic/gabbro complex and North Cape Island tombolo	D	Only ultramafic/gabbro ophiolite complex in northern New Zealand. Excellent example of cobble tombolo linking North Cape Island to mainland.	Intertidal and coastal cliff exposures of sequence of pillow lavas, sheeted dikes and ultramafic serpentinite. Spillite cobbles and boulders derived from local cliffs form a 100 m long tombolo rising to storm high tide level.	In cliffs and intertidal rocks right around North Cape block and island, and in abandoned serpentinite quarried area on top of Kerr Cliffs.	B	3	B15
Ohia black shale, Doubtless Bay	E	Best exposure of black shale in Northland; one of the best exposures of this important rock type in New Zealand.	Quarry faces with massive black shale and associated dark grey chert. Potential source of hydrocarbons for petroleum exploration when deeply buried.	In old county quarry on south side of main highway 10, 2 km east of junction with Whatuwhiwhi turnoff. Just protect the southern quarry face adjacent to the old quarry entrance.	B	2	H19
Opononi limestone, Hokianga	E	The best exposure in the Hokianga area of a small sequence through deep water Oligocene limestone with redeposited sandstone beds.	Thick argillaceous limestone containing mass flow units of bioclastic sandy limestone from shallow water.	Exposed intertidally on the south shore of Hokianga Harbour, 100-200 m east of Opononi wharf.	C	2	
*Otangaroa Cave, Mangamuka	F	This small stream cave contains subfossil bones, including moa, native frog and the site of an extinct large skink.	Small stream cave about 100 m in length in Oligocene limestone. Type locality of extinct skink <i>Oligosoma northlandi</i> . The site at which the fossil bones were found is a rock debris pile about 50 m upstream from the cave entrance and immediately before a very low section of cave passage. The bones were found on the rock pile, but only above the level of flood-deposited silts, and their position along the strand line suggests that they were carried in as carcasses by floodwaters, entering via an entrance in the unexplored, upstream reaches of the cave.	Up hillside, approximately 100 m south of Otangaroa Road, halfway between lime quarry and road turnoff to top of Mangataniwha trig.	C	1	W5, W6
Pandora pillow lava and sediment, Spirits Bay	E	One of the best preserved and well exposed examples of multicoloured mudstone and limestone within the Tangihua Volcanics Complex.	Tangihua pillow lava flows stratigraphically and tectonically intercalated with multi-coloured siliceous, non-calcareous mudstone and fossiliferous pink micritic limestone.	In intertidal rocks and low cliffs immediately west of Whangakea Stream mouth, Pandora, western end of Spirits Bay.	C	2	B15
Parengarenga - Te Pokere Miocene fossils	E	Diverse, warm-water, early Miocene molluscan fossil fauna.	Fossiliferous siltstone and fine sandstone sequence in eroding cliffs and shore platform.	1.2 km stretch of shoreline of north Parengarenga Harbour, below Te Pokere pa and between Waitapu Stm and Maungaroa Pt.	B	2	B15

Parengarenga silica sand spit	C	The largest unvegetated barrier sand spit in New Zealand. The most extensive and highest grade silica sand deposit in New Zealand.	Sand very high in silica (in excess of 95%).	Parengarenga Peninsula/Kokota Spit, northwest coast of Great Exhibition Bay.	B	2	H4
Parengarenga-Paratoetoe Miocene sequence	D	Best exposed sedimentary rock sequence through most of the upper Parengarenga Group: Type Paratoetoe Formation. Diverse, warm water early Miocene molluscan fauna.	Dipping fossiliferous siltstones and fine sandstones of shelf origin.	5 km of north Parengarenga Harbour coastline from Porutu Stream to Paramatetaha Point.	B	2	B15
Patipatiarero rock, Omapere	B	Spectacular knife-edge knob of bedded conglomerate.	Narrow ridge crest knob with bluffs of Omapere Conglomerate of early Miocene age.	Above Signal Station Rd, 800 m west of main highway saddle above Omapere.	C	2	
