

The Christchurch Waterways Story



Robert H Watts



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Foreword

Christchurch was ‘Leader of the Pack’ through the 1990s in terms of grasping the fundamental meaning of the internationally ground-breaking resource management legislation. Through a series of fortuitous events the Christchurch Drainage Board, which had for over a century dedicated itself to the task of squeezing every drop of surplus water out of the city – for purposes of sanitation, development and gardening, was transformed into a force for recognising water as ‘your friend’. This ‘force’ was the newly amalgamated, greater Christchurch City Council’s Water Services Unit. With the old guard retiring, a group of innovative engineers appeared, blinking as they emerged from their piped surrounds into the sunlight. This band of big thinkers embarked on the creative mission of freeing the city of its linear manicured mind set and instead introduced serpentine tussock-clad river banks, havens for native wildlife. Importantly, they implemented a multi-value approach to water planning in the city and for a while the concept, the indigenous plants and the wildlife flourished. And at about the time the rest of the country, which had been sending scouts down to Christchurch to view these new ideas, started to reinvent them in their own cities, Christchurch succumbed to a suffocating backlash from reactionary but influential citizens and politicians. Although there was an unfortunate check in the progressive developments, the spirit had been released from its Victorian straightjacket, and certainly the rest of the country began to take on the ideas as though they were the norm. The news is out, most people love the naturalistic riverbanks with their distinctive tall-tussock sedges, bellbird-attracting harakeke, and the kaikōmako that is flowering for the first time in a long time – beside the Avon River.

There have been books about the amazing emergence of a city from a swamp and the important engineering works that allowed this to happen. But there is a new chapter in this fascinating story to tell and who better than Robert Watts (one of those intrepid pioneers of sustainable, multi-value water management) to help us understand how the city has refounded its swampy past but in a tamed and constructive way – so that nature and culture can coexist and each can inform the other. So we can have a point of difference from the rest of the world and from the rest of New Zealand. All cities are eco-cities; Christchurch is much more than a narrow definition of a garden city. It is nature’s garden – an urban forest of native and exotic trees and shrubs that together personify the integration of historical stages and the hybrid vigour that results from this dynamic fusion.

Colin D Meurk
12 November 2009

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Preface

One of my earliest memories is of standing by a pond full of aquatic plants and surrounded by lush vegetation, that was being traversed by a large dragonfly with colourful wings that glistened in the sunlight. Since then I have always been excited by watery landscapes and the life they contain.

Twenty years later, as an assistant civil engineer in Auckland, I was asked to supervise the cleaning by dragline of an urban waterway. The removal of waterweed was intended to ensure that storm flow capacity was maintained. The aquatic plants were dumped beside the waterway together with entrapped fish and invertebrates. It seemed to me that I had been involved in something fundamentally bad. The waterway had already lost most of its riparian environment and pristine water quality, and now it was losing its life.

Today, the adverse impact that cities have on surface water is a worldwide issue.

No doubt you, like me, have been moved to ask: Why is it not possible to develop settlements in a way that protects our natural water environment? Whether you said it quietly to yourself or loudly to someone else, you think it *should* be possible, prompting a further question: How does one go about achieving it? My opportunity to make a start came twenty years ago when I was appointed Planning Manager in the Drainage and Waste Management Unit of the then new Christchurch City Council. Since then the management philosophy of surface water in Christchurch has changed from a single-focus, land drainage approach to one that responds to all its values. These values are identified as: ecology, landscape, recreation, heritage, culture and drainage. This change involved people with vision and energy who were able to translate into physical reality our society's desire for quality of life and quality of the environment.

Relating the story of how the change occurred is intended to encourage others to make the most of their local surface water environment. It tells how progress was made, who was involved, and what organisational changes and relationships were established.

The story begins with the 100-year-old Christchurch Drainage Board and its legacy. Part Two describes influential milestones on the path to change, and Part Three, how change was implemented. At the end of the story a philosophy emerges for the sustainable management of urban surface water environments.

I have written this story at the request of those involved in guiding the Low Impact Urban Design and Development research project¹ at Landcare Research, Lincoln.

Robert Watts
2010

¹ <http://www.landcareresearch.co.nz/research/built/liudd>

Postscript

This story was written before Christchurch was struck by a series of devastating earthquakes that began in September 2010. The likely impact of an earthquake on the city's land drainage infrastructure was assessed as part of an engineering lifelines study. The report entitled: 'Risks and Realities: A Multidisciplinary Approach to the Vulnerability of Lifelines to Natural Hazards' was published by the Centre for Advanced Engineering, University of Canterbury in November 1997. Not including a reference to this study in *The Christchurch Waterways Story* was an oversight on my part. I will leave it to others to compare predicted with actual 'risks and realities'. Such a comparison is likely to influence the proximity of future buildings and urban boundaries to waterways and wetlands.

