

Coastal News

Newsletter of the NZ Society for Coastal Sciences
and Engineering
A Technical Group of IPENZ

Number 2

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Society Plans First Seminar

The Role of Science and Engineering in Coastal Planning is the theme of the Coastal Society's first seminar, which will be held at the Plaza International Hotel in Wellington on Thursday 19 May 1994.

The seminar will provide an opportunity for all people with an interest in or responsibility for matters concerning the coastal zone to gain a broader understanding of the many issues involved in coastal planning. It is proposed that further seminars will be organised to deal with the many issues of concern in greater detail.

New Zealand's coastline, some 11,000 kilometres long, is arguably one of the country's most precious, and at the same time, most underrated assets. It is incumbent on all people in New Zealand to conserve and protect the coast, and an essential part of this process is the establishment of policies and plans to guide the ways in which future coastal activities may occur.

Coastal planning in New Zealand has been undergoing a period of significant change in recent years, particularly since the Resource Management Act 1991 came into law. The Act replaces over 70 pieces of existing legislation and amends many others.

Among the requirements in the Act are the preparation of a New Zealand Coastal Policy Statement, Regional Coastal Plans and District Plans. That these processes are still ongoing is at least partly due to the complexities of the issues to be resolved.

Not the least of the difficulties arises from the quite logical requirement of the Act 1991 that District Plans be consistent with the Regional Plan, which in turn must be compatible with the as yet unpublished New Zealand Coastal Policy Statement.

The introduction of the Act has also changed

consent procedures. New restrictions have been placed on the use of the coastal marine area and the lists of matters to be considered is significant.

The processes involved in preparing policies and plans, and both applying for and considering the granting of resource consent applications now requires a level of skill in matters relating to the coast not commonly available in New Zealand. These skills are multi-disciplinary and include planning, coastal sciences (geology, coastal processes, hydrography and hydrodynamics), engineering, marine biology, etc.

The Speakers . . .

The speakers are all considered leaders in their respective fields in New Zealand.

The two keynote addresses, by Mr Arnold Turner CMG and Professor Paul Komar, provide a rare opportunity to hear speakers of international reputation. The keynote speakers are:

- Mr Arnold Turner CMG was formerly Principal Planning Judge in New Zealand and has recently been Chairman of the New Zealand Coastal Policy Statement Board of Inquiry, which has recently published its summary of recommendations.
- Professor Paul Komar is visiting the University of Waikato from the College of Oceanography in Corvallis, Oregon, USA. He is the author of the well-known book *Beach Processes* and is in the process of completing another book on the Washington and Oregon coasts.

Chairman's Message

I would like to take this opportunity to welcome new members of the Coastal Society and readers of this second newsletter. The management committee recognises that the newsletter is a potentially valuable source of information for members and that, ideally it should be published at least 3-4 times a year. Now that the Society has become well established with around 100 members it is appropriate for systems to be put in place to ensure that this happens.

Newsletters, however, take considerable effort to put together and distribute. This effort is presently done voluntarily by just one or two people who have to fit it in with many other responsibilities. Ultimately, of course, newsletters require stories and it is here that the membership can help considerably.

One member has recently written to the Society castigating it, with some justification, for the lack of regular communication with its members. The criticism was, however, constructive and a number of good suggestions for future newsletters were made. This includes: dates and venues of meetings of interest to members, updated lists of coastal projects with names of contractors/consultants etc., involved, current coastal issues with respect to the Resource Management Act 1991, a "Coastwatch" section where volunteer members report prior to each newsletter, items of interest from regional councils and climate change updates.

No doubt, members can think of many more relevant subjects, but to put these excellent ideas into practice will require volunteers in each region to gather the information by a prescribed date and forward it to those responsible for production of the newsletter. I believe it is essential for the survival of the society that ideas such as these be put into

practice and this will be one of the main challenges for the management committee in the months ahead.

Initially, the Coastal Society decided that meetings would be held twice yearly in conjunction with the IPENZ and Marine Sciences conferences. Only two papers of coastal interest were presented at the recent IPENZ conference held in February 1994 and summaries of these papers are included in this newsletter. Around 25 people attended the session in which these papers were presented and most were not members of the Coastal Society. The management committee now feels, with the benefit of hindsight, that not only is continuing in this manner unproductive and of little benefit to members, but it is also contrary to one of the main objectives of the Society, namely to bring engineering, scientists and planners, etc., together on a regular basis for the interchange of ideas.

