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Te Hunga Takutai o Aotearoa
NEW ZEALAND COASTAL SOCIETY

Coastal News

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Bubbling up with solutions to biofouling

By Shelly Farr Biswell, Editor

Until now, stopping marine pests from fouling boats and marine infrastructure presented a never-ending challenge for boaties and commercial operators. However, a new approach to managing the accumulation of marine growth (termed biofouling) that involves a "curtain of bubbles" may turn out to be an anti-fouling solution that stops the spread of marine pests in an environmentally friendly way.

Dr Grant Hopkins, who is Cawthron Institute's Team Leader of Coastal Ecosystems, says preliminary trials at Port Nelson show that bubbles can be very effective at stopping marine pests from growing on surfaces.

"Diffusers and electric blowers capable of generating micro-bubbles are commercially available and are used in other industries (for example, to aerate sewage). Our challenge was to design an experiment that allowed us to trial the efficacy of bubbles under realistic conditions in the marine environment," he says.

To achieve this, Cawthron scientists partnered with the local port, engineers and commercial divers to construct and deploy an experimental array suspended beneath a commercial wharf.

Commissioned by Northland Regional Council, the trial compared underwater panels that are made of either concrete or acrylic. A subset of the acrylic panels were also coated with a very smooth, non-toxic, silicone-based paint, known as "fouling release coating". If painted onto a hull, the coating stops biofouling from attaching itself properly so that it will slough off once the vessel reaches a certain speed. One set of panels had continuous bubbles moving across the surface, and the other non-bubbled panels served as a control.

Giving biofouling the old one-two

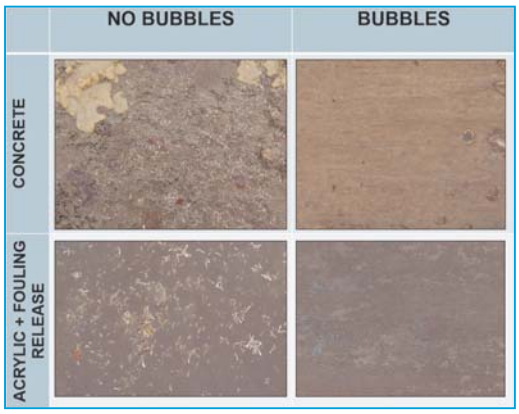
This first proof-of-concept trial is now finished, and the results are very promising. After three months, panels without bubbles had developed extensive fouling communities, whereas the acrylic and concrete panels treated with the bubbles were largely devoid of fouling. The super-smooth paint and bubbles were a winning combination, with no fouling accumulation at all.

"Many of the fouling organisms on the non-bubbled plates were non-native and included pests that have caused problems overseas," Grant says. "In fact, we often see pest species growing on structures, then growing on hulls immediately adjacent, so this two-step approach could provide a real solution to tackling fouling, which has been around as long as vessels have been in the sea."

Creating a sea change in biofouling

"We now want to explore how to retrofit bubble diffusers to existing pontoons, or new ones could be specifically designed to incorporate them," Grant says.

Man-made structures create havens for introduced species, such as Mediterranean fanworm, which can be destructive to New Zealand's marine environment. Traditional anti-biofouling solutions, such as the use of biocides in marine paints, stop marine organisms attaching themselves to boats and structures, but



As illustrated, the use of smooth paint with bubbles proved a "winning combination", with no fouling accumulation.

are only temporary and are not good for the environment.

Central government, local authorities and marina operators are already interested in the potential solution.

Northland Regional Council Biosecurity Manager Don McKenzie says the Cawthron trials have received significant interest from the nationwide Marina Operators Association.

Cawthron Institute Scientist Grant Hopkins (standing) monitors the underwater "curtain of bubbles".

We want your ideas!

Thanks to the success of the Coasts & Ports 2015 conference, the society made a profit. The management committee would like to use the profit to benefit the society's members and further our mission.

Please take a few minutes to share your ideas on how the money can best be used by completing the survey at: https://www.surveymonkey.com/r/V9LH86C by 29 August 2016.

If you are a current NZCS member and complete the survey by the deadline your name will go in a draw to receive a copy of *The Story of the Hauraki Gulf* by Raewyn Peart (EDS, September 2016). Winner to be announced 8 September.

We will report on ideas received at the 2016 AGM.

"New, environmentally appropriate tools are crucial in the fight to stop the spread of marina invaders. We think this technology has huge potential for fighting a centuries-old problem that has both environmental and economic impacts," Don says.

Cawthron and Northland Regional Council are now planning the second stage of trials, where they will scale up their treatments to include entire marina pontoons.

"The next step is ambitious and will require support and input from a range of organisations. For there to be uptake of this technology, it needs to be practical and cost effective. To achieve this, we need engineers and marina construction companies on the team, and for them to use our science to guide prototype development," Grant says.

"The enthusiasm and support from Northland Regional Council has been terrific. They appreciate the importance of managing risks from biofouling pests in their region and are taking a more proactive than reactive approach."

The project is also supported by Bellingham Marine, Monumental Plastics, paint producer Akzo Nobel, local engineering and diving companies and Port Nelson.

More ideas in the works

Cawthron is in the early stages of development of other tools to treat biofouling accumulation on marine structures.

"In partnership with an Auckland-based manufacturing company, Monumental Plastics, we have developed prototype devices that we hope will be capable of keeping wharf piles clean.

"As with the bubble curtains, we see it as important to develop these ideas in partnership with industry so that our ideas don't end up collecting dust on shelves. Like marina pontoons, wharf piles can become extensively fouled, so it is important that they are considered too," Grant says.

Trials are expected to commence this summer, when biofouling growth is at its worst.

What does it take to "Do The Right Thing"?
Seminar details and bookings at:
www.aucklandmuseum.com/whats-on/series/hauraki-gulf-marine-park-seminar

Using citizen science for coastal data collection

By Shane Orchard, University of Canterbury

Citizen science has come of age in New Zealand and there are a wide range of opportunities for coastal scientists and practitioners to make use of, or contribute to it. This article provides an overview of some recent highlights and progress with a focus on projects supported by NatureWatch NZ, a national platform for citizen science in New Zealand.

The term "citizen science" refers to a broad range of activities where information is collected by the community. The reasons for citizen science vary and there is a wide spectrum of interests for which it can be useful. Casual observation, surveys and monitoring are common contexts for citizen science. Often it involves information collected by volunteers as part of designing or implementing hands-on community initiatives.

