

6.13 SIGNIFICANT GEOLOGICAL SITES AND LANDFORMS

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Key to classifications:

Importance:	A.	International - site of international scientific importance
	B.	National - site of national scientific, educational or aesthetic importance
	C.	Regional - site of regional scientific, educational or aesthetic importance.
Vulnerability:	1.	Highly vulnerable to complete to complete destruction or major modification by humans
	2.	Moderately vulnerable to modification by humans
	3.	Unlikely to be damaged by humans
	4.	Could be improved by human activity
	5.	Site already destroyed (not necessarily by human activity).

G1 Abyss Creek Triassic fauna

SIGNIFICANCE: Together with Coal Creek, only richly fossiliferous early Triassic in New Zealand.

AGE: Triassic

LOCALITY: Small hill exposure on south side of road, immediately east of creek, Ohai. D45/162660.

FOSSIL RECORD NO: D45/f7648

EXPOSURE TYPE: Hillside

CLASSIFICATION: Importance = B Vulnerability = 3

HAZARDS: Erosion, farming

G2 Alpine Fault (Haast-Milford), Lake McKerrow

SIGNIFICANCE: Exposures of Alpine Fault [>3000 m south side up and 480 km RL oblique slip-high angle reverse fault]. Has good stratigraphic and topographic controls and exposure for detailed analysis of northern Fiordland portion of fault. Fault has vertical dip, dextral displacement rate of c.200 mm/yr and landward tilting uplift rates of c.1.6 mm/yr (SE side), and c.2.2 mm/yr (NW side). Note GR above is for Kaipo River site. Hokuru site is to NW at (D39/179364). This site is monitored for precise strain measurements by the Earth Deformation Section, Institute of Geological and Nuclear Sciences Ltd (New Zealand Geological Survey).

LOCALITY: Lake McKerrow area, Kaipo River-Hokuri Creek. D39/082245

CLASSIFICATION: Importance = C Vulnerability = 3

HAZARDS: Slumping and streambank erosion.

RESERVE STATUS: Fiordland National Park (Kaipo River) and Crown land (Hokuru)

G3 Anchorage Cove Springs

DESCRIPTION: Hot water vents.

LOCALITY: In Anchorage Cove (off George Sound), on the sea bed. C41/571676

CLASSIFICATION: Importance = C Vulnerability = 2

RESERVE STATUS: Fiordland National Park

G4 Anita Bay bowenite

SIGNIFICANCE: A particularly good example of gem-quality serpentine (bowenite).

DESCRIPTION: Attractive pale green boulders of precious serpentine.

LOCALITY: Anita Bay, at the southern side of the mouth of Milford Sound. D40/ 963116

ACCESS: By boat. **EXPOSURE TYPE:** Boulders on beach

CLASSIFICATION: Importance = B Vulnerability = 2

HAZARDS: Over-collecting

RESERVE STATUS: Fiordland National Park

G5 Anita Bay dunite mylonite

SIGNIFICANCE: Excellent example of mylonitised dunite.

DESCRIPTION: Foliaceous and porphyroclastic harzburgitic dunite mylonite with lesser blastomylonite, is associated with schist, and is separated from adjoining gneiss by faults.

LOCALITY: Southeast end of Anita Bay, near entrance to Milford Sound. The mylonite is also well-exposed at Poison Bay, 15 km SW of Milford Sound. D40/ 961118

EXPOSURE TYPE: Coastal, and boulders on the beach

CLASSIFICATION: Importance = B Vulnerability = 3

RESERVE STATUS: Fiordland National Park

G6 Arthur River delta

SIGNIFICANCE: A good example of a lacustrine birdsfoot delta. Classified as a moderately well defined landform of scientific/educational value.

LOCALITY: Lake Ada, 15 km inland from Poison Bay. D40/016964

ACCESS: Visible from Milford Track.

CLASSIFICATION: Importance = C Vulnerability = 3

RESERVE STATUS: Fiordland National Park

- G7 **Aurora Cave (= Te Anau)**
SIGNIFICANCE: Geomorphology - length, speleogenesis relationship to Pleistocene glaciation, sedimentary deposits; resurgence cave is a tourist cave.
DESCRIPTION: Shallowly inclined cave, containing about 6 km of passage, 227 m height difference between upper entrance and resurgence.
LOCALITY: Western Shores of Lake Te Anau, Tunnel Basin. D42/963328
ACCESS: Permit only
CLASSIFICATION: Importance = A Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G8 **Bald Cone exfoliation dome - Stewart Island**
SIGNIFICANCE: An excellent example of an exfoliation dome. Classified as an extremely well defined landform of scientific/educational value.
AGE: Quaternary
LOCALITY: South shore of Shipbuilders Cove, Port Pegasus, Stewart Island. D50/007183
ACCESS: Best seen from air.
CLASSIFICATION: Importance = C Vulnerability = 3
- G9 **Bare Hill zeolitised tuff zone, Hokonui Hills**
SIGNIFICANCE: Section through heulandite and analcime-bearing Late Triassic tuffs in the Southland Syncline; a world class example of zeolite facies burial metamorphism.
DESCRIPTION: About 11 cm of semi-continuous section through Late Triassic tuffaceous sediments. Heulandite and analcime-bearing tuffs are represented along with some albitised variants.
LOCALITY: Bare Hill forestry road (E45/675586 to E45/675596), Hokonui Hills. E45/675586
ACCESS: Key and permission required for forestry roads.
EXPOSURE TYPE: Semi-continuous road cuttings
CLASSIFICATION: Importance = A Vulnerability = 3
- G10 **Beaumont Stream and quarry Triassic fauna**
SIGNIFICANCE: Endemic, in-situ Etalian fauna with ammonites used in international correlation (quarry). Also holostratotype of Etalian Stage in stream section.
AGE: Triassic
LOCALITY: Small quarry on east side of road, between former Beaumont and Ardross Stations. Also in adjacent stream cutting. D45/215680. **FOSSIL RECORD NO:** D45/f7906
EXPOSURE TYPE: Quarry and stream cuttings
CLASSIFICATION: Importance = B Vulnerability = 3
HAZARDS: Erosion, burial by farming
- G11 **Ben Bolt Jurassic fauna**
SIGNIFICANCE: Richest and most diverse Aratauran fauna in New Zealand.
AGE: Jurassic
LOCALITY: On north side of Ben Bolt (hill), Hokonui Hills. E45/601588.
FOSSIL RECORD NO: E45/f9676
EXPOSURE TYPE: Road and stream exposures
CLASSIFICATION: Importance = B Vulnerability = 3
- G12 **Big Hellfire Beach sand pass**
SIGNIFICANCE: A very well defined example of an extensive dune system rising to 220 m asl. Classified as an extremely well defined landform of scientific/educational value
AGE: Post glacial
LOCALITY: From Big Hellfire Beach extending inland 1.25 km. D48/080642
CLASSIFICATION: Importance = C Vulnerability = 3
- G13 **Birch's Mill Pliocene shellbed**
SIGNIFICANCE: Very diverse macrofauna. Only good Pliocene fauna in southern South Island.
AGE: Pliocene
LOCALITY: Head of north coast of Te Wae Wae Bay, mouth of gully behind beach, 32 chains east of road up cliff to Birch's Mill. Thick lens of shalloe water shells. C46/835366.
FOSSIL RECORD NO: C46/f9595
EXPOSURE TYPE: Coastal cliffs
CLASSIFICATION: Importance = B Vulnerability = 3
- G14 **Blue Cliff Miocene fauna, near Port Craig**
SIGNIFICANCE: Moderately diverse Kapitean fauna.
AGE: Miocene
LOCALITY: Coastal cliff at west end (head) of Te Wae Wae Bay. C46/779362.
FOSSIL RECORD NO: C46/f9611
EXPOSURE TYPE: Coastal cliff
CLASSIFICATION: Importance = C Vulnerability = 3
HAZARDS: Marine erosion