In an effort to overcome these difficulties, the Coastal Society management committee have decided to run a series of seminars more in line with the original objectives. The first of these, to be held in Wellington at the Plaza International Hotel on Thursday 19 May 1994, is the subject of the lead story. A brochure providing programme details and a registration form is being distributed with this newsletter. I hope as many members as possible will take the opportunity to attend. A short AGM will be held at the conclusion of the seminar. Depending on the success of this seminar, it is proposed to hold future seminars on more specific topics.

Remember that the Coastal Society exists mainly for the benefit of its members and all comments and suggestions are welcome.

John Lumsden

Chairman, Management Committee

N Z S C S E Management Committee

John Lumsden
John Duder
Ken Grange
Bob Kirk
Terry Hume
Andrew Laing
Robin Falconer
Mike Jacobson

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Tonkin and Taylor Ltd, Auckland (Secretary)
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11th Australasian Conference on Coastal and Ocean Engineering

Townsville, Australia, August 21-27 1993

This well-organised conference was held in the Sheraton Breakwater Casino at Townsville. Three sessions ran concurrently and 105 papers were presented. The topics covered the full range of coastal engineering, from wave theory and observation to process studies and coastal management.

Of the 161 participants, 130 were from Australia, 16 from New Zealand and the remainder from around the Pacific rim. In addition to the 105 papers, there were 9 poster papers and five keynote speeches. Thus, there were almost as many presentations as there were participants, indicating a high level of involvement.

The paper deliveries were kept short to allow plenty of time for questions, as were the paper sessions, so there was plenty of time for informal discussions. Most participants found the sumptuous meals and liquid refreshments particularly challenging.

The keynote speeches were generally disappointing in content and poorly presented. An exception was the talk by Jim Houston, Director of the Coastal Engineering Research Centre (CERC, US Army, Corps of Engineers) entitled "The Greening of Coastal Engineering Research in the United States". Two significant new initiatives by CERC are:

- A new multi-million dollar initiative to study tidal deltas at tidal entrances (with similar goals to NIWA's FRST funded Tidal Deltas project).
- A strong move towards a finite element modelling capability.

In contrast to the keynote addresses, the standard of content and presentation of scientific papers was high. These are summarised as 4-6 page papers in the 726 pages of conference proceedings, two volumes that are well worth purchasing for your collection or library (National Conference Publication No 93/4, The Institute of Engineers, Australia).

In comparing our work with that of our Australian coastal colleagues, we noticed that:

- We lack their resources for gathering field data; however, we seem to extract more from the small amount of data we collect than they do;
- We are behind them in modelling;
- In terms of water quality aspects (e.g. bacteria, water colour/clarity) of Australian coastal projects, such as outfalls, harbours etc, we appear to be ahead.

There is much to be gained by establishing greater research links with our neighbours across the "ditch" — we have things to offer each other.

The Australasian Conference on Coastal and Ocean Engineering is by far the best "local" conference that Kiwi coastal physical/engineering types can attend. It has always been an excellent conference and successful forum for keeping up to date with "who's doing what and to who" and exchanging ideas.

The next biennial conference is in Melbourne in 1995.

*Terry Hume and Rob Bell
NIWA Ecosystems, Hamilton*

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1997 Conference on Coastal and Ocean Engineering to be held in Christchurch

Following the policy of holding every third conference in New Zealand, it was agreed at the Townsville Conference that the 13th conference would be held in Christchurch in August or September 1997.

Over 300 delegates attended the last conference held in Christchurch, in 1985. A steering committee will be formed later this year to organise this event.

Enquiries to John Lumsden (03) 364 2219

Hamilton Regional Meeting Held

The Northern Regional Group's recent meeting in Hamilton was attended by 35 people, including a good team from Auckland.

Jim Dahm opened the meeting, which was held at Environment Waikato on 17 March. He gave a case history of Whiritoa, on the east coast of the Coromandel Peninsula, with reference to the Resource Management Act.

Jim made a plea for the standardisation of assessing coastal hazard risks or erosion and then gave an overview of the pioneering beach care programme at Whiritoa. He described how the erosion had developed over the past 50 years from a combination of loss of dune vegetation, sand mining and dune overbuilding and then described the strategy developed by Environment Waikato and the Hauraki District Council.