There are many examples of citizen science in New Zealand that support environmental protection and restoration projects. These activities may generate knowledge that is not necessarily stored or even transmitted beyond a few individuals. Projects designed to crowd-source information from the wider community are a different form of citizen science. These may be initiated by science professionals and lay people alike. A related, though less structured, version occurs where researchers and agencies seek to mine data from sources already held by the community. Supporting and unlocking all of these knowledge sources has become a central focus within the citizen science movement in recent years.

Though the potential for citizen science to fill information gaps is huge, questions around data consistency and quality assurance have long been an "Achilles heel" in practice. Overcoming this is important for unlocking the potential of citizen science as a reliable source of data for purposes other than the very local contexts in which much of it is collected. This win-win is a worthy goal and can be encouraged through coordination and the development of standardised methods. However, promoting onerous procedures to volunteers and community groups is not likely to be a silver bullet and there will always be community projects with unique data collection needs. Thankfully, solutions may be found through the use of smart technologies.

Some of these aspects have been addressed in the development of NatureWatch NZ (NWNZ). This is a national-level data collection and database facility with many user-defined functions. These functions provide support for a wide range of data collection needs. There are an increasing number of coastal

Supported by NatureWatch NZ, CoastBlitz at Tapuae Marine Reserve in Taranaki is just one example of citizen science in action.

CoastBlitz, Tapuae Marine Reserve.

citizen science projects on NWNZ and an ever-increasing dataset of coastal species' observations. Although it is possible to keep records private, nearly all of the data is available under a Creative Commons licence using the search functions to locate records of interest. Downloads from the database are supported in a range of file formats. Note that for threatened species the point data coordinates are automatically obscured and a proxy coordinate inserted within a 10-kilometre radius. The true coordinates remain on the database and are available on request.

Some of the quality assurance features of the NWNZ platform are the identotron function to prevent typos leading to junk entries, and the "ID please" service to assist identification. The latter is a service that is crowd-sourced by the platform. An in-built quality assurance process for confirming identifications also uses crowd-sourcing based on photographic evidence. This function adds a "research grade" tag to observations that have been verified by other members. Research grade can be applied as a filter on any subset of the database. If you are familiar with one or more coastal taxa, please consider contributing to the expert community who are the engine room behind these unique functions.

Some of the other useful features are places and projects. Places are user-defined polygons. Many are preloaded and you can also create your own at any

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time. All records can be filtered by place so specifying a place of interest provides a very useful tool for database queries. Projects are the real heart of the platform. They allow users to create their own data entry page to support the collection of observations about any living thing or anything associated with it, such as tracks, signs or nests. Any number of custom data fields can be added to a project to create a template for online data entry with the data being all stored permanently in a cloud-hosted database. The template can be used directly in the field on a tablet or on a smartphone using mobile apps. You can also download it as a spreadsheet to create a hardcopy for fieldwork if desired. Records can also be bulk uploaded in batches. All of these functions are great for supporting monitoring projects or BioBlitzs and other surveys. There are many potential uses in education programmes that include exploring the IT aspects of the platform, as well as the data or the design of the citizen science projects hosted on it.

Some of the many coastal projects using NWNZ include monitoring of marine mammals, fish species, penguins and other birds. NWNZ is used for school-based education projects, such as Project Hotspot in Taranaki, and several CoastBlitz projects in different parts of New Zealand. To get involved with any of these efforts or to initiate something similar use the NWNZ messaging functions to get in contact with the people involved. NatureWatch NZ is an example of modern technology helping to combine the efforts of many people making observations. For existing and new environmental projects it provides a flexible tool for recording and storing observations and is a growing source of useful information.

Central government news

Marlborough Sounds Salmon Working Group established

The Marlborough District Council and the Ministry for Primary Industries have established a Marlborough Sounds Salmon Working Group to consider options to implement the Best Management Practice Guidelines for Salmon Farming in the Marlborough Sounds.

The working group began meeting in July and have been asked to provide recommendations to Marlborough District Council and the Government on implementing the guidelines later this year.

Working group membership includes representation from Marlborough District Council, Ministry for Primary Industries, key community and interest groups, iwi and New Zealand King Salmon. Both the Department of Conservation and the Ministry for the Environment will also input into the working group process.

The working group's recommendations will not be binding, but will inform future planning work for both the Marlborough District Council and central government.

Science strategy on environmental issues to be developed

New Zealanders have an opportunity to have their say on the environmental science priorities facing the nation.

A discussion paper released in mid-July will lead to a conservation and environment science "roadmap" identifying priority areas for scientific research during the next 20 years.

An independent Strategic Advisory Group, led by the Prime Minister's Chief Science Advisor, Sir Peter Gluckman, helped develop the paper alongside Ministry for the Environment and Department of Conservation staff.

The discussion paper, along with an online consultation tool and more information, can be found on the Ministry for the Environment website: http://www.mfe.govt.nz/more/about-us/conservation-and-environment-science-roadmap.

Consultation will close at 5.00 pm on 7 September 2016.

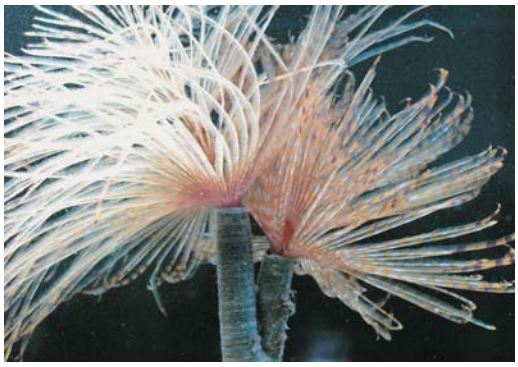
Biosecurity 2025 – consultation

The government is asking New Zealanders to give their views on the future of New Zealand's biosecurity system. Biosecurity 2025 is being developed to ensure that our biosecurity system continues to protect New Zealand against harmful pests and diseases. A new Biosecurity 2025 direction statement, which will replace *Tiakina Aotearoa – Protect New Zealand* (the 2003 biosecurity strategy), will be published following public consultation.

Consultation and public submissions close 9 September 2016.

To review the discussion document visit: https://www.mpi.govt.nz/protection-and-response/overview/biosecurity-2025/.