Poka Rd Early Miocene fossils, Waimamaku	E	Excellent and easily accessible exposure of unique assemblage of transported shallow and in-situ deep water early Miocene fossils shed off the front of the Northland Allochthon.	Only known exposure of Harnetts Formation rocks. Numerous well preserved fossil sharks teeth, solitary corals and deep-water foraminifera of Waitakian age within a small block of allochthon derived pebble conglomerates. The sequence is inferred to have accumulated in a deepwater channel on top or in front of the moving Allochthon and subsequently to have been incorporated into the top of it.	In small bluff on south side of Poka Rd and in farm road (locally known as Harnetts Track) cutting up east side of steep spur 0-100 m south of Poka Rd and 250 m east of junction with Tuoro Rd.	C	2	E6, H19
Poroporo Island drowned ridge crest, Bay of Islands	A	An unusual serpentine-shaped narrow island illustrating its drowned crest origins.	NW-SE oriented, 800 m long x 150 m wide greywacke island being the former crest of a ridge prior to its drowning by sea level rise in the Holocene.	500 m southwest of Urupukupuka Island, Te Rāwhiti Inlet, eastern Bay of Islands.	C	2	
Pouera (Pakaraka Mountain) scoria cone, lava flow field and lava-dammed lakes	V	A prominent, well-preserved scoria cone clearly visible from SH1. Deeply breached crater. Cone surrounded by the best preserved lava flow field in Northland and rare rafted scoria mounds and tumuli. Includes two lava-flow dammed lakes.	A scoria cone, 750 m in diameter, which stands 135 m high, 275 m ASL and has a 100 m deep summit crater breached to the SW. Rafting of part of the cone has resulted in debris mounds below the SW side of the cone. Stony rises, 1-10 m high, are distributed over much of the field and W of the cone sub-circular mounds 0.5 to 1.5 m high and 2 m in diameter, called tumuli, are abundant. Rafted scoria mounds to the E of the centre reach 18 m high. The longest flow, 4 km long flowed to the NE. The lava field covers an area of 13.5 square km. The largest pa and stone fields prehistoric site remaining in New Zealand. Includes Lake Owhareiti and Jacks Lake.	2 km SW of Pakaraka, extending from Hwy 1 across Ludbrook Rd to Lake Owhareiti.	B	2	H18, S12
Puketutu (Puketona) volcanic cones	V	A group of six small scoria cones highly visible from main road to Waitangi.	A group of six cones and mounds overlying a more massive lava flow. The northern two and southernmost are untouched. One has been mostly quarried away and the other two slightly damaged by quarrying.	10 km W of Paihia and 2.5 km east of intersection of SH10 with Puketona Rd. On both sides of road.	C	1	A1,M8
Pungaere limestone shafts and cave	F	Rare example of vertical solution shafts in Northland. At least one has opening into subhorizontal limestone cave.	Small area of limestone high sticking out from surrounding younger volcanic rocks. Limestone has at least seven distinct shafts each about 30-50 m across. One has 30 m-long cave.	600-800 m northeast of junction of Pungaere Rd and Glendale Heights Rd, about 6 km west of Hwy 10.	C	1	
Pungaere natural bridge	B	One of two natural bridges in basalt lava flows in New Zealand. Spectacular chasm and dry waterfall.	Dry waterfall at head of 40 m long, 8-10 m deep, vertical walled, 8 m wide chasm. Chasm has displaced basalt block forming natural bridge over part of chasm.	On Pungaere Stm, 50 m downstream from where it passes beneath Onekura Rd.	B	2	H21
Pungaere Rd rhyolitic sediments and obsidian	E	Most accessible exposure of reworked rhyolitic sediment in Northland.	20 m long, 2 m high road cutting containing bedded rhyolitic silt and reworked rhyolitic pebble conglomerate. Some channels evident.	In road cutting on south side of Pungaere Rd and road scraping on north side opposite. 2 km west of junction with Onekura Rd.	C	1	
Putahi rhyolite dome with associated halloysite	V	Prominent, easily accessible small rhyolite dome amidst basalt volcanic field. One of only two crystalline peralkaline rhyolite domes of Quaternary age in Northland. Good example of halloysite clay deposit.	Craterless dome (381 m ASL) rising 90 m above underlying basalt plateau. Several small (<6 m diameter) vents are noted (Letelier 1979). Covers an area of 4 square km. Halloysite clays derived from rhyolite by hydrothermal alteration are found around the Putahi Dome.	Putahi Trig, 1.6 km SE of Lake Omapere near junction of Lake and Te Pua roads.	B	2	A1,L3,M8
Rahui drowned lava flow, Kerikeri	B	One of the two best examples in New Zealand of a young basalt lava flow that has been partially drowned by rising sea level.	2 km long line of elongate intertidal and supratidal reefs and islets extending into Kerikeri Inlet from the south side. This is the end of a young basalt lava flow from Te Puke volcano.	Extends into Kerikeri Inlet from south side, 7-9 km east of Kerikeri.	B	2	E1