The first element in the strategy was the development of a dune management programme as the dune sand reserve was the most effective buffer against cyclic erosion. The programme consists principally of wooden slat accessways for vehicles and fencing to contain the pedestrian access and to assist in accumulating sand, coupled with some dune repair and revegetation.

The second element was to negotiate a

closedown of the sand extraction traditionally operated by local owners. After considerable discussion, the owners offered to cease mining activity over a three year period as their contribution to the beach's care.

The third element was coastal subdivision, which had locked up much of the sand dune and was also exacerbated by provision of a sewerage system that permits strata titles on the sections. There is an urgent need to control future subdivision in the hazard risk areas, which the Hauraki District Council has determined to be a 30 to 60 metre setback from the dune toe.

This programme is also up and running in Port Waikato Beach and Waihi Beach.

Professor Terry Healy of Waikato University then gave an outline of a proposed method for establishing the Coastal Hazard Zone (see below). He concluded by putting a plea for the preservation of our coastlines, which he deems a goldmine for the future of the tourism industry.

Harley Spence of Coastline Consultants concluded with a brief outline of the World Coast 1993 Conference he attended in November 1993 (see page 6).

John Duder

Coastal Hazard Zone Determination

At the Hamilton meeting of the Coastal Society in March, Terry Healy presented a paper on the determination and implementation of a development setback based on Coastal Hazard Zone principles.

The paper, which was also presented at an international conference in San Francisco at Easter, is called "Comprehensive Method for Determination of Development Setback / Coastal Hazard Zone Lines for Open Dune Coasts".

The most comprehensive method for coastal hazard zone determination would appear to be that evolved by Healy, which may be expressed as:

$$CHZ = R + 2S_{(max)} + X + D$$

where:

- CHZ is a linear distance measured inland from a reference point, here taken as the toe of the frontal dune;
- R is the long-term shoreline erosion or accretion rate trend;
- $S_{(max)}$ is the decadal term duneline fluctuation, representing the maximum observed cyclical fluctuation of extreme storm cuts within the past 50 years;

- X is the dune line retreat consequent upon projected sea level rise; and
- D is the dune stability factor.

The initial CHZ determination must then be subjected to three test conditions such that:

- (i) $CHZ > (V[S_{(max)}] + 400)/h$
where h is the mean dune elevation and $V[S_{(max)}]$ is the volume cut out from a maximum storm cut into the dunes representative for the shoreline sector, in m^3/m of beach.
- (ii) $H_f > S_s$
where H_f is the height of the frontal dune and S_s is the storm surge elevation. For the western Bay of Plenty the total storm surge and runup is of the order of 5 m RL. This accords closely to the elevation of flotsam line resulting from cyclone Bola observed on the frontal dunes at Papamoa in March 1988. If $H_f < S_s$, then the coastal hazard line must be extended inland at the storm surge elevation until it intersects with land.
- (iii) $H_f > T_s$
where T_s is the tsunami runup inundation level.

Terry Healy

University of Waikato

OCEL Society's Third Corporate Member

OCEL Consultants Limited is a consulting engineering practice with offices in Christchurch and New Plymouth.

OCEL has expertise in a wide range of civil engineering fields, but specialises in offshore and underwater engineering, port and harbour engineering, coastal engineering and coastal processes. The emphasis is on practical and sound engineering solutions and procedures — all technical staff are qualified divers and senior personnel are experienced in the nominated specialist fields.

Recent projects of interest include the design of equipment and the development of procedures for installation of 250 tonne water injection templates for Norske Shell in the Draugen field in the Norwegian sector for the North Sea. The precision installation operation, carried out by Stolt Comex Seaway, was in 276 metres of water and was completed using remote methods without diver intervention.

The work scope required the analysis of vessel motion responses to determine the weather limiting criteria and the resulting dynamic effects on the lifting gear and rigging and design of vessel modifications to enable the vessel to undertake the installation work.

Design including finite element analysis and checking was carried out by OCEL, both in Christchurch and Stavanger, with AutoCAD draughting done in Christchurch and output

files transmitted to Norway by modem.

Projects closer to home include the investigation, design and consent procedures for modifications to Chatham Islands Ports Limited facilities at Waitangi, which entailed reconstruction of wharf approach and fishing jetties and the construction of an extension to the existing reclamation for cargo handling purposes.