A video on biosecurity in New Zealand has been developed by the Ministry for Primary Industries and is available at: https://www.youtube.com/watch?v=VXb2ic-kroc.



Protecting New Zealand's biodiversity from marine pests, such as the Mediterranean fanworm, is an important part of Biosecurity 2025. Photo: MPI.

Waitangi Wharf Upgrade – XBlocs get thumbs up and work on breakwater begins

Photos and words by Tom Shand, Tonkin + Taylor

The Waitangi Wharf Upgrade, currently being undertaken on the Chatham Islands by the Memorial Park Alliance (NZ Transport Authority, HEB Construction, Downer Group, Tonkin + Taylor and Aecom), will restore a critical lifeline to this remote community.

The project involves reclamation of 9500 square metres of land for a new port, construction of new commercial and fishing wharves, dredging works and a 180-metre long breakwater constructed of XBloc concrete armour units. These units, being used for the first time in New Zealand, have been constructed on-island at a purpose-built yard. Three hundred of the estimated 3000 required XBlocs have now been produced and placement has begun.

Work will continue through the winter months with a construction end date expected around December 2017.

For more information about the full project, visit: www.wwup.co.nz

Manufactured XBlocs get the thumbs up from Dutch patent holders.

Upgrade benefits

The upgrade is expected to meet the community's expanding shipping requirements and improve the health and safety of wharf operations. According to the Memorial Park Alliance, improvements will include:

- increased weather access to the wharf due to construction of a breakwater;
- increased freight handling area;
- improved fishermen and cargo wharf;
- enhanced biosecurity area;
- improvements to livestock race;
- increased hardstand area; and
- new wharf facilities.

The current Waitangi Wharf provides a lifeline to Chatham Islands.

NZCS Management Committee

Chairperson:	Rick Liefting	rick.liefting@waikatoregion.govt.nz
Deputy Chairperson:	Hugh Leersnyder	hugh.leersnyder@beca.com
Treasurer:	Eric Verstappen	eric.verstappen@tasman.govt.nz
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University/Education Coordinator:	Tom Shand	TShand@tonkintaylor.co.nz
Central Government Coordinators:	Sarah McRae Michael Nielsen	smcrae@doc.govt.nz michael.nielsen@mpi.govt.nz
***Coastal News* Coordinator:**	Don Neale	dneale@doc.govt.nz
Website & Digest Coordinator:	Jose Borrero	jose@ecoast.co.nz
General Member:	Scott Stephens	scott.stephens@niwa.co.nz
Student Representative:	Hannah Berger	hvb15@uclive.ac.nz

Other NZCS Contacts

Administrator/Communications Coordinators:	Renee Coutts Rebekah Haughey	nzcoastalsociety@gmail.com
***Coastal News* Editor:**	Shelly Farr Biswell	shelly@biswell.net

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Dispersal of dredging plumes in Tauranga Harbour: A field study

By Mariana Cussioli, Karin Bryan, Conrad Pilditch and Willem De Lange, University of Waikato

In this issue we feature a summary of a paper presented at the 2015 Australasian Coasts and Ports conference. The full paper, including figures, references and acknowledgements, is available in the conference proceedings. Contact nzcoastalsociety@gmail.com for more information.

In ports and harbours, routine dredging activity is needed to maintain and deepen navigation channels. Dredging can generate high quantities of suspended sediments, which are transported from dredged area by currents and deposited on the seabed. The dimensions and dispersal dynamics of a plume are determined by the dredging strategy and local sediment and hydrodynamic characteristics. The complexity of these underlying factors and their potential interactions pose difficulties in predicting plume dynamics and behaviour.

Suspended sediments caused by dredge plumes and their potential impacts on marine flora and fauna are a key concern for environmental managers. For example, high suspended sediment concentrations (TSS) can reduce the feeding efficiency of filter-feeding bivalves and reduce light penetration thus affecting primary producers such as seagrasses. Ecological effects, however, are usually only considered significant when TSS caused by dredging is higher than the natural variation owing to storm events, wave-action, and river discharges.

Sediment plumes from maintenance dredging are usually of short duration, and most studies show that high TSS is mostly confined to the immediate environs of the dredging vessel and decays rapidly with time and distance from the dredge. The rate of TSS reduction depends on the characteristics of the area being dredged, the spatial and temporal extent of the plumes and the areas of potential impact.

Given the transient nature of dredge plumes, the use of acoustic technologies with high spatial and temporal resolution for tracking plumes is an advance over the use of point sample measurements.

Through the application of the acoustic method, our aim was to track the plumes created during maintenance dredging in Tauranga Harbour, with the objective of describing their dynamics and development with time and distance from the dredging area and comparing TSS values with background levels.

The harbour

Tauranga Harbour is an estuarine lagoon on the east coast of New Zealand's North Island, comprising an area of about 200 square kilometres. Intertidal flats separate the lagoon into two main areas, the northern and the southern basins. It is predominantly a shallow harbour, with an average depth at low tide of three metres. The tides in Tauranga Harbour are semi-diurnal and have a tidal range of 1.62 metres for spring tide and 1.24 metres for neap tide, and 60 percent of the harbour is intertidal sandflats. The harbour has two tidal inlets, one at each end of Matakana Island. The more important inlet for navigation is the south-eastern end bounded by the rocky headland of Mt Maunganui, where it is also the entrance to the Port of Tauranga.

The Port of Tauranga was officially established in 1873 and dredging activities at the port started about 100 years afterwards, in 1968, and occurred until 1978, restarting in 1991. The main dredging projects were aimed at deepening and widening of the shipping channels. To maintain channel depths that are adequate for navigation, maintenance dredging was regularly carried out approximately every two years since 1992. Presently, the port undertakes it annually.

Monitoring a maintenance dredging event

A maintenance dredging event occurred in October 2014, and the sediment plumes generated by the dredging activities were monitored between 13 and 16 October 2014. In this article we present two monitoring periods (dredging cycles) conducted on 15 October, Monitoring-1 and Monitoring-2 (hereafter M1 and M2, respectively), which tracked the dredging plume in the morning and afternoon.

The dredging was carried out using the TSHD *Pelican* (Van Oord) which has a hopper capacity of 965 cubic metres, 63 metres in length and 11 metres in width. The draft when loaded is 3.7 metres.

