

National Report of New Zealand

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1. Introduction

New Zealand does not have a formal, nationally administered, network of sea-level gauges. Instead, sea-level gauges are mostly operated independently by various agencies, with some national coordination of daily downloads of data, post processing and archiving undertaken through voluntary partnerships with either Land Information NZ (LINZ) or National Institute of Water and Atmospheric Research Ltd (NIWA). NIWA has been funded in the past by the NZ Foundation for Research Science and Technology to support and coordinate an informal open-coast network. However, large funding cuts in 2004 have curtailed more extensive contributions of quality-assured datasets to New Zealand and international science and geodetic communities. This is currently being addressed and quality-assurance of past records has re-commenced.

The following brief report outlines activities in New Zealand associated with sea-level gauges and availability of data.

2. Sea Level Stations

A large number of organisations own and operate sea level stations in New Zealand. These stations can be grouped into three categories; sites at major ports operated by the local port company or regional council, an open coast network managed by the National Institute of Water and Atmospheric Research Ltd (NIWA), a Crown-owned research institute and other sites.

2.1 Stations at Major Ports

Table 1: Sea level stations whose data is used to produce daily tide predictions.

Station	Latitude	Longitude
Whangarei	35° 46' S	174° 21' E
Marsden Point	35° 50' S	174° 30' E
Auckland	36° 51' S	174° 46' E
Onehunga	36° 56' S	174° 47' E
Tauranga	37° 39' S	176° 11' E
Gisborne	38° 40' S	178° 02' E

Port Taranaki	39° 03' S	174° 02' E
Napier	39° 29' S	176° 55' E
Nelson	41° 16' S	173° 16' E
Wellington	41° 17' S	174° 47' E
Picton	41° 17' S	174° 00' E
Westport	41° 45' S	171° 36' E
Lyttelton	43° 36' S	172° 43' E
Timaru	44° 23' S	171° 15' E
Port Chalmers	45° 49' S	170° 39' E
Dunedin	45° 53' S	170° 30' E
Bluff	46° 36' S	168° 21' E

2.2 Open Coast Network

NIWA coordinates a loose nation-wide network of open-coast sea-level gauges in partnership with some port companies (counted above), regional and local councils and for one installation, the National Tidal Centre, Bureau of Meteorology (Australia). There are currently 16 gauges that are coordinated and archived by NIWA, (excluding those stations counted above in Section 2.1), 10 of which are operated by NIWA itself. These stations complement the gauges operated by individual ports (section 2.1) and other local/regional councils (section 2.3). Details on sites and the characteristics of the 16 stations in the open-coast network are listed in Table 2.

Table 2: Sea level gauges in an open-coast network (excluding Standard Port Stations). Gauge type abbreviations are: B = gas bubbler with ParoScientific PS2 pressure sensor; SW = still-well float/counter weight + digital logger; US = ultrasonic in air; SEAFR = SEAFRAME acoustic gauge; R = radar.

Station	Latitude	Longitude	Start date of NIWA archive	Recording interval (min)	Gauge Type
Moturiki Is.	37° 38' S	176° 12' E	27-May-1971	1, 5	B+SW
Tararu	37° 08' S	175° 31' E	1-Nov-1992	5	US
Sumner Head	43° 34' S	172° 46' E	6-Jun-1994	1	B
Kaikoura	42° 25' S	173° 42' E	10-Aug-1994	1	B
Jackson Bay	43° 57' S	168° 37' E	13-Dec-1996	1, 6	SEAFR
Dog Island	46° 39' S	168° 25' E	5-Apr-1997	1	B
Kapiti Island	40° 51' S	174° 56' E	24-Jul-1997	1	B
Charleston	41° 54' S	171° 26' E	25-Apr-1998	1	B
Anawhata	36° 55' S	174° 28' E	19-Nov-1998	1	B
Whitianga	36° 50' S	175° 43' E	13-Jul-1999	5	R
Little Kaiteriteri	41° 03' S	173° 02' E	17-Jun-2000	1	B
Tarakohe	40° 49' S	172° 54' E	28-Jan-2005	1	B
Kaingaroa (Chatham Island)	43° 44' S	176° 16' W	24-Sep-2000	1, 5	B
Scott Base (Antarctica)	77° 51' S	166° 46' E	15-Jan-2001	5	B
Poutu Point	36° 22' S	174° 11' E	21-Apr-2002	5	B
Green Island	45° 57' S	170° 23' E	6-Dec-2002	1	B

2.3 Other Sites

Table 3a: Other sites at minor port or estuaries where continuous sea level measurements are taken. Most of these stations are owned and operated by local/regional councils.