OCEL has also recently completed a detailed review of shoreline dynamics, circulation currents and pollution levels of Queenstown Bay, Lake Wakatipu for Queenstown Lakes District Council.

The study encompassed detailed bathymetric survey, wave refraction analysis, beach sediment sampling and grading, drogue tracking, bed sediment sampling and pollution analysis, beach profile surveying, assessment of the performance of existing shoreline protection measures and the mechanics of specific erosion problems.

Assessment of design wave and water level conditions and development of resulting loading distributions has been carried out by OCEL for the proposed New Brighton Pier development in Christchurch. This work was part of the preliminary design input for Resource Consent Application.

Ian Goss — OCEL Consultants Ltd

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Wellington Group to Form

Dr Wayne Hastie of the Wellington Regional Council is the regional coordinator for the Coastal Society.

There are plenty of coastal activities going on in the Wellington region, Wayne says. To get things started, he suggests arranging a series of meetings/talks/presentations to discuss recent and current projects.

Wayne is seeking the views of Coastal Society members as to how the Wellington coastal group might best be organised to suit the interests of the members. If you are interested, please contact:

Wayne Hastie
c/- Wellington Regional Council
P O Box 11-646
Wellington
Phone (04) 802 0337
E-mail wayne@wrc.govt.nz

"Integrated Coastal Zone Management". World Coast 1993 Noordwijk on Zee, Netherlands

Over 90 nations, 20 international organisations and 23 non-governmental organisations attended this conference to discuss management of the world's coastal zones. Dr Ian Stewart from the Department of Conservation and Harley Spence of Coastline Consultants represented New Zealand.

Discussion during the first two days focused upon the IPCC "Common Methodology for Vulnerability Assessment in the Coastal Zone". An interesting debate developed over the appropriateness of a single methodology for all situations. Representatives of non-governmental organisations, developing nations and small island states criticised the proponents of the common methodology for being too technocratic. This north-south division occurred throughout the conference.

Most importantly, these sessions highlighted the lack of site-specific information to validate global modelling scenarios and that Integrated Coastal Zone Management (ICZM) policies cannot be formed using a purely technical

base.

Discussion during the rest of the conference focused on the concept of ICZM.

The Integrated Coastal Zone Management, although in its infancy as a management direction, seems to have been embraced by enthusiastic people from around the globe as the way of the future. A few points to note:

- There are no ICZM "experts" anywhere.
- It is urgent that ICZM issues be confronted by all involved.
- Old-style fragmented administrative and research methods are incompatible with the goals of ICZM.
- There will never be one common methodology for ICZM. It is subjective and value-based. In New Zealand, our approaches towards ICZM will have to be unique.
- Innovation and co-operation between disciplines, between organisations and between nations is required to achieve Integrated Coastal Zone Management.

Harley Spence

Coastal Policy Statement Update

The Board of Inquiry on the NZ Coastal Policy Statement (NZCPS) has completed its public inquiry and presented the Minister of Conservation with its report and recommendations.

The Minister is considering the report and recommendations at present and will revise the NZCPS accordingly. He will then recommend approval of the NZCPS to the Governor-General in Council. After approval, the Minister will issue the NZCPS by notice in the Gazette.

While gazettal is a matter of urgency in order that the NZCPS can guide the preparation of Regional Coastal Plans, the time frame is uncertain, as with all matters that must be considered first by the Minister and his colleagues.

The report and recommendations of the Board of Inquiry is available from the Department of Conservation.

Mike Jacobson, DOC

IPENZ Policy on Continuing Education

The 1993 IPENZ policy in relation to attendance at workshops, conferences, seminars, symposia and technical meetings categories 5.1 to 5.5:

The 1993 IPENZ policy on continuing education encourages members to undertake a recommended minimum of 150 equivalent hours of continuing education per three years on a rolling basis. It is the Institution's intention at some time in the future to require members to self certify that they are following this recommendation when renewing their membership each year.

It is suggested therefore that members of IPENZ keep a personal record of their attendance at any workshop/seminar/symposium/conference/technical group meeting. In doing so, it is important to note that each hour of course attendance attracts credit of *one equivalent hour* for the purposes of policy statement.

This policy was published in the November 1993 issue of *New Zealand Engineering*. Copies are available through IPENZ National Office.