Rainbow Falls, Kerikeri	B	One of the five best examples of a waterfall cascading over the edge of an eroding basalt lava flow in northern New Zealand.	27 m high waterfall over basalt flow with undercut eroded out of softer underlying sediment.	On Kerikeri River, 3 km upstream from Old Stone Store	C	2	
Rangi Point giant concretions, Hokianga	B	One of the two best and most easily accessible places to see giant concretions in northern New Zealand.	Numerous spherical concretions line the foreshore and intertidal zone for 1 km. Eroding out of Late Cretaceous Punakitere Sandstone.	At the southern end of Rangi Point Road, off West Coast Road south of Panguru, mid western Hokianga Harbour coast. Foreshore and intertidal strip.	C	1	
Rangiahua autochthonous sedimentary sequence, sink hole and cave, Okaihau	E	Most complete and best exposed autochthonous middle Tertiary sequence beneath the allochthon in Northland. Deep sink hole and small cave.	Sequence of Ruatangata Sandstone, deep water "Whangarei Limestone" and Waitemata Group sitting on Waipapa Group greywacke and overlain by Northland Allochthon.	In valley of true left tributary of Hautau Stream from where stream emerges from cave extending up hillside to the southeast through limestone outcrop to Waitematas. Sink hole in catchment of Hutoia Stream.	C	2	E4, E5, E7
Rangiora Bay honeycomb weathering, North Cape	D	One of best examples of honeycomb weathering (tafoni) in sea cliffs in Northland.	Honeycomb weathering in cliff faces of early Miocene Kaurahaupo Conglomerate.	Small bay 5 km north of Parengarenga Harbour entrance, Great Exhibition Bay, North Cape.	C	2	
Rawene Paleocene limestones	E	Best exposures of deep water Paleocene limestone facies in Northland.	Many blocks comprise thin turbidites of calcareous sandstone/sandy limestone within background non-calcareous pink, green and grey mudstone. Nannofossil studies show that all six nannofossil zones of the Paleocene are present.	Intertidal foreshore extending from 50 m north of end of Gundry St to 100 m south of end of McDonell St on the west side of Rawene peninsula.	C	2	K1
Runaruna mud volcano, Herekino	C	Best example of an active mud volcano in New Zealand and only active one in Northland.	3 m high mud volcano mound with multiple vents discharging mix of carbon dioxide, methane, allochthon derived mud and some water.	In farm paddock near Panguru/Pawarenga/Broadwood road intersection.	B	1	P1, H15
Spirits Bay Miocene giant barnacle fossils	E	Only example of fossil, deep-water giant barnacles in Northland. Easily accessible and easily seen at low tide.	10 x 5 m lens of fossil early Miocene giant barnacles ( <i>Bathylasma aucklandica</i> ) preserved near the base of the cliffs sitting on Tangihua Volcanics.	In low coastal cliffs at the northernmost end of Spirits Bay.	C	2	H11
St Pauls exfoliation dome, Whangaroa	B	A prominent dome-shaped rocky hilltop visible from many parts of the Whangaroa area.	Composed of volcanic laharic breccias of t early Miocene Wairakau Volcanics. Dome produced by exfoliation of relatively unjointed rock outcrop.	High hill above Whangaroa township.	C	2	H9
St Peters conglomerate dome, Whangaroa	B	Prominent and well-known example of a rocky dome-shaped hill.	A prominent 167 m high rounded dome of Wairakau Volcanics laharic breccia/conglomerate on the north side of Whangaroa Hbr. Formed by exfoliation of a relatively massive rock.	1 km east of end of road at Totara North.	C	2	H9
Sweetwater dune-dammed lakes, Awanui	B	Well-developed and easily accessible elongate lakes and swamps in swales between sand dunes.	Numerous dune-dammed swamps and lakes up to 1.5 km long, entrapped by an en echelon series of northeast-trending longitudinal dunes, now protected from prevailing southwesterlies by coastal pine plantations.	1.5-4 km inland from southern end of Ninety Mile Beach, about 20 km north of Kaitaia.	C	2	
Taita Stream Miocene fossils, Waimamaku	E	Diverse, early Miocene fossils, including the largest foraminifera (3-4 cm diameter) in New Zealand.	Fauna coming out of massive displaced bed includes numerous larger foraminifera, algal rhodoliths and encrusting bryozoa, serpulid worms and corals.	Approximately 2.5 km up Taita Rd from Waimamaku, 50 m downhill on west side of road, in stream banks and small slips.	B	2	W1