Station	Latitude	Longitude
Opuā	35° 19' S	174° 07' E
Frenchman Island	35° 52' S	174° 32' E
Dargaville	35° 56' S	173° 52' E
Tauranga Harbour (Kotuku Reserve)	37° 40' S	176° 03' E
Tauranga Harbour (Sulphur Point)	37° 41' S	176° 10' E
Tauranga Harbour (Oruamatua)	37° 42' S	176° 13' E
Tauranga Harbour (Hairini Bridge)	37° 43' S	176° 10' E
Whakatane Town Wharf	37° 57' S	177° 00' E
Port Ohope Wharf	37° 59' S	177° 06' E
Opotiki	38° 02' S	177° 14' E
Milford Sound	44° 40' S	167° 56' E
Spit Wharf	45° 47' S	170° 43' E

Table 3b: The Pacific Tsunami Warning Center (PTWC) has two stations on Chatham Island (to the east of New Zealand) and LINZ operates a site in Antarctica.

Station	Latitude	Longitude
Waitangi (Chatham Island)	43° 57' S	166° 33' W
Owenga (Chatham Island)	44° 01' S	176° 22' W
Cape Roberts (Antarctica)	77° 02' S	163° 12' E

2.4 GLOSS Stations

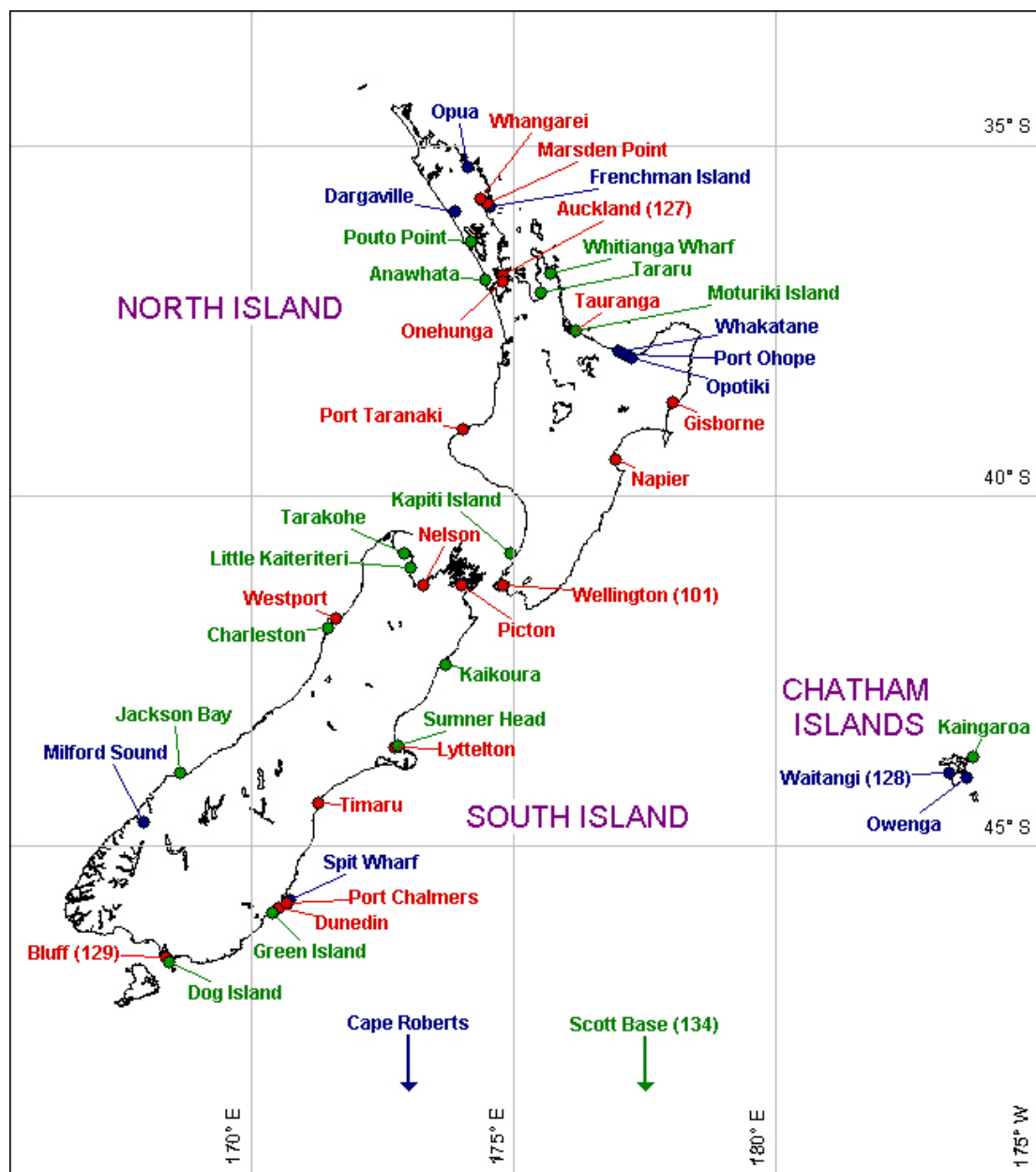
Table 4: Sea level stations that are included in the GLOSS Core Network. Stations 101, 127 and 129 appear in Table 1, station 128 is included in Table 3b and station 134 is part of Table 2.