- G15 **Brydone Oligocene molluscan fauna**
SIGNIFICANCE: Very diverse Waitakian molluscan fauna.
AGE: Oligocene
LOCALITY: Mataura River, west bank. F46/885315.
FOSSIL RECORD NO: F46/f8492
EXPOSURE TYPE: River cliff
CLASSIFICATION: Importance = B Vulnerability = 3
- G16 **Cape Providence graptolite-rich Ordovician black shales**
SIGNIFICANCE: Exceptionally well exposed black shale - turbidite association, important biostratigraphic section through lower Ordovician graptolite-rich rocks, important for understanding Ordovician paleoenvironments.
DESCRIPTION: Ordovician black shales intercolated with turbidite structures.
AGE: Ordovician
LOCALITY: 4 km length of coastal platform extending from Landing Bay to Cape Providence and along coast to the Arch Stack, Fiordland. A45/037466.
FOSSIL RECORD NO: A45/f22
ACCESS: Boat
EXPOSURE TYPE: Shore platform
CLASSIFICATION: Importance = B Vulnerability = 2
HAZARDS: Mining
RESERVE STATUS: Fiordland National Park
- G17 **Caroline cutting Triassic fauna**
SIGNIFICANCE: Rich and diverse Kaihikuan brachiopods and bivalves. Historically important type for brachiopod species described by Trenchman. Tuffaceous rock, vertical beds.
AGE: Trassic
LOCALITY: East side of main road between Dipton and Lumsden. E44/510746.
FOSSIL RECORD NO: E44/f9541
EXPOSURE TYPE: In road (formerly rail) cutting
CLASSIFICATION: Importance = B Vulnerability = 3
HAZARDS: Erosion, overgrowth by grass
- G18 **Chalky Island submarine canyon and fan deposits**
SIGNIFICANCE: The "Bellany Depocentre" represents canyon and rise sediments related to Oligocene continental borderland or shelf-edge environments located between the New Zealand continent and the southern Tasman Ocean.
DESCRIPTION: Continental "shelf", canyon, and rise deposits follow one another in ascending some 900 m. Most sediments were deposited by subaqueous mass-transport in an Oligocene submarine canyon and fan system, and grade up into abyssal seafloor argillaceous chalk marls. The sequence unconformably overlies Drop Point Granite basement.
AGE: Eocene, Oligocene, Miocene
LOCALITY: Chalky Island, southwestern Fiordland, at the entrance to Chalky Inlet, most southerly but one of the major fiords. Grid reference is for Sealers Bay. A45/096430
ACCESS: By boat
EXPOSURE TYPE: Coastal cliffs and shore platform
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G19 **Chimney Peaks ridge pillow lava**
SIGNIFICANCE: Complex pillow lava and pillow breccia sequence.
DESCRIPTION: Complex pillow lava and pillow breccia sequence with intrusion of sheet lava tongues into clastic sequence.
AGE: Lower Permian
LOCALITY: Ridgeline 2 km northeast of Chimney Peak. D44/067853
CLASSIFICATION: Importance = C Vulnerability = 3
- G20 **Cleddau Chasm**
SIGNIFICANCE: A well defined and easily accessible gorge. Classified as an extremely well defined landform of scientific/educational and scenic value.
LOCALITY: Cleddau River. D40/101973
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park

- G21 Clifden Miocene sediments**
SIGNIFICANCE: The "classic" highly fossiliferous reference section for middle Miocene sedimentary sequence in Southland. Very diverse macrofaunas and holostratotypes of Altonian, Clifdenian, Lillburnian and Waiauian Stages.
DESCRIPTION: Otaian to Waiauian sequence of limestones (Clifden Limestone), silty and muddy sandstones (Otahu Formation), banded sandstones (Merton Sandstone), massive siltstone with interbedded sandstone (Nga Pari Formation), and sandstones with interbedded shellbeds (Park Bluff Sandstone). One of the localities where Miocene marine and terrestrial fossils occur together in numbers suitable for age correlation.
AGE: Miocene
LOCALITY: Clifden, where river has exposed sediment upstream from Clifden Bridge, right bank section. D45/001508.
FOSSIL RECORD NO: D45/f8651
ACCESS: Easy from road along Waiau River.
EXPOSURE TYPE: Stream bed and cliffs
CLASSIFICATION: Importance = A Vulnerability = 3
HAZARDS: Flooding and erosion
RESERVE STATUS: Clifden Scientific Reserve
- G22 Coal Creek Triassic fauna**
SIGNIFICANCE: Together with Abyss Creek, only richly fossiliferous early Triassic in New Zealand. Holostratotype of Malakovian Stage.
AGE: Triassic
LOCALITY: Small hillside exposure, Malakov Hill. D45/183662.
FOSSIL RECORD NO: D45/f7574
EXPOSURE TYPE: Hillside
CLASSIFICATION: Importance = B Vulnerability = 3
HAZARDS: Erosion and farming
- G23 Conical Hill Jurassic brachiopod locality**
SIGNIFICANCE: Diverse lower Ururoan brachiopod fauna. Type locality of several taxa.
AGE: Jurassic
LOCALITY: In Otapiri Gorge, above stream. E45/583543.
FOSSIL RECORD NO: E45/f9860
EXPOSURE TYPE: Hillside
CLASSIFICATION: Importance = B Vulnerability = 3
HAZARDS: Erosion, farming
- G24 Cow and Calf Point gabbro intrusion, Stewart Island**
SIGNIFICANCE: Readily accessible good coastal exposures of hornblende gabbro grading into hornblende.
DESCRIPTION: Gabbro exposures, similar in petrology to hornblende gabbro at Pahia Point (Longwood Complex).
AGE: ?Jurassic
LOCALITY: Well exposed on both sides of Cow and Calf Point, north shore of Paterson Inlet. E48/366554
CLASSIFICATION: Importance = C Vulnerability = 3
- G25 Croydon clinker**
SIGNIFICANCE: Representative example of thermally metamorphosed sediments associated with naturally burnt coal in Southland.
DESCRIPTION: Clinker material above 20 m thick lignite seam.
LOCALITY: Croydon lignite deposit west of Gore. F45/865516
EXPOSURE TYPE: Walls of a currently abandoned mine cutting
CLASSIFICATION: Importance = C Vulnerability = 2
HAZARDS: Future exploitation of lignite
- G26 Darran Complex, Milford Sound**
SIGNIFICANCE: Very well-exposed meta-igneous rocks with amphibolite facies overprint (example of passage from Darran Igneous Complex to Harrison Formation layered gneisses).
DESCRIPTION: Partly gneissose hornblende diorite with metamorphic epidote and mica; garnet present from Bowen Valley westwards.
LOCALITY: Bowen Falls, Milford Sound, and quarry opposite hostel. D40/078036
ACCESS: By foot on track from Milford Sound wharf to base of Bowen Falls.
EXPOSURE TYPE: Excellent continuous coastal exposures and cliff face
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G27 Donne Glacier roche moutonnee and glacierised surfaces**
SIGNIFICANCE: Examples of roche moutonnee and glacierised surfaces which are undisturbed by NZ standards. Classified as extremely well defined landforms of scientific/educational value.
LOCALITY: Donne Glacier D40/180125
CLASSIFICATION: Importance = C Vulnerability = 3
RESERVE STATUS: Fiordland National Park