IPENZ Nelson Conference

Coastal Society members presented two papers at the annual IPENZ conference in Nelson this February. They were:

- John Lumsden on "Seawalls—Do they have a role in coastal management?"
- John Duder and Grant Pearce on "Coastal Sensitivity Index: Application and Interpretation".

Seawalls and Coastal Management

The reputation of seawalls as a means of providing coastal protection has become tarnished in recent years and there is now very little support for such structures, particularly among planners and decision-makers. The behaviour of seawalls, however, is poorly understood, and although in the past they have been blamed for creating a variety of shoreline problems, there is often little or no factual evidence to support such claims.

This paper discussed the construction of seawalls and, more particularly, the mechanisms determining their behaviour in terms of potential adverse effects. While caution in the use of seawalls is appropriate, it was concluded that construction can be justified in some circumstances, and there are means of mitigating against the likelihood of damage to the nearby coastal zone.

Applying and Interpreting the Coastal Sensitivity Index

The Resource Management Act requires territorial authorities to define and classify areas susceptible to coastal hazards, while the Building Act requires such hazards to be advised

when issuing a project information memorandum. In December 1992, the Department of Conservation published a Science and Research series document No 55 entitled *A Standardized Coastal Sensitivity Index Based on an Initial Framework for Physical Coastal Hazards Information* in which methods for quantifying and combining coastal hazards in a sensitivity index are discussed.

This paper discussed the application and interpretation of methods contained within the above document from an end users point of view, and the authors presented an alternative to the CSI.

The authors concluded that the evaluation of two of the CSI variables, "short term fluctuation" and "horizontal trend", utilising the recommended method of comparison of historical aerial photographs would be extremely expensive when carried out on a continuous length of coast. It was also found that the combination of several coastal hazards in one sensitivity index simply by numeric addition of the CSI variables resulted in anomalies. The assessment of critical variables from one risk category was in some cases offset by the variables of another risk category.

For these reasons, the authors devised an alternative to the CSI — the Coastal Hazard Sensitivity Index (CHSI). The CHSI keeps the assessment of each coastal hazard separate and only requires the assessment of "short term fluctuation" and "horizontal trend" when specific sites exhibit or are known to exhibit instability problems.

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Coastal News

Present plans are to publish *Coastal News* on a more regular basis and as suitable material is received. Members are encouraged to contribute material that would be of interest to others.

Material for *Coastal News* can be sent to:

- John Lumsden
Centre for Advanced Eng
University of Canterbury
Private Bag 4800
Christchurch
Fax (03) 364 2069
- John Duder
Tonkin & Taylor
P O Box 5271, Auckland
Fax (09) 307 0265

Coastal Society Welcomes Corporate Members

The Society is now seeking corporate membership and it may be advantageous for some members to encourage their employing organisation to take up this form of membership.

A corporate member may nominate up to eight staff members, who will enjoy all the benefits of individual members. The annual fee is \$200.

Forms for this purpose can be obtained from the Secretary (John Duder). Corporate members will be encouraged to submit articles for the newsletter about their activities.