Dredging activities occurred in Stella Passage with 1283 and 1187 tons of material dredged during M1 and M2, respectively. Both sediment types were composed mainly of sand. On 15 October, low tide was 0.2 metres at 05:49 and high tide was 1.8 metres at 12:15. The M1 monitoring was conducted during flood tide and the M2 during ebb tide. The monitoring period covered the end of the spring tide.

TSHD Pelican. *Photo: Mariana Cussioli.*

Dredging plumes were tracked using backscatter signals measured by a boat-mounted acoustic Doppler current profiler – ADCP (Workhorse Teledyne RD Instruments 1200 kHz). Transects along and across the main current direction were made during and after dredging until the plume signal declined to background levels, and therefore difficult to detect, or until time or technical limits were imposed. Six and nine transects were completed for M1 and M2, respectively. Plume backscatter signals were compared with averaged profiles of background values determined from transects conducted immediately before each dredging monitoring.

Additional measurements were carried out to complement the study: water temperature, salinity and suspended solids concentration. Temperature and salinity were measured using a CTD (SBE 19 plus V2 SeaCAT) and casts carried out before dredging started for background conditions and at the end of each monitoring period. Water samples for total suspended solids concentration (TSS) were collected at the surface, mid-depth and bottom using a Schindler-Patalas trap and retained in bottles until filtering, which occurred less than 24 hours after sampling.

	Monitoring-1		Monitoring-2	
Time (NZST)	Start	End	Start	End
Monitoring	07:11	09:35	12:13	14:28
Background sampling				
CTD	07:13		12:16	
Water surface	07:25		12:17	
Water mid-depth	07:22		12:16	
Water bottom	07:20		12:14	
Transects	07:21	07:59	12:18	3
Plume sampling				
Dredging	08:15	08:45	12:25	13:15*
Transects	08:15	09:36	12:34	14:28
Water surface	08:30		12:45	
Water mid-depth	08:31		12:43	
Water bottom	08:35		12:41	
CTD	9:37		14:28	

* M2 dredging time was reduced to 30 minutes following an operational delay of 20 minutes.

Table 1. Start and end time for measurements carried out during M1 and M2 to characterise the area before, during and after dredging. Times are in New Zealand Standard Time (NZST).

Results for M1

Surface temperature was ~1˚C higher at the water surface than at the bottom, but there were no differences between CTD casts made before (07:13) and after (09:37) the dredging monitoring. Before dredging monitoring, there was a vertical salinity gradient with slightly higher levels at the bottom compared with the surface, but differences were weaker at the end of the monitoring period. Thus, there was no strong evidence of water column stratification that could influence the distribution of the plume.

Tauranga Port from the Coastal Marine Group's research vessel Tai Rangahau*. Photo: Mariana Cussioli.*

Background backscatter for M1 (determined from transects conducted previous to the dredging monitoring) was highest (~84.4 dB ± 5.6) at the surface (<2 metres depth) and was consistently lower (~80 dB ± 2) below this depth. Background concentrations determined by TSS were 7 mg l^{-1} at the surface, 9.5 mg l^{-1} at mid-depth and 9 mg l^{-1} at the bottom. TSS concentrations were lower at the surface, thus was inconsistent with our ADCP transect data. During the dredging, the TSS concentration was 9, 13 and 70.3 mg l^{-1} at the surface, mid-depth and the bottom, respectively.

During dredging, ADCP measurements detected an initial plume ~350 metres long with a vertical gradient of backscatter ranging from 1.4 to 1.25 times greater than the background at the surface and the bottom, respectively. After 10 minutes, in transect 2 the plume length at this position was >250 metres with the highest relative backscatter occurring at lower depths (below 8 metres) compared to observations during transect 1.

Ten minutes following the end of the dredging, two parallel transects (3 and 4) revealed a plume >70 metres in length with concentrations 1.35 to 1.30 times greater than background and higher concentrations at the surface. Diffuse areas of the plume (1.2 times greater than background) extended 30 metres either side of the central plume area.

Transects running longitudinally to the channel (5 and 6) 20 and 35 minutes after the dredging ended, revealed plume movement towards the south according to the direction of the currents and flood tide. Along these transects, there was an abrupt change in the bathymetry, from a maximum of ~12 metres to ~5 metres depth. The plume presented maximum backscatter around 1.3 to 1.15 times the background as plume drifted from the deeper to the shallow area and measured ~600 metres at transect 5, and 800 metres at transect 6. After 55 minutes of monitoring, the plume appeared to dissipate and was no longer detectable within the dredging area.

Results for M2

Similar to M1, salinity and temperature did not vary noticeably through the water column or between CTD casts and background backscatter was also highest (~85.4 dB ± 3.4) at the surface (<2 metres depth) and

decreased towards the bottom (~80 ± 1.8). However, below a depth of seven metres, the background backscatter signal slightly increased (~82.5 ± 1.8). Background TSS concentrations were 6.7 mg l^{-1} at surface, 8.7 mg l^{-1} at mid-depth and 9.6 mg l^{-1} at the bottom, very similar to the M1 and also the opposite of the background ADCP profile. Water samples collected during dredging produced TSS concentrations of 14.9, 21.6 and 24 mg l^{-1} at the surface, mid-depth and the bottom, respectively.

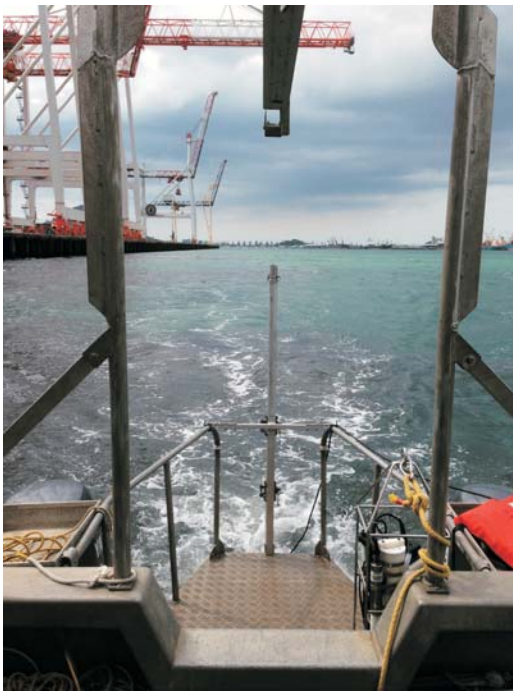
ADCP transect 1, at the beginning of the dredging, detected a plume with signal 1.35 to 1.4 times greater than background extending for ~60 metres and a diffuse area of the plume 1.2 times greater than background extending ~30 metres on the side of the central plume area. After 30 minutes, transects in the centre of the dredging area (2 and 3) showed a surface plume (< 6 metres) 1.15 to 1.2 times greater than background.