Tapotupotu estuary, Cape Reinga	C	Northernmost estuary in New Zealand. Excellent, easily accessible and viewable example of a sand-filled valley creating a mangrove and salt marsh estuary.	Extending 1.5 km inland from tidal mouth over east end of Tapotupotu Beach and dunes.	From eastern end of Tapotupotu beach, inland for c. 1.5 km.	C	2	
Tarahi scoria cone	V	The highest and most prominent of the scoria cones in the Kaikohe Volcanic Field.	This steep-sided scoria cone (750 m diameter) is breached to the NNW, stands approximately 140 m above the surrounding flows, 390 m ASL, and is highest in the Kaikohe Volcanic Field.	3 km NW of Ohaewai and 3-5 km E of Lake Omaperere. Near junction of Hariri and Remuera Settlement roads.	C	2	A1, M8
Taratara butte, Whangaroa	B	One of the best examples of a butte in the North Island.	A spectacular flat topped, steep sided hill, the flat top controlled by very gently dipping strata. An unusual feature in Northland.	2 km inland from southern shores of Whangaroa Harbour.	B	3	

Taronui gravel barrier and lagoon, Kerikeri	C	Possibly the best example in New Zealand of a coastal lagoon enclosed by a gravel barrier and margined by a white silica sand beach.	400 x 200 m coastal tidal lagoon with no breach in the gravel barrier across the northeast side.	In Taronui Bay on west side of mouth of Tapuaetahi Creek, 11 km northeast of Kerikeri.	B	2	
Tauanui scoria cones and dammed lake	V	One of the best preserved volcanic cones in Kaikohe Volcanic Field with a distinct crater and lava flows. One of three lakes in the Kaikohe area that have been formed by the damming of a valley by the volcano and its lava flows.	A circular scoria cone, 150 m high, 351 m ASL, located at the SE end of the lava field with a small lake at the S edge. The conical summit crater is approximately 12 m deep. A subsidiary cone is located 1 km to the NW and forms a 0.7 km long, 75 m high scoria ridge with associated explosion craters and lava channels. A large flow extends from the main cone W for 19 km to Taheke.	9-10 km southeast of Kaikohe, 1-2 km east of Mangakahia Rd.	B	2	A1,M8
Tauranga Bay channelised flow, Whangaroa	E	Most easily accessible example of a flow confined within a Miocene ring plain paleogully.	200 m+ wide andesite flow filling 10m deep paleogully in laharic breccia sequence.	In cliffs at back of Tauranga Bay camp ground.	C	2	H9
Tauranga Bay coastal features, Whangaroa	B	Well developed examples of wide shore platforms, sea stacks and a sea arch.	Eroded in greywacke that forms Te Anina Pt and rock stacks offshore.	Te Anina Pt and stacks, east end of Tauranga Bay, Whangaroa Bay.	C	2	
Tauranganui Stream mouth melange, Doubtless Bay	E	An excellent example of a structural melange between nappes within the Northland Allochthon.	Melange zone between overlying Tangihua Volcanics and Mangakahia Complex. Melange contains blocks of Late Cretaceous cherts, sandstones and conglomerates.	In foreshore rocks at Tauranganui Stream mouth, north of Waitetoki.	B	2	B19
Te Ahuahu volcanic cone	V	One of the five highest and most prominent steep-sided scoria cones in the Kaikohe Volcanic Field.	A single circular cone, 500 m in diameter, with an E-W trending flow covering a total area of 1.5 square km. The cone stands 100 m above the surrounding plateau, 373 m ASL, but the small crater is shallow, 10 m deep, and is 'breached' to the west by erosion. A small overflow stream channel runs down the slopes on N side. A very well preserved volcanic landform. There is a small farm quarry near the summit containing volcanic bombs amongst the scoria (Fig 6, Kear and Waterhouse 1961).	1.5 km E of Lake Omapere, on the northwest side of Hariru Rd.	C	2	A1,M8
Te Huka Beach and Kurahaupo Rocks Miocene sedimentary sequence, Far Nth	D	Best exposed sequence through most of early Miocene lower Parengarenga Group.	Deep water fine-grained sediments overlain by volcanoclastic conglomerates (Kurahaupo Conglomerate).	In sea cliffs and intertidal rocks from west end of Te Huka Beach to east end of Kurahaupo Rocks point.	C	2	B15