NZSCSE Members

Name	Affiliation	Name	Affiliation
Mr Keith Armstrong	OCEL Consultants Ltd	Assoc. Prof Bob Kirk	Dept of Geography, University of Canterbury
Ms Wendy Bailey	EG&G Geos	Mr R B Knowles	R B Knowles & Associates Ltd, Consulting Engineers
Mr Rene Bakx	Otago Port Company	Mr Takis Koutsos	Hawkes Bay Regional Council
Dr Robert Bell	NIWA Ecosystems	Dr Andrew Laing	NIWA Marine
Mr Alan Betts	Alan Betts Consulting Engineer	Mr David Le Marquand	Ministry for the Environment (Auck)
Mr Peter Bolton	Base Consulting Engineers	Mr John Lumsden	Ctr for Adv Engineering / Coastal Eng Consultant
Mr Barrie Cameron	Port of Wellington Ltd	Mr Garry Macdonald	Beca Steven, Director Environmental Engineering
Mr R J Carter	NIWA Marine	Mr Andrew MacDuff	Carson Mills Project Mgmt
Dr Lionel Carter	NIWA Marine	Mr Geoff McAlpine	Department of Conservation
Dr Stephen Chiswell	Dept of Civil Engineering, University of Auckland	Dr Bruce McCabe	McCabe Environmental Consultants Ltd
Dr Collin Christian	Brian T Coffey and Associates	Mr Terence McCarthy	Connell Wagner Rankine and Hill Ltd
Dr Brian Coffey	Dept of Earth Sciences, University of Waikato	Mr Ralph McCorkindale	McCorkindale Associates
Mr Russell Cole	EG&G Geos	Mr B C Mischewski	Development Consultants Ltd
Mr Nicholas Collins	Massey University (grad student)	Mr William Mitchinson	Mitchinson McGregor (Consulting Engineers)
Ms Michelle Creamer	KRTA Ltd	Dr Mike Moore	NIWA Marine
Mr Allen Crosby	Fraser Thomas Partners, Consulting Engineers	Mr D Neale	Department of Conservation
Mr Gordon Cuthbert	Global Engineering	Mr Scott Nodder	NIWA Marine
Mr John de Bueger	Dept of Earth Sciences, University of Waikato	Mr Gavin Palmer	Environment Waikato
Dr Willem de Lange	OCEL Consultants Ltd	Dr Mike Patrick	Royds Garden Ltd
Mr Frank Dennis	Dept of Earth Sciences, University of Waikato	Mr David Peacock	Gisborne District Council
Mr Albert Dommerholt	Porirua City Council	Mr Grant Pearce	Tonkin and Taylor Ltd.
Mr Malcolm Douglass	Tonkin and Taylor	Mr Richard Pope	Carrington Polytechnic
Mr Alistair Dryden	Retired	Mr Stephen Priestley	Beca Carter Hollings & Ferner
Mr John Duder	SOPAC (South Pacific Applied Geoscience Commission)	Mr Hamish Rennie	Department of Conservation
Mr Robert Duncan	GeoResearch Associates	Mr Allan Richards	Northland Regional Council
Mr Jim Eade	Environment and Planning Division, Auckland Regional Council	Mr Gregory Shaw	Plans & Calcs
Dr Robin Falconer	Spicer Oppenheim	Ms Angela Sheffield	Perry Aggregates Ltd
Ms Sue-Ellen Fenelon	Department of Conservation	Dr Mike Shepherd	Massey University
Mrs Wilhelmina Flick	Dept of Earth Sciences, University of Waikato	Mr Ralph Simpson	ex-Ministry of Works
Mr Rob Forlong	OCEL Consultants Ltd	Mr Martin Sinclair	Eliot Sinclair and Partners Ltd
Mr Gregory Foster	NIWA Marine	Mr John Smart	J Smart Consulting Engineer
Mr Ian Goss	Dept of Geology, University of Auckland	Dr David Smith	Barrett Fuller & Partners
Dr Ken Grange	NIWA Marine	Mr Harley Spence	Coastline Consultants
Dr Murray Gregory	Canterbury Regional Council	Mr Basil Stanton	NIWA Marine
Mr Malcolm Greig	Beca Carter Hollings and Ferner	Mr Peter Steel	Beca Carter Hollings & Ferner
Mr R J Hall	Works Consultancy Auckland	Mr Grant Stevens	Richardson Stevens Consultants Ltd
Mr John Harding	Wellington Regional Council	Mr Andrew Swales	Environment and Planning Division, Auckland Regional Council
Ms Jenny Hart	Works Consultancy Services	Mr Gary Teear	OCEL Consultants Ltd
Dr Wayne Hastie	Waikato University	Dr Betty Terzaghi	ex-DSIR
Mr David Hay	NIWA Marine	Mr Sergei Terzaghi	Murray North Consultants
Professor Terry Healy	James Cook University	Mr W G Thomson	Argo Thomson Ltd.
Dr Ron Heath	NIWA Freshwater Division	Mr Derek Todd	Canterbury Regional Council
Prof Malcolm Heron	NIWA Ecosystems	Mr Stephen White	Taranaki Regional Council
Dr Murray Hicks	Offshore Scientific Services	Mr John White	Consultant
Dr Terry Hume	Department of Conservation	Mr David White	EG&G Geos
Mr Allen Hundley	Waimakariri District Council	Mr Brian Wilson	Brian Wilson Consulting Engineer
Mr Michael Jacobson	Hydraulic Modelling Services	Ms Jean Wolfenden	Psychology Dept, University of Auckland
Mr Richard Johnson	EG&G Geos	Prof Ian Wood	Dept of Civil Engineering, University of Canterbury
Dr Steve Joynes		Ms Lesley Woudberg	Waimakariri District Council
Mr Mike Kelley			