After dredging finished, a series of parallel transects were made in the direction of flow, from transect 4 to transect 7, and showed plumes with maximum backscatter ranging from 1.4 (transect 4) to 1.15 (transect 7) times greater than the background with plumes usually measuring 100 metres long. A longitudinal transect (8) made perpendicular to the previous transects showed backscatter similar to background levels. A comparison between one transect conducted just after dredging ended and another transect 50 minutes later (4 and 9) showed that levels had reduced to background levels within and near the dredging area.

Analysing the results

Dredging plumes during M1 and M2 dissipated quickly, as shown by the rapidly decaying backscatter signal during the first 10 minutes of dredging.

After dredging started, during M1, the plume was initially concentrated in the surface layers, but later descended in the water column, with deflections in backscatter signals in the direction of the current at the mid-depth ranges. These observations are indicative of material settling from the upper plume and the effect of currents on the plume motion. The plume was transported by the flood tide to the south of the dredging area; the abrupt change in bathymetry, the shallow waters and structures made it difficult to complete the survey and detect plume boundaries in this area. Shipping traffic in the area added further complications. The plume observed during the dredging monitoring potentially included not only the plume from the dredging but also from other contributors, such as ship movement disturbing the sediments. It was not possible to separate the ship effects from the dredging activity in the dredge plume data since the dredging was carried out very close to the berthing area. In M2, plume signals were easier to distinguish from the background and allowed a more comprehensive plume tracking. Manoeuvring of ships that were smaller than the one observed in M1 appeared to contribute less to the TSS concentrations. Transects conducted during dredging indicate that the plume drifted in the direction of the ebb tide currents and was more concentrated at surface and mid-depths.



Tauranga Port from the Coastal Marine Group's research vessel Tai Rangahau*. Photo: Mariana Cussioli.*

After one hour, measurements obtained in the proximity of the dredged area showed that the backscatter signal was close to the background levels for both monitoring periods. However, backscatter signals in profiles conducted within the plume track in M2 showed a more rapid reduction in concentrations compared to the plume from M1, suggesting a more rapid dissipation of the ebb tide plume. Just before the end of the monitoring, further away from the dredging area, the last observations collected showed that the plume from M2 shifted northward and backscatter signal was close to the background levels, whilst the plume from M1 was lower concentration but still detectable (1.15 to 1.2 greater than background) at ~1 kilometre south. The estimation of the concentration of the residual plume could have been influenced by the fact that the background backscatter was measured in deeper areas, whilst the residual plume was detected in the shallow areas, thus potentially representing differences between background turbidity levels at the two locations.

The effects on biota were evaluated according to concentrations found in our TSS analysis and the time for plume dispersion detected in the transects.

Other sources of contamination that could affect the biota, such as heavy metals and other possible dredge-related impacts, were not considered in this study. Although studies have demonstrated negative effects caused by dredging plumes on the biota, our study suggests that the range of TSS and the duration of plume observed during the monitoring would have no adverse effects on key species in Tauranga Harbour such as bivalves: cockles (*Austrovenus stutchburyi*), pipis (*Paphies australis*) and seagrass (*Zostera muelleri*). Pipis, which are considered to be sensitive to increases in TSS, would only be negatively affected if exposed

to concentrations of 150-200 mg l^{-1} for five days. Seagrass can be moderately to severely impacted at TSS levels of > 75 mg l^{-1}; however, the duration of the plume resulting from dredging is unlikely to be long enough to adversely affect seagrass condition.

Our preliminary results for Tauranga Harbour show that although the plume dissipated more quickly on the outgoing tide, and dredging on the outgoing tide only will provide the least likelihood of impacts, we also show that dredge operators should be able to continue working on both tides because the flood tide plume was also dissipated within an hour. This fast dissipation time is likely due to the strong flushing that occurs inside of the entrance and the generally sandy sediments. Upcoming capital dredging may uncover a greater range of particle sizes, and so monitoring of the plume is ongoing with greater potential mitigation strategies in place should the plume dissipation rate decrease.

Update on dredging

Since this presentation was given, the port has almost finished the major dredging campaign and has had no complaints about turbidity to date. In part, this is attributed to management of the dredging to mix silty sediment with non-silty sediment in the hopper, and also to a "green" valve that adjusts the rate and amount of overflow from the hopper.

There are plans to incorporate the green valve technology in the replacement dredge for the port's ongoing maintenance dredging requirements.

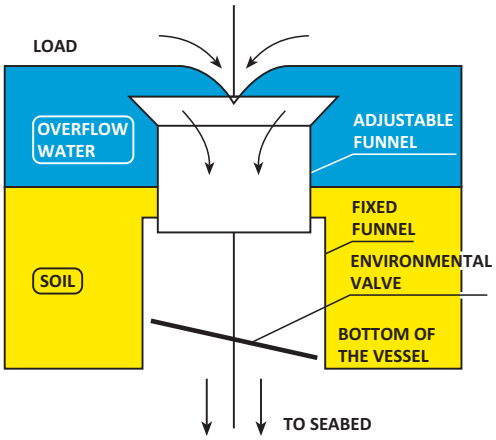


Image shows the structure of the discharge funnel from the hopper including the "green" or environmental valve. The purpose of the valve is to reduce the amount of air being discharged with the sediment, allowing the sediment to sink to the seabed faster, which reduces turbidity. Image: Willem de Lange.

(Top image) This image shows the entrainment of air, which creates bubbles. At the top is an adjustable funnel that can be released and lowered to vary the rate of discharge, which also reduces the turbidity. Photo: Willem de Lange.

(Left image) View looking down on the discharge funnel. Photo: Willem de Lange.

Contributing to *Coastal News*

We always welcome contributions for forthcoming issues of *Coastal News*. Please contact the Editor, Shelly Farr Biswell, at shelly@biswell.net if you'd like to submit a news in brief, article, or have content suggestions. The submission deadline for the next issue is 14 October 2016.

Coastal News

Te Hunga Takutai o Aotearoa
NEW ZEALAND COASTAL SOCIETY

2016 conference set to be a cracker

Join us in Dunedin from 16 to 18 November for the New Zealand Coastal Society Annual Conference.