- G28 Doubtful Sound gneisses**
SIGNIFICANCE: Well-exposed high grade gneisses of both sedimentary and igneous origin.
DESCRIPTION: Widespread hornblende-bearing gneiss and granulite. Metagneisses have localised marble beds (see Kellard Point marble).
LOCALITY: Doubtful Sound (grid reference is approximate). B43/343262
ACCESS: Best by boat from Deep Cove, which has road access from Lake Manapouri.
EXPOSURE TYPE: Excellent exposures along fiord shoreline
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G29 Dusky Sound zincian staurolite**
SIGNIFICANCE: The highest zinc content in a zincian staurolite recorded in the world, is associated with other rare minerals.
DESCRIPTION: A lens in medium grade metamorphic rock of the amphibolite facies with well crystallised rare minerals occurring in bands of quartz/gahnite/staurolite, with chalcopyrite and dannemorite.
LOCALITY: Dusky Sound, 4 km NW of Mt Pender, between Wet Jacket Arm and Bowen Channel. B44/286859
ACCESS: By boat from Dusky Sound.
EXPOSURE TYPE: Heavily vegetated
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G30 Earl Mountains Cenozoic sequence**
SIGNIFICANCE: Complete sequence through lower half of Te Anau Basin Cenozoic succession. Type section for Earl Mountains Sandstone.
DESCRIPTION: Sequence starts at basal unconformity (with more than 20 m relief) over Eglington Volcanics, passes through Sandfly Formation conglomerate, Earl Mountains Sandstone fluvial unit, Boyd Creek Formation submarine fan sandstone with End Peak Member crossbedded sandstone (? channel fill).
AGE: Eocene, Oligocene
LOCALITY: Earl Mountains from D41/136629 to D42/114593, Fiordland. D41/136 629
ACCESS: Preferably helicopter to N end of section, or foot from Eglington Valley.
EXPOSURE TYPE: Ridge crest, bluffs and cliffs, gullies
CLASSIFICATION: Importance = C Vulnerability = 3
HAZARDS: Eventual tussock overgrowth
RESERVE STATUS: Fiordland National Park
- G31 Earnest Islands tombolo, Stewart Island**
SIGNIFICANCE: A particularly good example of a tombolo. Classified as an extremely well defined landform of scientific/educational value.
LOCALITY: Connects south end of Mason Bay to Earnest Islands, Stewart Island. D49/050470
CLASSIFICATION: Importance = B Vulnerability = 3
- G32 Gair Loch debris dam**
SIGNIFICANCE: A good example of many such features in the district. Classified as an extremely well defined landform of scenic value.
LOCALITY: Gair Loch, on Seaforth River, Fiordland. C44/502926
ACCESS: Accessible by track.
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G33 Gog and Magog exfoliation domes, Stewart Island**
SIGNIFICANCE: Best example of exfoliation domes in the country. Classified as an extremely well defined landform of scientific/educational value.
LOCALITY: Southwest corner of Stewart Island. D49/973211
CLASSIFICATION: Importance = B Vulnerability = 3
- G34 Granite Knob and Lees Knob exfoliation domes, Stewart Island**
SIGNIFICANCE: Two distinctive exfoliation domes. Classified as an extremely well defined landform of scientific/educational value.
AGE: Quaternary
LOCALITY: North end of Tin Range, southern Stewart Island. D49/140325
ACCESS: Best seen from air.
CLASSIFICATION: Importance = C Vulnerability = 3
RESERVE STATUS: Forest Park
- G35 Green Islets wavecut notches**
SIGNIFICANCE: A spectacular set of wave cut notches. Classified as extremely well defined landforms of scientific/educational and scenic value.
LOCALITY: On south coast of South Island, near Green Islets. B46/309243
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park

- G36 **Green Lake rock avalanche deposit**
SIGNIFICANCE: A very large example of a rock avalanche deposit - it is the only one in New Zealand which can be recognised on satellite images. Classified as an extremely well defined landform of scientific/educational value.
LOCALITY: Green Lake. C44/717766
CLASSIFICATION: Importance = A Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G37 **Haldane estuary**
SIGNIFICANCE: A good example of an estuary. Classified as an extremely well defined landform of scientific/educational value.
LOCALITY: Haldane Bay, south coast of South Island. F47/061889
CLASSIFICATION: Importance = C Vulnerability = 3
RESERVE STATUS: Catlins State Forest Park
- G38 **Harrold Bay spheroidal weathering, Stewart Island**
SIGNIFICANCE: An example of spheroidal weathering in granite. Classified as an extremely well defined landform of scientific/educational value.
AGE: Post glacial
LOCALITY: Harrold Bay, south side of Half Moon Bay, Stewart Island. E48 /405 570
CLASSIFICATION: Importance = C Vulnerability = 3
- G39 **Heale Ridge shallow marine Jurassic fauna**
SIGNIFICANCE: Very rich, shallow marine bivalve and brachiopod fauna. Unique New Zealand locality for several bivalve genera.
AGE: Jurassic
LOCALITY: Outcrops on Heale Ridge crest, Hokonui Hills. E45/559543.
FOSSIL RECORD NO: E45/f85
EXPOSURE TYPE: Loose blocks on hillside
CLASSIFICATION: Importance = B Vulnerability = 3
HAZARDS: Farming, bulldozing, earthworks
- G40 **Hidden Lake, Milford Track**
SIGNIFICANCE: A well defined avalanche formed tarn. Classified as an extremely well defined landform of scenic value.
LOCALITY: Clinton River (West Branch), on Milford Track, 2 km northeast of Six Mile Hut. D41/012811
ACCESS: On Milford Track.
CLASSIFICATION: Importance = A Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G41 Deleted by way of reference to the Environment Court.
- G42 **Hollyford Valley dikes**
SIGNIFICANCE: Unusual and accessible dikes.
DESCRIPTION: Cr-diopside ankaramite dikes in volcanogenic sediments.
AGE: Permian
LOCALITY: Road cuttings between Hollyford River and Hollyford-Eglinton. D41/ 232884
CLASSIFICATION: Importance = C Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G43 **Homer Saddle glacial features**
SIGNIFICANCE: A collection of well defined glacial features, the Homer Saddle being of particular historic importance as the only direct inland crossing to Milford Sound. Classified as extremely well defined landforms of scientific/educational and scenic value.
LOCALITY: Area of the Homer Tunnel on State Highway 94. D40/128931
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G44 **Howells Point pillow lavas**
SIGNIFICANCE: Pillow lavas and pumpellyite mineral location.
DESCRIPTION: Well developed pillow lavas - amygdalae contain radiating clusters of blue green pumpellyite.
AGE: Permian
LOCALITY: Coastal exposures at Howells Point. D46/282133
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Howells Point Domain
- G45 **Kaherekoau aegirine**
SIGNIFICANCE: A good example of a mineral rare in New Zealand.
DESCRIPTION: Aegirine occurring in granite.
LOCALITY: In the Kaherekoau Mountains, south of Lake Monowai, at the headwaters of the Lillburn. C45/749621
CLASSIFICATION: Importance = C Vulnerability = 3