Te Paki sand dunes	C	Best preserved area of active sand dunes on Aupouri Peninsula. A major tourist attraction.	Approximately 20 sq km of dynamic sand dunes at the northern end of Ninety Mile Beach.	From Ninety Mile Beach extending 3 km inland on either side of Te Paki Stream.	B	1	B15
Te Pua Volcanic Crater, Kaikohe	A	An unusual large tuff ring with a large crater in the Kaikohe Volcanic Field	A 2.5 km diameter, sub-circular centre with a large central crater, 750 m in diameter and 30-40 m deep. Flows travelled less than 0.75 km from the vent. Te Pua is cut by a minor fault.	Immediately E of the Putahi rhyolite dome in the Kaikohe area. Remuera Settlement Rd runs through the middle.	C	2	
Te Puke scoria cones, Waitangi	V	Four of the youngest and best preserved scoria cones with craters in the Kaikohe-Bay of Islands volcanic field.	A line of four close-spaced small scoria cones (Fig.5 Kear and Waterhouse 1961). The main cone is 136 m ASL and stands 90 m above the surrounding plateau. Two flows were emitted from this centre, a 5 km long flow extended N down an existing valley, expanding laterally towards the Kerikeri inlet, and a 4 km long valley filling flow extending E forming the Brampton Reef.	5 km NW of Waitangi Treaty House on Te Araroa Walkway.	C	2	A1, M8
Te Reinga Bay thrust contact, Doubtless Bay	E	One of the best examples of contacts between nappes within the Northland Allochthon.	Sharp thrust contact between overlying Tangihua Volcanics and Late Cretaceous Mangakahia Complex flysch.	In foreshore rocks at Te Reinga Bay, Northeast of Waitoki.	B	3	B19
Te Rewa Pt Pleistocene fossils, Hokianga Harbour	D	One of the two richest Pleistocene shallow marine fossil localities in Northland. Onlap contact on Tangihua Volcanics exposed.	Fossiliferous shallow marine and estuarine mudstone, sandstone and conglomerate exposed in low coastal cliffs and adjacent shore platform. Includes a pebbly breccia contact on Tangihua Volcanics breccia overlain by a woody carbonaceous estuarine mudstone at Te Mata Pt.	Coastal exposures around Te Rewa and Te Mata Points.	B	1	

Te Werahi sand dunes and fossil fauna, Cape Reinga	C	One of best remaining examples of coastal sand dunes draped over rocky ridges. Contain rich subfossil bird and bat bones, and landsnails.	Dune field containing Late Pleistocene and Holocene fossil vertebrate (birds, bats) and land snail assemblages.	Between Cape Maria van Dieman and Te Werahi Beach.	B	1	M4, B17
Twilight Beach badlands, Far Nth	C	Best example of badlands erosion in northern North Island.	A 300 x 100 m area of bare ground with purple and red soils eroded into deep runnels.	500 m inland on ridge crest from southern end of Twilight Beach.	C	2	
Twilight Beach pillow lavas, Far Nth	E	One of the best preserved, accessible examples of Cretaceous pillow lavas in Northland.	Basal sequence of Cretaceous pillow lavas (Tangihua Volcanics) overlying and interfingering with terrigenous sandstone and multicoloured mudstones. Excellent 3D exposure of tubular pillows with wrinkled glassy selvages.	Rocks at south end of Twilight Beach.	C	3	B15
Waihou Valley limestone bluffs and mid tertiary sequence	B	Three prominent limestone bluffs and several limestone caves – rare in Northland. The best, most complete and well exposed sequence up through mid Tertiary sedimentary rocks that are intermediate in character between those typically found in the Northland Allochthon and in the autochthon.	Occurs within a large allochthonous block.	In lower 1 km of Cave Stream, from its junction with Waikaraka Stream up through limestone bluffs. Prominent bluffs under forest north of Cave Stream and two narrow limestone bluffs south of Cave Stream. Includes cave entrances.	C	3	E7
Waikari Inlet "old hat", Bay of Islands	B	One of the best examples of an "old hat" island in New Zealand.	A small island surrounded by broad intertidal rock platforms, giving it the classic "old hat" shape. Eroded in greywacke rock.	Motutokape Island, 700 m due east of Opuha wharf, near entrance to Waikari Inlet.	B	3	C2
Waikuku Beach (north) Miocene limestone, North Cape	E	One of only two small knobs (both at Waikuku) comprising the only marine middle or late Miocene sedimentary rock and fossils known north of East Cape or Kawhia.	Bioclastic warm water limestone. Contains interesting warm water molluscs and larger foraminifera.	North end of Waikuku Beach, North Cape. Small rock outcrop at back of beach, projecting through Quaternary sands.	B	2	L2