The conference theme this year is: "He waka eke noa – linking science, engineering, management and community". He waka eke noa, a Māori proverb, loosely translated means: "A canoe in which we are all in with no exception" or "We are all in this boat together".

It's a fitting theme that is reflected in the wide range and high quality of abstracts received for this year's conference.

The conference will feature about 55 oral presentations running in three streams and 10 posters. Presentation topics include: coastal hazards and protection; coastal engineering; citizen science; environmental monitoring and indicators; guardianship of the marine environment by indigenous communities; dune processes; surfing; and coastal management.

The conference committee is organising three short workshops for the conference. Topics being considered include:

- the 2016 review and update of the Ministry for the Environment's coastal hazards and climate change guidance document;
- engaging communities on coastal hazards; and
- marine spatial planning and an open data repository.

With so many opportunities for coastal exploration in the Otago region, the committee also plans to offer three field trips: a harbour cruise, a tour of the beaches, and a visit to the port.

The annual conference is a great way to get to know your coastal professional colleagues.

In the coming weeks, we will post information about keynote speakers and the programme on our conference webpages (www.coastalsociety.org.nz/NZCS_Conference_2016/).

Conference registration will begin in late August.

Special thanks to this year's conference sponsors, including NIWA, the University of Otago, the Port of Otago, the Department of Conservation, and Tonkin + Taylor.

For more information or to get involved in organising the conference, contact nzcoastalsociety@gmail.com.

There will be three field trip options this year – a harbour cruise, a tour of the beaches and a port visit.

Conference accommodation

Accommodation will be available on-site at St Margaret's College. The nightly room rate is $82.50 (incl GST) per guest for bed and breakfast.

A cooked and continental breakfast will be available every morning in the main dining room. All linen and towels are provided. Shared bathroom facilities.

Bookings can be made at the time of conference registration through the online registration process.

NZCS Mission Statement

The New Zealand Coastal Society was inaugurated in 1992 "to promote and advance sustainable management of the coastal environment". The society provides a forum for those with a genuine interest in the coastal zone to communicate amongst themselves and with the public. The society currently has over 400 members, including representatives from a wide range of coastal science, engineering and planning disciplines, employed in the engineering industry; local, regional and central government; research centres; and universities.

Applications for membership should be sent to NZCS Administrator Renee Coutts (email: nzcoastalsociety@gmail.com).

Chair's message – we're in this boat together

By Rick Liefting

The Māori proverb "He waka eke noa" that loosely translated means "A canoe in which we are all in with no exception" is a fitting theme for this year's conference. It reflects the wide range of disciplines and interests of our members. We recognise that a multidisciplinary approach – where links are forged between science, engineering, management and community – is often required to address some of today's greatest challenges.

We hope you will all be able to join us at the conference from 16 to 18 November. Our Conference Committee is just going through the MANY abstracts for this year's sessions and it looks to be another fantastic event. A popular part of the conferences are the focused workshops, and this year is no different.

We are lucky enough for this conference to have accommodation available on-site at St Margaret's College where 200 single student rooms are available. Not only does this mean a reasonably priced accommodation rate, but it also means that there will be more opportunity for some of those late-night informal conversations to take place.

A big thanks to all the Conference Committee members, particularly Conference Chair Terry Hume, for their work to make the conference a success.

We would still appreciate more volunteers, so please contact us if you are keen.

Earlier this year, I had the opportunity to take a two-month trip around California and Europe with my family. I couldn't help looking at the coast from a practitioner's point of view and while we have some of the best coasts in the world, we can certainly still learn a thing or two. I encourage us all to investigate what is going on around the world in terms of managing existing and future coastal issues.

Obviously the wheels needed to be kept turning while I was away, and I would like to thank my Management Committee colleagues for all their work in my absence. Our administrators, Renee Coutts and Rebekah Haughey, also deserve a big thanks for coordinating committee meetings and keeping us all on the same page – in spite of busy schedules.

Finally, I would also like to congratulate Hannah Payne-Harker and Ross Martin who have been awarded this year's Student Research Scholarships. You can read more about their work below.

Our commitment to quality student research is just one of the many ways our society supports the coastal profession – our waka.

Building our future – scholarship winners announced

Congratulations to Hannah Payne-Harker and Ross Martin who have been awarded this year's Student Research Scholarships.

Ross will receive a $5000 scholarship to support his PhD research at the University of Waikato. Ross will be investigating remote sensing options for long-term monitoring of estuarine seagrass.

Hannah will receive $2500 to go towards her Master's thesis on an ecosystem services based approach to coastal management in New Zealand. Hannah is earning her Master of Planning through the University of Otago.

Each year, NZCS offers a $5000 scholarship to a PhD student and a $2500 scholarship to a Master's student who are conducting research that has the potential to contribute towards the aims of the society.

Hannah Payne-Harker (top right) and Ross Martin (bottom right).

News from the regions

Coastal News

Te Hunga Takutai o Aotearoa NEW ZEALAND COASTAL SOCIETY

Auckland

Natasha Carpenter and Sam Morgan, Regional Representatives

Plan agreed for Huia Domain and foreshore

A plan to address erosion along the Huia Domain foreshore has been approved following extensive consultation with the local community, iwi, coastal engineers and council specialists. The need to develop a plan for the frontage was triggered by a series of storm events that caused foreshore lowering, erosion and damage to the seawall protecting the domain. Initial options to mitigate erosion were not able to meet the broad range of technical, financial and stakeholder considerations for the site, prompting the formation of a working group to develop a more holistic response.

The approved option takes a soft engineering approach to meet the key criteria to "preserve the full extent of Huia Domain" given its intrinsic heritage and recreational value within the Waitakere Ranges. The option retains the existing coastal protection structures along the frontage as a backstop retaining feature. This is combined with the provision of two semi-detached groynes and localised sand transfer to restore an area of dry high-tide beach. The beach will act not only as a fronting natural buffer, but is intended to improve pedestrian access and amenity attributed to the site.

Auckland Council will continue to work with the community and mana whenua through the detailed design phase, in support of applying for publicly notified resource consents, with the aim of having physical works completed before the end of 2017.