- G46 **Kellard Point marble**
SIGNIFICANCE: Well-exposed marble in central Fiordland high-grade gneisses.
DESCRIPTION: Coarse-grained marble with numerous flakes of pale brown mica (phlogopite). Other minerals include diopside and graphite.
LOCALITY: Kellard Point, Doubtful Sound, a short distance from entrance of Crooked Arm (also exposed at entrance to Halls Arm, and Helena Falls at head of Deep Cove). B43/431224
ACCESS: Road to Deep Cove from Lake Manapouri, then by boat.
EXPOSURE TYPE: Good coastal exposures
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G47 **Kershaw to Coal Creeks ridge intrusion**
SIGNIFICANCE: Well exposed shallow intrusion.
DESCRIPTION: A zoned 200 m wide shallow intrusion of gabbro to quartz diorite composition.
AGE: Lower Permian
LOCALITY: On the ridge between Kershaw and Coal Creeks, eastern side of Takitimus. D44/150955
CLASSIFICATION: Importance = C Vulnerability = 3
- G48 **Key Summit Permian lower Maitai Group meta-sediments and syncline**
SIGNIFICANCE: Best, easily accessible outcrops of lower Maitai Group lawsonite-bearing, low temperature/pressure slate. Includes an unusual occurrence of sodic-amphibole, an indicator of high pressure, low temperature metamorphic condition. A good exposure of a syncline of unique regional continuity.
DESCRIPTION: Accessible exposures of Wooded Peak Limestone, Tramway Formation, and Little Ben Sandstone. Grey slates contain lawsonite in association with blue sodic amphibole. Sediments folded to near isoclinal syncline.
AGE: Permian (upper)
LOCALITY: Key Summit Trig, Routeburn Track west of Lake Howden. The syncline extends several hundred kilometres. D41/248878
ACCESS: Walking from Milford Sound Road via Routeburn Track.
EXPOSURE TYPE: Sporadic exposure in track cuttings, ridge crest bluffs, and streams draining Key Summit Ridge
CLASSIFICATION: Importance = B Vulnerability = 2
RESERVE STATUS: Fiordland National Park
- G49 **Kisbee Bay Ordovician biostratigraphic section**
SIGNIFICANCE: Important biostratigraphic section through lower Ordovician graptolite-bearing rocks.
AGE: Ordovician
LOCALITY: Coastline from Kisbee Bay for 1 km to south and north. B46/239365.
FOSSIL RECORD NO: B46/f6520
EXPOSURE TYPE: Shore platform
CLASSIFICATION: Importance = B Vulnerability = 2
HAZARDS: Marine erosion
RESERVE STATUS: Fiordland National Park
- G50 **Kowhai Creek Triassic macrofauna**
SIGNIFICANCE: Well-preserved Kaihikuan macrofauna.
AGE: Triassic
LOCALITY: Kowhai Creek, bluff above on true right-hand side, upstream from junction with Little Kowhai Creek. D44/251822.
FOSSIL RECORD NO: D44/f58
EXPOSURE TYPE: Hillside
CLASSIFICATION: Importance = C Vulnerability = 3
HAZARDS: Erosion, grazing
- G51 **Lake Erskine, Earl Mountains**
SIGNIFICANCE: A text book example of a tarn. Classified as an extremely well defined landform of scientific/educational and scenic value.
LOCALITY: Earl Mountains, 8 km south of Homer Tunnel. D41/146847
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G52 **Lake Hakapoua debris dam**
SIGNIFICANCE: Classified as an extremely well defined landform of scenic value.
LOCALITY: Lake Hakapoua, south coast of South Island. B46/419308
CLASSIFICATION: Importance = C Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G53 **Lake Hakapoua shore platform**
SIGNIFICANCE: Classified as an extremely well defined landform of scientific/educational value.
LOCALITY: Green Islets, 12 km west of Lake Hakapoua outlet. B46/309243
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park

- G54 Lake Hauroko fault scarp**
SIGNIFICANCE: Fault scarp that displaces Holocene (and older) surfaces in the Wairaurahiri Valley (N side up). Example of late Quaternary faulting in eastern Fiordland.
LOCALITY: Outlet of Lake Hauroko/source of Wairaurahiri River. C45/673428
CLASSIFICATION: Importance = C Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G55 Lake Marian, Darran Mountains**
LOCALITY: Lake Marian, in Marian Creek off Hollyford River, Darran Mountains. D40/209908
ACCESS: Visible from Gertrude Saddle, but accessible by track for 3 km off Hollyford Road.
CLASSIFICATION: Importance = C Vulnerability = 3
HAZARDS: Might be commercialised to small extent.
RESERVE STATUS: Fiordland National Park
- G56 Lake Quill cirque and Sutherland Falls**
SIGNIFICANCE: An extremely scenic cirque lake (approximately 1 sq km) at high elevation, with an outlet direct to a magnificent high waterfall. Classified as extremely well defined landforms of scientific/educational and scenic value.
LOCALITY: Lake Quill and the Sutherland Falls, 20 km SW of the head of Milford Sound. D41/930870
ACCESS: Access on foot to the base of the falls from Milford Track. Lake better appreciated from the air.
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G57 Letham Ridge thrust**
SIGNIFICANCE: The best regional exposure of a terrane boundary.
DESCRIPTION: An east-dipping thrust fault juxtaposing Murihiku terrane with Brook Street terrane.
LOCALITY: On the west side of Letham Ridge between Letham trig and Morley trig, D44/191811 and D44/192738.
EXPOSURE TYPE: Discontinuous exposure in stream valleys
CLASSIFICATION: Importance = C Vulnerability = 3
- G58 Luxmore Cave**
SIGNIFICANCE: Geomorphology - largest of Mt Luxmore caves, representative of these alpine caves.
DESCRIPTION: Submergence cave, horizontal streamway, in Oligocene limestone.
LOCALITY: Mt Luxmore, Fiordland National Park. C43/889217
CLASSIFICATION: Importance = C Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G59 MacLean Peak basalt and andesite section, Takitimu Mountains**
SIGNIFICANCE: Type section of the Maclean Peak Formation, basalt to andesite flows.
DESCRIPTION: Submarine lava flows. Andesite is first to appear in the formation and there is a continuous range of silica contents from basalt to andesite.
AGE: Lower Permian
LOCALITY: Hillslope 500 m east of Wairaki Peaks. D44/112851
CLASSIFICATION: Importance = C Vulnerability = 3
- G60 MacLean Peak pillow lava**
SIGNIFICANCE: Interesting features within a pillow lava flow.
DESCRIPTION: Pillow lava flow with range of features at base including paravesicles and incorporation of soft sediment. 2 km NE of the type section of MacLean Peak Formation.
AGE: Lower Permian
LOCALITY: Ridgeline 500 m south of MacLean Peak. D44/124863
CLASSIFICATION: Importance = C Vulnerability = 3
- G61 Mararoa River Permo-Triassic Maitai Group sediments**
SIGNIFICANCE: Excellent exposure of Upukerora Breccia and Waiiau and Stephens Formations, Maitai Group.
DESCRIPTION: SW-dipping sequence of red and green volcanogenic breccia (Upukerora Breccia), thick-bedded red sandstone and red and green mudstone (Waiiau Formation), and green and grey volcanogenic sandstone and black mudstone (Stephens Formation).
AGE: Permian, Triassic
LOCALITY: Mararoa Valley. D43/250260
ACCESS: Mavora Lakes Road. **EXPOSURE TYPE:** Bluffs and riverside exposures
CLASSIFICATION: Importance = C Vulnerability = 3
- G62 Mason Bay sand passes and dunes, Stewart Island**
SIGNIFICANCE: An extensive area of dunes and sand passes. Classified as extremely well defined landforms of scientific/educational value.
LOCALITY: Mason Bay, Stewart Island. Grid Reference is for Big Sand Pass. D48/127539
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Stewart Island Forest Park
- G63 Mavora Lakes glacial swamp and lake**
SIGNIFICANCE: Excellent example of a moraine dammed lake and swamp. Classified as extremely well defined landforms of scientific/educational value.
LOCALITY: Small lake and swamp 1 km south of South Mavora Lake. E42/320309
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Mavora Lakes Park