Waikuku Beach (south) Miocene limestone, North Cape	E	One of only two small knobs (both at Waikuku) comprising the only marine middle or late Miocene sedimentary rock and fossils known north of East Cape or Kawhia.	Bioclastic warm water limestone. Contains interesting warm water molluscs and larger foraminifera.	South end of Waikuku Beach, North Cape. Small rock outcrop at back of beach, projecting through Quaternary sands.	B	2	L2
Waikuku tombolo, sand dunes and dune-dammed swamp	C	One of best remaining areas of natural sand dune fields and dune-dammed swamps in New Zealand. Rich Holocene terrestrial fossil fauna (birds, marine mammals, land snails).	Unusual tombolo with a set of active sand dunes built up on the west and east sides trapping swampland in between. Largely unmodified by human actions. Includes extensive dune areas with subfossil flax snail and bone deposits.	All dune and swamp area between Tom Bowling Bay and Waikuku Beach, North Cape.	B	2	B15
Waimamaku River Miocene sedimentary sequence	E	Excellent exposure of moderately deep-water early Miocene sedimentary sequence.	Thick, well-bedded sequence of Waititi Formation with diverse fauna of small mollusca in some beds.	In slipping cliff face on north side of Waimamaku River, 100-300 m downstream of junction with Waiiti Stream, approx 1 km east of Waimamaku township.	C	3	W1
Waimimiti scoria mounds	A	Part of an unusual segmented scoria ring (1.5 km diameter) and associated scoria mounds. One of two localities in Northland where abundant large, 1-10 cm, gabbroic inclusions can be found.	A segmented scoria ring, surrounding a cluster of approximately fifteen small scoria mounds, breached to the SE and NW, overlying Tarahi lavas in places. Inclusions may be found at a locality to the E of the centre.	Located 4 km ESE of Lake Omapere. Covers an area of c. 1.3 km x 1.3 km on the south side of Remuera Settlement Rd.	C	2	A1, M8
Waiomio Caves (Kawiti Caves) and limestone pillars	B	Outstanding glow worm-caves and unusual karst limestone pinnacles. Well known tourist attraction.	Glow-worm caves with stalactites and stalagmites, ornate cave decorations and magnificent Cathedral cavern, in Oligocene limestone. A small stream flows through the cave from a blind valley to the north. Karstified limestone pillars are a striking feature of the landscape.	5 km south of Kawakawa, off Waiomio Rd. Limestone bluffs, pinnacles and cave.	C	2	D2, N1
Waipapa River outlier of Waitemata sediments, Puketi	E	Only known exposure of early Miocene marine sedimentary rocks between Omapere and Parengarenga. Sequence records the first phase of allochthon movement into Northland.	20 m sequence sitting unconformably on Whangarei Limestone consisting of basal conglomerate, bioclastic sandstone, flysch, and finally mass flow deposits of allochthon clasts.	On south side on outside of abrupt bend in Waipapa River, around 500 m downstream from Puketi Forest picnic area.	B	2	E4



Waipoua dune lakes	B	Only significant examples of lakes dammed by moving Quaternary sand dunes between Maunganui Bluff and Hokianga Harbour.	Two small lakes, the northernmost (north of Waipoua River mouth) is surrounded by high dunes and presumably is pre Holocene. The second dune lake (south of Waipoua R mouth) is separated from the beach by a low Holocene sand dune and is therefore of Holocene age.	Lakes 0.6-0.8 km from the beach and 0.5 and 1.5 km north and south of Waipoua River mouth respectively. Northern lake is c. 200 x 80 m in size and the southern lake is c. 400 x 150 m in size.	C	2	
Wairakau estuary, Whangaroa Harbour	B	Best example of a deeply incised small gorge flooded by the sea in Northland.	Gorge was invaded by the sea during post-glacial sea level rise. Now the embayment is partly infilled by modern sediments forming a tidal estuary with steep rocky walls.	Mouth of Wairakau Stream, head of Pekapeka Bay, Whangaroa Harbour.	C	3	
Wairere Boulders basalt proto-karst, Hokianga	B	Best known example in New Zealand of a valley filled with gigantic basalt boulders that are relics from a former lava flow that extended over the valley. One of two best examples in New Zealand and probably the world of deep fluting and basins produced by solution of basalt (proto-karst).	Valley part filled with large boulders of fluted basalt derived from the Horeke Basalt flow on top of ridge that used to extend across valley. A private tourist attraction with track through them. Boulders in stream bed are tilted at many different angles relative to the fluting whereas most of the fluted boulders above the stream have vertical fluting and solutions basins and sometimes flats on top.	Hokianga, Wairere Valley, extending inland from head of Wairere estuary at end of McDonnell Rd.	A	2	B6, S2