Muriwai Beach dune restoration

Auckland Council has obtained resource consent to undertake Stage Two of dune restoration works at Muriwai Beach Regional Park. The works follow the earlier managed realignment of the southern carpark at Motutara Road, approximately 40-metres landward, that was completed back in 2009. Stage Two now focuses on dune reshaping and replanting of the adjacent old surf club frontage following the club's earlier relocation landward.

Proposed dune restoration works adjacent to the old surf club site. Before: top left, and proposed: bottom right.

The dunes at Muriwai are recognised as an Outstanding Natural Feature. Their revegetation at this location with native sand-binding species and extended backdune planting will contribute to restoring this threatened dune habitat and will enhance the natural character values of the area. Recreation and amenity values at the site will also be enhanced through provision of improved access from the backdune to the foreshore through the dunes. The works are scheduled to start next month and will be undertaken in two stages.

Coastal inundation mapping for the Auckland Region

Auckland Council has published a comprehensive report outlining the best available information regarding predicted extreme water levels and the associated extent of coastal inundation by both storm-tides and waves in the Auckland Region. The report follows the recent updates undertaken by NIWA and DHI for discrete areas of the Auckland Coast, particularly the Parakai/Helensville area and Auckland's small east coast estuaries.

The report can be found at: www.knowledgeauckland.org.nz/publication/show/1201.

Auckland Unitary Plan

On 22 July, the Independent Hearings Panel provided its recommendations to Auckland Council on the Proposed Auckland Unitary Plan. Following Auckland Council's consideration of the recommendations, on 27 July the panel's recommendations and Auckland Council's decisions were posted on the Auckland Council website. Following the release of the recommended version of the plan, a statutory process will be followed before Auckland Council makes its final decision between 10 and 18 August.

When finalised, the plan will take the place of the existing Regional Policy Statement and 13 different district and regional plans that have been operational prior to and since the amalgamation of Auckland Council in 2010. Ultimately, the plan will set out a consistent "rule book" for planning for the future growth of Auckland. This includes key provisions relating to the management of coastal and natural hazards and the impacts of climate change from a land-use planning perspective taking a risk-based approach.

New marina proposed for Waiheke Island

Kennedy Point Boat Harbour Limited (KPBHL) is developing a proposal for a new 200-berth marina for Waiheke Island. The proposed site is on the southern side of Waiheke Island adjacent to the existing commercial and vehicle ferry terminal. This is following the recent Environment Court decision declining the proposed marina at Matiatia, on the western side of the island.

KPBHL has engaged a wide team of consultants and

has been in discussion with Ngāti Paoa to develop a robust and innovative proposal. One of the key differences at this stage of design is the floating carpark which is thought to minimise the effect on the intertidal area and removing the requirement for reclamation. The suggested location is also considered to be deep enough to remove the requirement for dredging. Lodgement of resource consent application documents is anticipated in the near future.

Waikato

Christin Atchinson, Regional Representative

Sea Change – Tai Timu Tai Pari

The *Hauraki Gulf/Tikapa Moana Marine Spatial Plan* is now well advanced and is scheduled to be finalised by the end of 2016. Each of the major topics within the plan, such as water quality; commercial, customary and recreational fisheries; marine protection; aquaculture; accessibility; and infrastructure, are seen as having overlapping causes and potential solutions. Accordingly, an integrated approach to all of these related issues facing the Hauraki Gulf is needed for the future.

The plan is the first step to change, and also a challenge to business as usual. The plan will ultimately set out a clear pathway to how the Hauraki Gulf is shared, used and safeguarded, both now and for future generations.

While not a legally binding document, the plan will provide a clear pathway for the various regulatory authorities (Auckland Council, Waikato Regional Council, Department of Conservation and Ministry for Primary Industries) that manage the Hauraki Gulf and its catchments. Once published, the next step will be for the various regulatory authorities to implement the plan's recommendations through their statutory processes.

To find out more go to http://seachange.org.nz.

Bay of Plenty

Mark Ivamy and Kieran Miller, Regional Representatives

Hovercraft trial in Tauranga Harbour

Bay of Plenty Regional Council-Toi Moana is trialling an innovative solution to reducing mangrove spread in 600 hectares of Tauranga Harbour through the use of a purpose-built hovercraft fitted with a mangrove seedling mowing unit. It's the first of its kind in New Zealand. The hovercraft offers a solution to preventing mangrove seedling establishment in consented control areas with minimal tracking or disturbance to other wildlife.

The hovercraft has been fitted with a mangrove seedling mowing unit.

Kaituna rediversion a step closer

The project to divert 20 percent of the Kaituna River's freshwater flows back into the Maketu Estuary and create 20 hectares of new wetland habitat now has all Environment Court appeals resolved. Phase one construction work is scheduled to start in February 2017. Feasibility studies included consideration of 18 different methods and options for rediverting the Kaituna River and creating new wetlands. The chosen option returns as much water as possible to maximise ecological and cultural benefits while keeping a channel open for boating access and flood management.

Planting season

This time of year is busy with community planting days up and down the coast. Bay of Plenty Regional Council-Toi Moana is fortunate to have plenty of engaged schools, care groups, iwi groups and community members who propel this work forward. In particular, after 15 years of work and more than 10,000 plants, the Pio Shores Coast Care Group at Waihi Beach received the 2016 Best Coastal Community Group award from the Dune Restoration Trust of New Zealand earlier this year.

Congratulations to the Pio Shores Coast Care Group on receiving the 2016 Best Coastal Community Group award from the Dune Restoration Trust.

Proposed Regional Coastal Environment Plan update

Mediation has recently finished for the 16 appeals lodged with the Environment Court against the Bay of Plenty Regional Council's decisions on the proposed *Bay of Plenty Regional Coastal Environment Plan*. The *Regional Coastal Environment Plan* promotes sustainable management of the natural and physical resources of the Bay of Plenty's coastal environment. Environment Court hearings are likely later this year or early in 2017 on the following topics:

- mangrove management;
- natural heritage – providing a consenting pathway for new regionally significant infrastructure;
- iwi resource management – appeal made by the Ngāti Mākino Heritage Trust;
- Motiti Rohe Moana planning framework; and
- Matakana Island – outstanding natural feature and landscape status.

Nav Safety Bylaw review

Bay of Plenty Regional Council-Toi Moana is currently reviewing its Navigation Safety Bylaw. This review will help ensure the bylaw reflects current community issues, attitudes and changing legislation and that the increasing number of boats and activities on the water can co-exist safely.