- G64 **Mavora Lakes vuagnatite**
SIGNIFICANCE: Only in situ occurrence of vuagnatite in New Zealand.
DESCRIPTION: The ophiolite mineral vuagnatite occurs as small well-formed crystals in a veinlet cutting a rodingite dike.
LOCALITY: West Burn, West of North Mavora Lake. D42/270445
ACCESS: By foot up West Burn Valley.
EXPOSURE TYPE: Valley walls
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Mavora Lakes Park
- G65 **Monkey Creek hanging valley**
SIGNIFICANCE: A well defined hanging valley. Classified as an extremely well defined landform of scientific/educational value.
LOCALITY: Monkey Creek, approximately 2 km west of Milford Road. D41/150886
CLASSIFICATION: Importance = C Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G66 **Monowai Suspension Bridge Oligocene flysch**
SIGNIFICANCE: A good exposure of mass flow breccia and flysch for educational purposes.
DESCRIPTION: Fining upward "flysch" from basal mass flow breccia to interbedded sandstone and siltstone.
AGE: Oligocene
LOCALITY: Banks of the Waiau River upstream from suspension bridge on road to Monowai. D44/926768
ACCESS: On foot from road to Monowai, at bridge over Waiau.
EXPOSURE TYPE: River bank outcrops
CLASSIFICATION: Importance = C Vulnerability = 4
HAZARDS: May become overgrown
- G67 **Moonlight Fault backtilted terrace**
SIGNIFICANCE: Post glacial backtilting of late Quaternary (Antipenultimate or Whitestone glacial advance) terrace surface along Moonlight fault. Terrace on W side of fault tilted to W. Steeply dipping Plio-Pleistocene Prospect Formation gravels exposed in conspicuous cutting below terrace.
LOCALITY: The Key- north side of Mararoa River. D43/118073
EXPOSURE TYPE: Botanically altered natural
CLASSIFICATION: Importance = C Vulnerability = 3
HAZARDS: Burning, overstocking
- G68 **Moraine Creek rockfall**
SIGNIFICANCE: New Zealand's best example of a rockfall. Classified as an extremely well defined landform of scientific/educational value.
LOCALITY: Moraine Creek, lower end of Lake Adelaide. D40/171989
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G69 **Morley Bridge quarry Triassic macrofauna**
SIGNIFICANCE: Good Etalian macrofauna.
AGE: Triassic
LOCALITY: Frasers Ford on Beaufort Stream. D45/207666.
FOSSIL RECORD NO: D45/f7500
EXPOSURE TYPE: Stream bed
CLASSIFICATION: Importance = B Vulnerability = 3
HAZARDS: Stream erosion, development
- G70 **Mossburn Permo-Triassic fossiliferous volcanoclastic sequence**
SIGNIFICANCE: Only example of Maitai Group rocks in the region. Diverse late Permian fauna. Allochthonous material in the exposure.
DESCRIPTION: Coarse volcanoclastic rocks of Maitai Group, including diverse late Permian fauna.
AGE: Permian, Triassic
LOCALITY: Quarry, true left hand side of Oreti River, 1.7 km upstream of Oreti River Bridge from Mossburn-Five Rivers Road. E44/384950.
FOSSIL RECORD NO: E44/f1
ACCESS: Road
EXPOSURE TYPE: Quarry face
CLASSIFICATION: Importance = B Vulnerability = 2
HAZARDS: Could disappear if quarry extended
- G71 **Mossburn serpentinite quarry**
SIGNIFICANCE: Ophiolite occurrence.
DESCRIPTION: Serpentinite melange containing large knockers of metagabbro/metabasalt.
AGE: Permian
LOCALITY: Quarry off Hillas Road, Mossburn. E44/427987
CLASSIFICATION: Importance = C Vulnerability = 2
HAZARDS: Quarrying

- G72 Murchison Mountains granodiorite tors**
SIGNIFICANCE: An area of many spectacular granodiorite tors. Mainly pinnacle shaped, they locally form castellated complexes up to 25 m high. Classified as extremely well defined landforms of scientific/educational and scenic value.
LOCALITY: Above the bush line between the Point Burn Valley and the South Fiord of Lake Te Anau. D43/925296
CLASSIFICATION: Importance = C Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G73 North Range metasomatites**
SIGNIFICANCE: An excellent example of low-temperature metasomatites.
DESCRIPTION: Albite-adularia-pumpellyite-quartz in zeolitised ash beds; the result of low-temperature metasomatism.
LOCALITY: North Range. E44/476854
EXPOSURE TYPE: Discontinuous exposure on ridge crest
CLASSIFICATION: Importance = B Vulnerability = 3
- G74 North Range zeolite facies**
SIGNIFICANCE: Internationally classic example of zeolite facies metamorphism.
DESCRIPTION: Epiclastic volcanogenic sandstones, in part with albitised plagioclase and zeolites, prehnite and pumpellyite; and zeolitised tuffs.
LOCALITY: North Range, in particular White Hill (E44/443833) and Wether Hill (E44/475795), Southland. E44/443833
EXPOSURE TYPE: Discontinuous exposures in rough pasture
CLASSIFICATION: Importance = A Vulnerability = 3
- G75 Oraka Point intrusions**
SIGNIFICANCE: Type location of Oraka Hybrids and contains basic xenoliths.
DESCRIPTION: Consists of a transition from granite and trondhjemite to tonalite, dolerite and orthopyroxene gabbro. The trondhjemite contain basic xenoliths in various stages of assimilation.
AGE: Permian
LOCALITY: Coastal section from Coloc Bay to Kawakapita Bay. D46/165117
CLASSIFICATION: Importance = C Vulnerability = 3
- G76 Orepuke oil shale pit**
SIGNIFICANCE: Only oil shale in New Zealand worked specifically for oil.
DESCRIPTION: Discovered in 1875 by Hutton and Ulrich. Part of a processing plant still in situ. Worked 1899-1903.
LOCALITY: On banks of Waimeamea River, near Orepuke. D46/050261
ACCESS: Roadside
CLASSIFICATION: Importance = C Vulnerability = 3
HAZARDS: Loss of access due to gorse growth
- G77 Oreti River (east) Triassic locality**
SIGNIFICANCE: Holostratotype of Oretian Stage.
AGE: Triassic
LOCALITY: East side of main road, across fence. Hillside outcrop at southern end of Caroline cutting. E44/510739.
FOSSIL RECORD NO: E44/f9512
EXPOSURE TYPE: Hillside exposures
CLASSIFICATION: Importance = B Vulnerability = 4
HAZARDS: Needs to be kept free of grass, farming
- G78 Otamita Stream Triassic macrofauna**
SIGNIFICANCE: In-situ faunas and type locality of Otamitan macrofauna. Stratotype of Otamitan Stage. Trechman Siltstone, type locality for several of Trechman's Otamitan macrofaunal taxa. Very well-preserved material.
AGE: Triassic
LOCALITY: Otamita River, Hokonui Hills. F45/784561.
FOSSIL RECORD NO: F45/f8801
EXPOSURE TYPE: Stream cuttings
CLASSIFICATION: Importance = B Vulnerability = 3
HAZARDS: Stream erosion of the soft rocks
- G79 Otamita Valley Rd Taringatura Group regressive sequence**
SIGNIFICANCE: Stratigraphic section through Taringatura Group (Triassic), with well exposed sedimentological features at various horizons.
DESCRIPTION: Overall a regressive sequence. Base dominated by turbidites; upper part of sequence varied, including storm deposits and airfall tuffs.
AGE: Triassic
LOCALITY: Otamita Valley (upper), Hokonui Hills, Southland. E45/690646
ACCESS: Roadside
EXPOSURE TYPE: Road cuttings
CLASSIFICATION: Importance = B Vulnerability = 4
HAZARDS: Weathering (road cut in 1981)