GLOSS ID	Station
101	Wellington
127	Auckland
128	Waitangi (Chatham Island)
129	Bluff
134	Scott Base (Antarctica)

SEA LEVEL SITES IN NEW ZEALAND

Major port sites (Table 1) are shown in **red**
 Open coast sites (Table 2) are shown in **green**
 Other sites (Table 3, except the Tauranga Harbour sites) are shown in **blue**

Names of GLOSS stations are appended with their GLOSS ID number



3. Sea Level Technologies

3.1 Port Stations

Sea level data at all major ports (Table 1) is recorded digitally except for Whangarei where paper chart recording is still used.

A variety of sea level measurement technologies are used, including sub-surface pressure transducers, float and stilling well, downward-looking radar and ultrasonic systems.

Data is recorded once every minute at half of the sites with the balance producing data at intervals of either 5 or 10 minutes.

3.2 Open Coast Network

As listed in Table 2, most of the sites operated by NIWA use a bubbler gauge technology with PS2 ParoScientific pressure sensors, while other installations use either radar, acoustic, ultrasonic or float/counter weight systems.

All sites record data in digital form, mostly at 1 minute recording intervals, with the remaining gauges recording at either 5 or 6 minute intervals.

3.3 Other Sites

Details of equipment used at these sites has not been collected, however pressure sensors, ultrasonic and radar technologies would be most likely.

4. Continuous GPS (CGPS)

CGPS observations are made at four Standard Ports (Auckland, Wellington, Lyttelton and Dunedin). GNS Science, a Crown-owned research company, operates these receivers.

5. Data Availability

5.1 Hourly Data, GLOSS stations (UHSLC)

- a) Wellington (101) and Bluff (129):
Fast delivery of data for these GLOSS stations commenced May 2007; all available hourly data (since 1944) for Wellington and recent (since 1998) data for Bluff has been submitted.
- b) Auckland (127):
Efforts are being made to obtain permission from the port company to make this data available to the international community.
- c) Chatham Island (128):
Near real-time data is provided through PTWC.
- d) Scott Base (134): The entire dataset is being quality-assured at present and will be made available at quarterly update intervals to UHSLC.

5.2 Monthly and Annual Means (PSMSL)

- a) Tauranga, Nelson, Marsden Point:
Mean values since 1984, 1984 and 1989 respectively have been supplied to PSMSL for these locations,
- b) Other stations:
Data held by PSMSL for other New Zealand stations is neither comprehensive nor complete. Permission has been obtained to make this data available and this will be carried out as time and funding permits for undertaking quality-assurance on the datasets.

5.3 Other requests

Requests for information or data not covered above can be made to the authors of this report – contact details shown on the first page.

The open-coast network data is processed nightly and uploaded to the internet in the form of plots from tide, storm surge and long-wave/tsunami analyses. The web site is:

<http://www.niwascience.co.nz/services/sealevels/>

Metadata for Antarctica gauges at Scott Base and Cape Roberts are listed at:

http://gcmd.nasa.gov/KeywordSearch/Home.do?Portal=amd_nz&MetadataType=0 under the Oceans and Tide Gauges sub-sections.

6. Tsunami Early Warning Network

LINZ has been directed to improve the system of sea level recorders around New Zealand and its off-shore islands to allow better detection and confirmation of tsunamis.

An assessment has been made of the sources of tsunamis that potentially pose a threat to New Zealand. A network of 18 sea level recorder stations is proposed with the first of these becoming operational during the second half of 2007.

The data from these sites will be transmitted to GNS Science which is responsible for monitoring New Zealand's geophysical hazards (earthquakes, volcanoes, landslides and tsunamis). Real time data from this network will be available via the Global Telecommunications System (GTS). Data will also be archived and made freely available from LINZ's web-site.