Waitahora Lagoon, Spirits Bay	C	Only coast-parallel, barrier-enclosed lagoon in northern Northland and northernmost lagoon in New Zealand.	Brackish Waitahora Lagoon drains Paranoa Swamp and is almost permanently closed off by long-shore drift-induced sand barrier accumulation, 2 km long and 100 m wide, at the western end of Te Horo Beach, Spirits Bay.	2 km east of Pandora, western Spirits Bay, Far Nth.	C	2	
Waitangi columnar-jointed lava flow and gabbroic inclusions	E	Best locality for gabbroic inclusions of lava of Quaternary age in Northland.	A columnar jointed basalt flow extends into the sea forming a 20 m by 50 m portion of the shore platform with 8 m outcrop on N end of boulder covered beach. Inclusions may be found in 2-3 m band near top of the outcrop, and in boulders on the shore platform.	On North edge of the Waitangi Treaty House Grounds and south east corner of Waitangi golf course where it abuts the coast.	B	2	A1, S4
Waitapu Bay Cretaceous unconformity, Whangaroa Harbour	E	Best exposure of late Cretaceous conglomerate and micaceous sandstone unconformably overlying early Cretaceous Tupou Formation.	Occurs within a large nappe in Northland Allochthon. Best exposure of several around Whangaroa, where late Cretaceous conglomerate and micaceous sandstone unconformably overlies with sedimentary contact an irregular surface of early Cretaceous Tupou Formation.	On point, 200 m north of Ota Point, Waitapu Bay, south Whangaroa Harbour.	C	2	B19
Waiwhatawhata Coast conglomerate, basalt flows and lignite, Hokianga	D	Excellent exposures of marine deltaic conglomerate and terrestrial volcanoclastic sequence. Best Miocene sequence in Hokianga district; includes most diverse fossil macroflora in North Island. Well exposed section through three Waipoua Basalt flows that form spectacular columnar-jointed reefs.	Distal flows of Waipoua Basalt interbedded with deltaic marine and non-marine Omapere Conglomerate, overlain by freshwater deposits of Pukorukoru Formation. Marine to non-marine regressive sequence. Lava flows dip southwest, forming a series of three southwest-dipping reefs. Spectacular sedimentary features in shallow marine and fluvial conglomerate and sandstone. Fossil palm, ferns and leaves in a number of places in Pukorukoru Formation.	South of Hokianga Harbour mouth, along 5 km of coastline, between Waiwhatawhata Stm mouth and 1 km north of Waimamaku River mouth. Includes section of coastal rocks and cliffs around Hokianga South Head.	B	2	H6, H14
Wekaweka natural gas seep, Hokianga	C	Best, perhaps only, true hydrocarbon seep in Northland.	A 5-m-diameter watery mud pool with moderate to vigorous discharge of methane.	Approx. 5 km up the Wekaweka Valley road and 800 m up farm track on north side. In patch of manuka 30 m south of farm track.	C	1	P1
Whakaterekia allochthon block, Whangaroa	D	Well exposed stream section through basal nappe of the allochthon containing overturned unshaped argillaceous limestone.	Thinly bedded Oligocene argillaceous limestone (not sheared) grading up into calcareous siltstone.	Whakaterekia U-bend gorge, North Omahuta, 500 m downstream from New Zealand Forest Service headquarters at Mangapa.	C	2	B21
Whakaterekia Stream Eocene rock sequence, Whangaroa	D	Type section of Mangapa Mudstone, and possibly the thickest in situ Eocene in Northland.	Nearly complete exposure of ca 300 m of in situ greensand and calcareous siltstone resting on greywacke and beneath the Northland Allochthon.	From just above road bridge, east of Mangapa upstream to concrete ford atop high falls on forestry road.	B	3	B21

Whangamumu Harbour and peninsulas, Cape Brett Peninsula	A	Unusual narrow, sinuous deep-water harbour with two elongate peninsulas jutting out into sea on either side. Shape reflects origins by drowning of deeply incised small valley.	3 km long, 500-800 m wide deep-water harbour, being the drowned deeply incised head of a small valley eroded into greywacke rocks that form the two finger-like peninsulas, one on each side.	Whangamumu Harbour and enclosing peninsulas along northern and southern coasts, eastern side of Cape Brett Peninsula, east of Bay of Islands.	C	3	