- G80 Otapiri Stream Triassic fauna**
SIGNIFICANCE: Holostratotype of Otapirian Stage. Diverse faunal assemblage. Type locality of endemic Otapirian fauna. Nationally important exposure of Triassic-Jurassic boundary.
AGE: Triassic
LOCALITY: True right hand side of Otapiri Stream to north of Taylors Crossing. E45/587613.
FOSSIL RECORD NO: E45/f9465
EXPOSURE TYPE: Stream exposures
CLASSIFICATION: Importance = B Vulnerability = 3
HAZARDS: Farming, erosion; partly destroyed by bridge works
RESERVE STATUS: Otapiri Stream Scientific Reserve
- G81 Pahia Point layered mafic rocks and shore platform potholes**
SIGNIFICANCE: Type location of Pahia intrusives. Very well defined shore platforms with excellent examples of potholes. Classified as an extremely well defined landform of scientific/educational value.
DESCRIPTION: Rock types consist of orthopyroxene, olivine and hornblende gabbro and norite in a layered mafic complex.
AGE: Permian (intrusives), Post glacial (shore platform and potholes)
LOCALITY: Pahia Point. Intrusives are exposed along coastline between Monkey Island and Pahia Point. D46/008185
CLASSIFICATION: Importance = C Vulnerability = 3
- G82 Pears Track Triassic macrofauna**
SIGNIFICANCE: Good early Oretian macrofauna.
AGE: Triassic
LOCALITY: Aparima Valley, Dunrobin Station, south side Aparima River on farm track, known as Pears Track. D44/243839.
FOSSIL RECORD NO: D44/f9046
EXPOSURE TYPE: Farm track cutting
CLASSIFICATION: Importance = C Vulnerability = 3
- G83 Pembroke granulite**
SIGNIFICANCE: First described and probably best developed planar alteration zones in granulite, world-wide.
DESCRIPTION: Basic or intermediate granulite - hornblende granulite with sub-planar, randomly oriented, garnet replacement zones. Also garnet amphibolite and pegmatoid veining.
LOCALITY: Pembroke Valley and north shore of Milford Sound. D40/050079
ACCESS: Boat from Milford Sound.
EXPOSURE TYPE: Good exposures along shoreline of sound and along sides of Pembroke Valley.
CLASSIFICATION: Importance = A Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G84 Port Craig Tertiary sequence**
SIGNIFICANCE: Magnificent example of submarine turbidites (Oligocene) overlain unconformably by a nearshore bioclastic limestone/breccia sequence (Pliocene). Regionally significant unconformity of Late Miocene age, reflecting progressive uplift of Hump Ridge horst during Middle Miocene. Includes the only diverse Kapitean (Late Miocene) fauna in the southern South Island, 1.8 km NNW of Port Craig, where the Whata track to Port Craig leaves the beach and goes up the cliff.
DESCRIPTION: Bioclastic limestone overlapping unconformably on to basement amphibolite, then progressively younger transgressive sandstone/mudstone sediments. Port Craig Formation sediments overlying unconformity include barnacle plate limestone, shellbeds, basal conglomerate.
AGE: Oligocene, Miocene, Pliocene
LOCALITY: Coastal platform and cliffs from old Port Craig wharf (C46/752280) north to the Whata track (C46/742299), southwest side of Te Wae Wae Bay. C46/742299
FOSSIL RECORD NO: C46/f9585
ACCESS: Track or beach from road end at Bluecliffs, Te Wae Wae Bay (3-4 hr). Exposed only at low spring tide.
EXPOSURE TYPE: Coastal cliffs and intertidal platform
CLASSIFICATION: Importance = C Vulnerability = 3
HAZARDS: Slow marine erosion
- G85 Port William dikes, Stewart Island**
SIGNIFICANCE: Very good example of late basic and intermediate dikes cutting dioritic rocks.
DESCRIPTION: Well exposed late basic to intermediate dikes cutting dioritic rocks.
AGE: ?Jurassic
LOCALITY: Wave-cut platform on the northeast shore of Port William Bay. E48/352633
CLASSIFICATION: Importance = C Vulnerability = 3
- G86 Potters Graben**
SIGNIFICANCE: Graben feature, bounded and crossed by reverse and bending moment faults, and broader warps. Up to c.100 m Quaternary displacement on main W faults, with unfaulted weathered Pleistocene quartzose and schistose sediments preserved in basin area. Good late Quaternary traces in area.
LOCALITY: km S of Campbell Creek, southern Old Man Range. F43/078241
EXPOSURE TYPE: Sluicings and altered natural
CLASSIFICATION: Importance = C Vulnerability = 2
HAZARDS: Prospecting/mining and burning

- G87 Preservation Inlet hornfels**
SIGNIFICANCE: Well-exposed example of hornfels and contact schists.
DESCRIPTION: Coastal exposure of hornfels and contact schists.
LOCALITY: Hornfels exposed north of Kisbee Bay (B46/244366) and NE point of Cording Islets, Preservation Inlet (B45/217408); contact schists exposed close to Last Cove, Long Sound (B45/278517). B46/244366
EXPOSURE TYPE: Coastal
CLASSIFICATION: Importance = C Vulnerability = 3
- G88 Productus Creek laumontite**
SIGNIFICANCE: An unusually well developed example of replacement of fossils by laumontite - one of the best examples in New Zealand.
DESCRIPTION: Laumontite replacement of fossils.
LOCALITY: Productus Creek, upper Wairaki River Valley. D44/193785
CLASSIFICATION: Importance = B Vulnerability = 3
- G89 Productus Creek Permian fossils, Letham Burn**
SIGNIFICANCE: Holostratotype of Braxtonian Stage.
AGE: Permian
LOCALITY: 400 m east of pack track in small saddle south of second east branch, Letham Burn. Exposed along valley side and ridge above stream. D44/180801.
FOSSIL RECORD NO: D44/f9621
EXPOSURE TYPE: Hillside and ridge exposures
CLASSIFICATION: Importance = B Vulnerability = 3
- G90 Productus Creek Permian fossils, Mangarewa locality**
SIGNIFICANCE: Rich, well-preserved brachiopod and molluscan fauna. Glossopteris fossils very important here.
AGE: Permian
LOCALITY: In bluff above true right hand side of Productus Creek. D44/183780.
FOSSIL RECORD NO: D44/f9478
EXPOSURE TYPE: Bluff
CLASSIFICATION: Importance = A Vulnerability = 2
HAZARDS: Erosion, land slips, quarrying of limestone
- G91 Productus Creek Permian Wairaki Breccia localities (Letham Trig)**
SIGNIFICANCE: Youngest Permian fauna from New Zealand. Holostratotype of Makarewan Stage, Wairaki Breccia.
AGE: Permian
LOCALITY: The watershed north of Productus Creek on the slopes of Letham Trig. Large outcrop at foot of steep scarp on south side of head of east branch of Elbow Creek. D44/193773.
FOSSIL RECORD NO: D44/f9874
EXPOSURE TYPE: Stream cutting
CLASSIFICATION: Importance = A Vulnerability = 3
- G92 Puysegur Point uplifted marine platforms**
SIGNIFICANCE: Sequence of raised marine benches that have recorded uplift rates in SW Fiordland. Benches up to 1,000 m high record 4.3 mm/y uplift for the last 24,000 years and 1-2.5 mm/y for last 7,000 years. Used in international correlation.
LOCALITY: Puysegur Point area, SW Fiordland coast. B46/168310
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G93 Redcliff Creek section, Takitimu Mountains**
SIGNIFICANCE: Type section of the Brunel Formation, volcanoclastic sediments and basaltic lava flows.
DESCRIPTION: Basaltic lava flows, hyaloclastites and rare rhyodacite lava flows and subordinate basic volcanoclastic sediments. Formed on the flanks of a calc-alkaline volcanic chain.
AGE: Lower Permian
LOCALITY: North-south ridge section, south bank of Redcliff Creek. D44/066 864
CLASSIFICATION: Importance = C Vulnerability = 3
- G94 Ringaringa intrusives, Stewart Island**
SIGNIFICANCE: Excellent, well exposed outcrops of hybrid and composite rocks developed between hornfels and acid intrusive rocks.
DESCRIPTION: Shows a variety of composite rocks (intrusion breccia and vein hornfels) formed where hornblende hornfels is cut by trondhjemite, quartz-rich tonalite and locally pegmatite.
AGE: ?Jurassic
LOCALITY: Point at south end of Ringaringa Beach. E48/398557
CLASSIFICATION: Importance = B Vulnerability = 3
- G96 Ruggedy Flat, Stewart Island**
SIGNIFICANCE: Good examples of peat swamps and lakes developed within them. Classified as an extremely well defined landform of scientific/educational value.
AGE: Late Quaternary
LOCALITY: An extensive area in Ruggedy Flat, Stewart Island. D48/160640
CLASSIFICATION: Importance = C Vulnerability = 3
HAZARDS: Vulnerable to fire damage.