Submissions for the proposed bylaw have closed and more than 200 submissions were received. Hearings were held in late July.

Tamaki Drive wave overtopping research findings

By Matthew McQueen, Aaron Falconer, Tom Shand and Heide Friedrich

Tamaki Drive is an arterial route running along the coastline of Auckland's eastern suburbs. The road is exposed to the Hauraki Gulf, with the seawall vulnerable to wave overtopping during storm events, including significant inundation during Cyclone Ita in 2014.

A collaborative research project between the University of Auckland, Tonkin + Taylor, and Auckland Civil Defence was undertaken to better understand the mechanism responsible for overtopping events along Tamaki Drive.

A physical model was constructed in the University of Auckland's Hydraulic Engineering Laboratory, using a 25-metre wave flume, with a scale of 1:10. The model represented a typical cross-section based on a site survey of the Tamaki Drive seawall at the western end of Kohimarama, which was the site of the worst observed wave inundation during Cyclone Ita. The model replicated the sloping rock face, vertical seawall that protects the road and the shallow seabed offshore of the wall.

Wave and water level conditions occurring during Cyclone Ita were replicated and overtopping flows observed and measured. Water level was incrementally increased to simulate the effects of the event coinciding with a higher tide or with higher future sea levels.

As a result of testing, the following conclusions were reached:

1. Wave overtopping is potentially hazardous to pedestrians and vehicles at relatively low mean overtopping rates.
2. The volume of overtopping is sensitive to small changes in the water level. Even 0.2 metres of sea-level rise would lead to at least double the volume of overtopping discharge for similar wave events.
3. Hazardous events would become more frequent under future sea-level rise and the magnitude of large events would increase.
4. Areas not currently susceptible to hazardous wave overtopping could become hazardous with future sea-level rise.

For this study, physical modelling has improved the understanding of the mechanisms responsible for wave overtopping. Results can be used to calibrate empirical models and allow predictions of overtopping frequency at this and nearby locations, thus enabling asset managers to make informed decisions on future maintenance and upgrade.

Full article available at http://bit.ly/28TZjRt

Wave overtopping on Tamaki Drive occurs during significant storms, such as during Cyclone Ita in 2014.

University and education update

Waikato University

A paper by Stephen Hunt on ebb-flood asymmetry in Raglan Harbour "Observations of asymmetry in contrasting wave and tidally-dominated environments within a meso-tidal basin: implications for estuarine morphological evolution" was recently accepted in *Earth Surface Processes and Landforms*.

A paper by Victor Godoi on "Regional influence of the climate patterns on the wave climate of the southwestern Pacific: The New Zealand Region" was recently published in *Journal of Geophysical Research Oceans*.

The last stakeholder meeting for the Ministry of Business, Innovation and Employment project on surfbreaks of national significance was on 25 June in Raglan.

Waikato is advertising for three PhD projects at the moment. One on inundation hazards in estuaries (contact Karin Bryan) and two on benthic ecology (contact Conrad Pilditch).

Contact: Assoc. Prof. Karin Bryan,
School of Science

Massey University

Alastair Clement has recently published a paper in *Quaternary Science Reviews* that investigates spatial variability in the timing and magnitude of sea-level changes around New Zealand during the Holocene.

Contact: Dr Alastair Clement,
Institute of Agriculture & Environment

The University of Auckland – Engineering

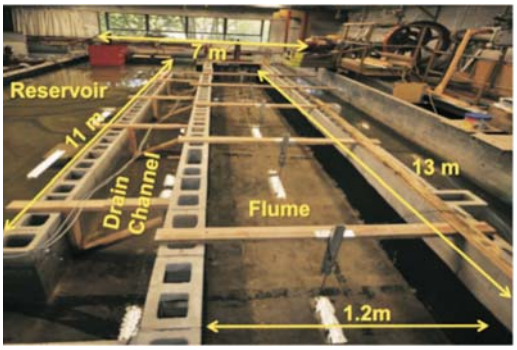
A team from Auckland University is working in a large-scale multidisciplinary research project assessing port structures and bridges in New Zealand against tsunamis to current codes of practice. The project is funded by the Natural Hazards Research Platform.

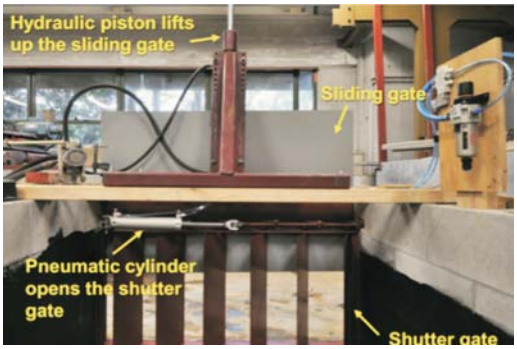
Professor Bruce Melville has been leading recent investigations into tsunami impacts on key infrastructure. Under his supervision, PhD student Farzad Farvizi has been investigating tsunami-induced loads on bridge superstructures. PhD student Cheng Chen has been conducting physical experiments on the impact of a tsunami bore on a wharf, and the mitigating effect of a seawall on these impacts.

Dr Colin Whittaker has recently been appointed as a lecturer at the University of Auckland. His research interests include tsunami generation and coastal responses to extreme wave attack using a combination of physical and numerical modelling.

A state-of-the-art tsunami flume will soon be operational in the Newmarket Campus of the University of Auckland. This flume is the largest of its type in New Zealand, with dimensions of 20 metre length, 1.2 metre width and 1.2 metre depth. The flume will be used for fundamental and applied tsunami experiments (at larger scales than have been previously possible), positioning the University of Auckland as a national hub of tsunami research.

Contact: Dr Napayalage Nandasena,
Dept. of Civil and Env. Eng.





Current tsunami flume at University of Auckland.

The University of Auckland's new tsunami flume will be the largest of its type in New Zealand.

Coastal News

Te Hunga Takutai o Aotearoa
NEW ZEALAND COASTAL SOCIETY

Adapting to the consequences of climate change: Engaging with communities

In this New Zealand Coastal Society special publication we share insights and practical solutions for engaging with communities about the effects of climate change. The publication is divided into three sections:

- Section 1 provides an overview of the current framework;
- Section 2 includes a discussion on engaging with communities; and
- Section 3 looks at how Coastcare groups and communities are addressing climate change.

To learn more or order copies email nzcoastalsociety@gmail.com.

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