Whangape Harbour entrance gorge	A	Spectacular, deeply-incised river gorge flooded by post-glacial sea-level rise to form a narrow, elongate harbour entrance. Landform unique in New Zealand.	Narrow, sinuous harbour entrance (3km long by 100-300 m across at sea level), with steep slopes on both sides rising to 300 m ASL. Water averages 4-5 m deep.	Forms entrance to Whangape Harbour, west Northland.	B	3	
Whangape pillow basalt	E	One of the best preserved and easily accessible examples of pillow lava and fresh hyaloclastite in the Tangihua Volcanic Group of Northland.	Well-preserved late Cretaceous pillow lavas and hyaloclastite, exposed in three dimensions showing lobe-like form.	In shore platform and low cliffs on south side and west end of Whangape Harbour.	C	2	
*Whangape Pleistocene fossils	E	One of the two richest shallow-marine fossil faunas in Northland.	Fossiliferous shallow marine mudstone and sandstone exposed in low coastal cliffs and shore platform. Late Pleistocene MIS 7 age.	Coastal exposures at the end of Proctor Rd, Whangape Harbour.	B	1	
Whangaroa exfoliation domes	B	A spectacular area of rocky exfoliation domes, rock pinnacles, rocky ridges and overhanging rocks (Dukes Nose).	Eroded out of andesite laharic breccias that were deposited on the ring plain of the early Miocene Wairakau Volcano. Spectacular rock formations surround much of Pekapeka Bay, Whangaroa Harbour.	Ridge along south side of Pekapeka Bay, Whangaroa Harbour - includes The Dukes Nose.	C	2	
Whangaroa Harbour lacustrine sequence	E	Best exposure of lacustrine sediments in Wairakau Volcanics sequence. One of the best exposures of penecontemporaneous slump folding in lake sediments in New Zealand.	Three units up to 0.5 m thick, of penecontemporaneous slump folding and spectacular liquefaction within a 10 m thick sequence of fine grained early Miocene volcanigenic lake sediments.	Northwest side Whangaroa Harbour coastline, 2 km northeast of Totara North.	C	3	W2, H9
Whangaroa North Head ring plain deposits and rocky pinnacled ridge crest.	B	Best exposures of Miocene ring plain deposits in northern New Zealand, including several paleogullies and their walls. Most easily accessible exposures (Taupo Bay). Includes outstanding rocky ridge crest with mushroom rock on top.	Laharic breccias, reworked breccias, minor fluvial sediments and a flow confined in paleogullies eroded in breccias. Pyroclastic dikes intrude laharic breccias at south end of Taupo Bay. Ridge crest above has numerous rocky knolls, pinnacles and a mushroom rock all in laharic breccia.	In cliffs from inside Whangaroa Harbour entrance west to south end of Taupo Bay and on ridge crest extending south east to the head of Pekapeka Bay.	B	3	H9, H10
Whangatapere Bay plutons	D	Best exposed section through the two intrusive plutons of Karikari Plutonics. Only major intrusive plutons in Northland.	Exposures of predominantly quartz microdiorite with coarse lithologies present. Dike intrusions are common.	Coastal intertidal rock and cliff section around Whangatapere Bay, Karikari Peninsula.	C	3	I3, R2, R3
Wharepoke Falls, Kerikeri	B	An unusual example of a wide, low waterfall over a basalt flow.	5 m high falls over eroded Pliocene basalt lava flow with large plunge pool beneath. Tourist attraction.	On Kerikeri River about 1 km upstream from Stone Store and 2 km downstream from Rainbow Falls.	C	2	
Whatuwhiwi Cretaceous sedimentary rocks and pillow lavas, Cape Karikari	E	Most complete and least deformed late Cretaceous sedimentary rock sequence in Northland. Type locality of Tokerau Formation mid Cretaceous sedimentary rocks and pillow lava.	Little deformed (in situ?) conglomerate, flysch and mudstone resting unconformably on Cretaceous Houhora Volcanics. Includes type section of bedded Tokerau Formation argillite and greywacke with intercalated pillow lava flow intruded by early Miocene dike.	2 km section from point east of Patia Pt to Waiparaheke Stn, Whatuwhiwi, Cape Karikari. Also short intertidal rock section west end of Parakeraka Bay.	C	2	I2

## Appendix 6

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