- G97 Shell Gully Oligocene molluscs**
SIGNIFICANCE: Diverse Duntroonian molluscs.
AGE: Oligocene
LOCALITY: Kelly's Farm, Chatton. F45/938638.
FOSSIL RECORD NO: F45/f9668
EXPOSURE TYPE: Hillside outcrop and slip
CLASSIFICATION: Importance = B Vulnerability = 2
HAZARDS: Cover by vegetation
- G98 St Anne Point gneiss**
SIGNIFICANCE: Excellent example of well exposed quartzo-feldspathic, garnetiferous gneiss, locally with marble or calc-gneiss.
DESCRIPTION: Quartz-plagioclase-muscovite-garnet kyanite gneiss and plagioclase-hornblende-biotite gneiss as part of St Anne formation.
LOCALITY: St Anne Point (by white pole at lighthouse landing) at the headland at the southern entrance to Milford Sound. D40/958131
EXPOSURE TYPE: Coastal
CLASSIFICATION: Importance = C Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G99 Stewart Island hornblende hornfels**
SIGNIFICANCE: A good example of hornblende hornfels.
DESCRIPTION: Dark, massive hornblende hornfels in masses over 30 m across as inclusions within later intrusive rock.
LOCALITY: Hornblende hornfels is variably present between Port William and Paterson Inlet, but is best exposed at the northern end of Horseshoe Bay (E48/390595) and south end of Ringaringa Beach (E48/398557). E48/390595
EXPOSURE TYPE: Coastal
CLASSIFICATION: Importance = C Vulnerability = 3
- G100 Takitimu epistilbite**
SIGNIFICANCE: Epistilbite is regionally developed in the eastern Takitimu Mountains, but rare elsewhere in New Zealand.
DESCRIPTION: Epistilbite and laumontite occur in vesicles in lavas and cement in pyroclastic rocks.
LOCALITY: Spence Burn, eastern Takitimu Mountains. D44/144888
ACCESS: By foot from 4-WD track beside the Aparima River.
EXPOSURE TYPE: Well exposed in stream cuttings
CLASSIFICATION: Importance = B Vulnerability = 3
- G101 Takitimu yugawaralite**
SIGNIFICANCE: The only New Zealand occurrence of yugawaralite.
DESCRIPTION: Yugawaralite occurring as vesicles in dolerite.
LOCALITY: Near the start of the Princhester Creek Track in the northern Takitimu Mountains. D43/163011
ACCESS: Pinchester Creek Track, from the end of Princhester Road.
EXPOSURE TYPE: An excellent exposure in bluffs above the bushline.
CLASSIFICATION: Importance = B Vulnerability = 3
- G102 Taringatura Hills Triassic locality**
SIGNIFICANCE: Only fossiliferous Otapirian in southern South Island, with distinctive large Lima.
AGE: Triassic
LOCALITY: Northern spur of Taringatura Hills, 3 km southwest of Castledowns Homestead. E44/407748.
FOSSIL RECORD NO: E44/f8633
EXPOSURE TYPE: Hillside exposures
CLASSIFICATION: Importance = B Vulnerability = 3
- G103 Taylors Stream / Otapiri Valley junction Jurassic faunal locality**
SIGNIFICANCE: Historically important Aratauran locality with significant ammonoid, bivalve and brachiopod fauna.
AGE: Jurassic
LOCALITY: In stream bed, at junction of Taylors Stream and Otapiri Stream. E45/587603.
FOSSIL RECORD NO: E45/f9458
EXPOSURE TYPE: Stream bed
CLASSIFICATION: Importance = B Vulnerability = 3
HAZARDS: Erosion by stream
- G104 Te Anau South Fiord sediments**
SIGNIFICANCE: Well exposed Oligocene-Miocene sequence typical of the west margin of Te Anau Basin, with excellent cross-bedding and cyclic sedimentation.
DESCRIPTION: Shallow marine Point Burn Formation overlain by bioclastic limestone and sandstone of Tunnel Burn Formation. Solution pipes occur in the top of the Tunnel Burn Formation which is overlain by massive deep water mudstone of Garden Point Mudstone.
AGE: Oligocene, Miocene
LOCALITY: Section exposed along north side of South Fiord, Lake Te Anau. D43/950280
ACCESS: By boat.
EXPOSURE TYPE: Lake shore
CLASSIFICATION: Importance = C Vulnerability = 3

- G105 Te Anau erratic boulder**
SIGNIFICANCE: An isolated 3 m erratic boulder sitting on the flat outwash surface beside the road providing evidence of a former extensive glacier about 100,000 years BP. Important as it is interpreted to be a lag deposit from a moraine related to an extensive glacier. Classified as a moderately well defined landform of scientific/educational value.
AGE: 100,000 years BP
LOCALITY: East of lake Te Anau. D43/047076
CLASSIFICATION: Importance = C Vulnerability = 1
HAZARDS: Vandalism, complete removal.
RESERVE STATUS: Scientific Reserve
- G106 Tin Range schist and tin workings, Stewart Island**
SIGNIFICANCE: Well exposed mica-quartz schist of Western Province derivation. A source of cassiterite and New Zealand's most distinctive occurrence of wolframite in situ. Only locality in New Zealand where cassiterite has been worked.
DESCRIPTION: Biotite-muscovite schist, with some quartzite, occurs as roof pendants in locally gneissic biotite granite. Near the summit of the Tin Range the schist hosts a tin-tungsten lode. Wolframite-cassiterite greisen zone mineralisation. Remains include benched routes of tramways and packhorse tracks, old hut sites, stone dam, adit and surface crosscuts. Ore was derived from auriferous high-level marine bench blacksand deposit.
LOCALITY: South end of Tin Range, 3 km NE of Port Pegasus, Stewart Island. D49/113283
ACCESS: Track from North Arm, Port Pegasus or South-West Arm, Paterson Inlet, permission required from Department of Conservation.
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Stewart Island Forest Park, administered by Department of Conservation
- G107 Toetoes Bay submarine lignite**
SIGNIFICANCE: Submarine lignite illustrating tectonism/sea level rise since early Quaternary time.
DESCRIPTION: Wet lignite fragments within grey carbonaceous mud with rounded quartz pebbles.
AGE: Pleistocene
LOCALITY: Toetoes Bay, near Bluff, offshore. F47/252173
ACCESS: Offshore, rather difficult!
EXPOSURE TYPE: Submarine, 18 m deep
CLASSIFICATION: Importance = C Vulnerability = 3
- G108 Upukerora River delta, Lake Te Anau**
SIGNIFICANCE: An actively prograding river delta in a lake, a good example with easy access. Classified as a moderately well defined landform of scientific/educational and scenic value.
LOCALITY: Upukerora River mouth, Lake Te Anau. D42/027480
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Fiordland National Park
- G109 Upukerora authigenic minerals**
SIGNIFICANCE: A rare occurrence of authigenic low temperature minerals replacing the matrix of a Quaternary landslide deposit.
DESCRIPTION: Veins and cavity fillings and replacement of ophiolitic debris flow by chrysotile and pseudoboehmite, in association with pectolite, stevensite and pyroaurite.
LOCALITY: In bluffs on the east side of the Upukerora River. D42/225470
EXPOSURE TYPE: Excellent, clean riverbank exposure
CLASSIFICATION: Importance = B Vulnerability = 3
- G110 Waiiau Cave**
SIGNIFICANCE: Isolated cave, lowland.
DESCRIPTION: Horizontal streamway cave, in Oligocene limestone.
LOCALITY: Clifden. D45/028525
CLASSIFICATION: Importance = C Vulnerability = 3
- G111 Waiiau River Miocene bathyal fauna**
SIGNIFICANCE: Diverse bathyal Waiiuan fauna, very thick sequence in siltstone.
AGE: Miocene
LOCALITY: East bank of Waiiau River, opposite Monowai Power Station, 1 km up and down-stream. D44/916787
EXPOSURE TYPE: River bank
CLASSIFICATION: Importance = C Vulnerability = 3
- G112 Waiiau River Oligocene sandstone dikes**
SIGNIFICANCE: One of the best examples of sand injection structures developed during large scale folding in New Zealand Tertiary rocks.
DESCRIPTION: Intense development of sandstone dikes and sills in an Oligocene turbidite sequence.
AGE: Oligocene
LOCALITY: On Horseshoe Bend, Waiiau River, south of Monowai Road bridge. D44/ 933753
ACCESS: By foot from Old Monowai Road.
EXPOSURE TYPE: Hundreds of square metres of exposed river-cut benches
CLASSIFICATION: Importance = B Vulnerability = 2
HAZARDS: River is controlled by Hydro-electric power generation, and when high it obscures exposures.

- G113 **Waikawa estuary**
SIGNIFICANCE: A good example of an estuary. Classified as an extremely well defined landform of scientific/educational value.
LOCALITY: Waikawa Harbour, south coast of South Island. G47/138922
CLASSIFICATION: Importance = C Vulnerability = 3
RESERVE STATUS: Catlins State Forest Park
- G114 **Wairaki Hills Triassic fossiliferous volcanoclastics**
SIGNIFICANCE: An in situ death assemblage. An example of a seafloor community being wiped out by a tuff. The most fossiliferous and diverse early middle Triassic rocks in New Zealand.
DESCRIPTION: Bedded, richly fossiliferous volcanoclastics and tuffs.
AGE: Triassic
LOCALITY: Outcrop on sharp bend of farm track, upper Etal Creek catchment. D44/237747.
FOSSIL RECORD NO: D44/f44
ACCESS: Ardross Station, Ohai - farm track.
EXPOSURE TYPE: Road cutting
CLASSIFICATION: Importance = C Vulnerability = 3
HAZARDS: Farming, erosion, widening of farm track.
- G115 **Wairaki Peaks rhyodacitic tuff**
DESCRIPTION: Rhyodacitic Plinian-style tuff.
AGE: Lower Permian
LOCALITY: Ridgeline 100 m south of Wairaki Peaks (south). D44/125864
CLASSIFICATION: Importance = C Vulnerability = 3
- G116 **Wairaki Peaks, Heartbreak Formation igneous section**
SIGNIFICANCE: Type section of the Heartbreak Formation, microgabbro and basaltic lavas, pillow lava and breccia.
DESCRIPTION: A succession of microgabbroic and basaltic lavas, pillow lava and breccia. A near vent submarine facies deposited at principal or parasitic vents within the volcanic chain.
AGE: Lower Permian
LOCALITY: Ridgeline 500 m south of Wairaki Peaks. D44/104851
CLASSIFICATION: Importance = C Vulnerability = 3
- G117 **Wairaki River fault**
SIGNIFICANCE: Late Quaternary fault scarp that displaces alluvial surfaces (c.2 m E side up, no strike slip). Interpreted as a reverse fault/thrust.
LOCALITY: Takitimu Forest area, c.1 km N of Elbow Creek - Wairaki River junction. D44/177788
EXPOSURE TYPE: Botanically altered natural
CLASSIFICATION: Importance = C Vulnerability = 3
HAZARDS: Farming practices
- G118 **Wairaki River Permian fauna**
SIGNIFICANCE: Holostratotype of Telfordian and Mangapirian Stages.
AGE: Permian
LOCALITY: Outcrops for 10 km up true left side of Wairaki River, Takitimu Mountains. D44/092712.
FOSSIL RECORD NO: D44/f9511
EXPOSURE TYPE: River bank outcrops
CLASSIFICATION: Importance = B Vulnerability = 4
- G119 **Wairaki melange**
SIGNIFICANCE: One of the best and most accessible examples of a mudstone matrix melange in New Zealand.
DESCRIPTION: Permian limestone in sheared mudstone matrix.
AGE: Permian
LOCALITY: On the west side of Letham Ridge, between D44/191821 and D44/191798. D44/191821
EXPOSURE TYPE: Discontinuously exposed in bluffs and stream valleys
CLASSIFICATION: Importance = B Vulnerability = 3
- G120 **Waituna Miocene lignite pit**
SIGNIFICANCE: Lignite pit, type locality for pollen species.
AGE: Miocene
LOCALITY: Waituna. F47/754006
EXPOSURE TYPE: Quarry face
CLASSIFICATION: Importance = C Vulnerability = 3
- G121 **Waitutu uplifted marine terraces**
SIGNIFICANCE: One of the most well preserved sequence of uplifted marine terraces in NZ giving detailed Quaternary uplift history of S Fiordland.
LOCALITY: Waitutu River area, southern Fiordland. C46/515270
CLASSIFICATION: Importance = B Vulnerability = 3
RESERVE STATUS: Waitutu State Forest

G122 **West Plains igneous basement**

SIGNIFICANCE: Exposure of ?Bluff/Greenhills Igneous Complex.

DESCRIPTION: Exposure of fresh/slightly weathered andesite, visible only at low tide.

AGE: Permian

LOCALITY: Left bank of the Makarewa River, 250 m upstream from junction with Oreti River. E46/448165

CLASSIFICATION: Importance = C Vulnerability = 1

G123 **Western Fiordland orthogneiss**

SIGNIFICANCE: Exposure of large and variable granulite basement of igneous origin.

DESCRIPTION: Hornblende granulite, with some alteration to garnet granulite, often metamorphically hydrated. Some intrusive contacts preserved.

LOCALITY: Sutherland, Bligh and George Sounds (grid reference is approximate). C41/780864

ACCESS: Best by boat from Milford Sound.

EXPOSURE TYPE: Excellent continuous exposures along fiord coasts and on mountain summits and slopes.

CLASSIFICATION: Importance = B Vulnerability = 3

RESERVE STATUS: Fiordland National Park