A more recent study by Environment Canterbury assesses the ecological impact of the earthquakes on Christchurch waterways and its estuary.

Robert Watts
September 2011

Author Information

Robert Watts, Member Institution of Professional Engineers, New Zealand, completed this report while working as an environmental researcher at Landcare Research 2008—2010.

Part One: The Christchurch Drainage Board – keeping folk dry and healthy

The first British settlers of Christchurch were able to make use of an abundant supply of artesian water and a natural system of waterways for transport. Over time, as the population of the settled areas grew, waterborne diseases, high groundwater levels and flooding became serious problems. In due course the Christchurch Drainage Board was established (in October 1875) and given the dual tasks of land drainage and wastewater management. Fortunately, the Board engaged an experienced civil engineer from London, William Clark, who advised the Board to construct separate foul water and stormwater sewers.



The market place, Christchurch 1859 (Dr A C Barker, Canterbury Museum) Permission of Canterbury Museum, Christchurch, New Zealand must be obtained before any re-use of this image.

During its more than one hundred year existence the Board constructed many hundreds of kilometres of open drains, concrete- or timber-lined channels, and pipelines. It progressively deepened, widened and straightened the Avon, Heathcote and Styx rivers. Low-lying riverside neighbourhoods were

protected from flooding by the construction of stopbanks and local area pumping stations. The cost of replacing this stormwater infrastructure is estimated to be half a billion dollars. All this activity created land upon which an English style 'Garden City' could grow.

While the main focus of the Board was on flooding and public health, in its latter years there was also concern for aquatic life. The Board's Biologist and Trade Waste Inspectors improved public awareness of the connection that the stormwater system had with natural water and the need to avoid pollution.

In the 1980s issues relating to local government reform, wise resource management and the environment were to the fore. Planning staff at the Christchurch Drainage Board had already begun to think about such issues as more and more people expressed concern for the continual loss of natural values associated with surface water. At this time also there arose a growing expectation that the Board, with its narrow, constraining responsibilities, would be replaced.



Members of the Christchurch Drainage Board and visitors present at the opening of the septic tank, Bromley, 4 September 1905 (CCC NPGU)

A short history of the Board and a guide to further reading may be found on the NZine website².

² http://www.nzine.co.nz/features/swamp_city1.html

Part Two: Some influential early milestones

The following are the important events that marked the progress of thinking away from reliance solely on engineering solutions and towards finding space upon the urban landscape for protecting and emulating nature.

The Woolston Cut – an environmental disaster but a new beginning

Many hundreds of properties lie on the Heathcote River floodplain. Flood studies undertaken in the 1980s and an assessment of likely flood damage indicated that up to 60 homes and some 200 garages would have water inside them if urban development continued to expand within the catchment.

The extent and frequency of flooding alongside the lower reaches of the river was reduced following the commissioning of the Woolston Cut by the Christchurch Drainage Board in 1986. ‘The Cut’ is a wide concrete-sided channel that allows flood flows to largely bypass a long, narrow meander in the natural river channel. The work was seen as a necessary first step to enable channel enlargement work to be undertaken along various reaches of the river upstream.



*The lower Heathcote River / Ōpāwaho showing the Woolston Cut.
The undeveloped land in the bottom right is flood prone*

The Woolston Cut was planned against a background of historical flooding that residents of riverside neighbourhoods found distressing. The motivation to do something to reduce flood levels is high when a community witnesses people, especially the elderly, being evacuated from their flooded homes in bitterly cold weather. Strong damaging winds and the gorging of sanitary sewers added further misery to residents of flood-affected areas.

In 1989 the Christchurch Drainage Board's organisation merged with a new, larger Christchurch City Council as part of local government reform.

At the same time, the environmental effects on the Heathcote River upstream of the Cut were beginning to give rise to new concerns. Extensive slumping of banks and the death of a few of the more susceptible riverside trees had occurred. A full investigation was initiated.

The environmental damage arose from tidal backflow up the Cut bringing saline conditions to a previously freshwater zone. It was a change in soil chemistry that caused loss of soil cohesion and consequent instability of the riverbanks. This effect was compounded by the activities of a burrowing crab that migrated upstream from the Avon–Heathcote Estuary. In addition, tree death was increasing as tree roots translocated more salt to the trees with each tide cycle.

Residents of riverside neighbourhoods were angered by the dramatic loss of their treasured river environment. They rejected an adaptation approach, i.e. one in which the emerging estuarine conditions are accepted and the banks stabilised with salt-tolerant native plants. The solution eventually adopted was to construct a barrage at the upstream end of the Cut. The radial gates on the barrage are normally closed, so that tidal movement is returned to the original meandering river channel, and opened only for flood flows. A bank restoration and tree planting programme followed.



The Woolston Barrage



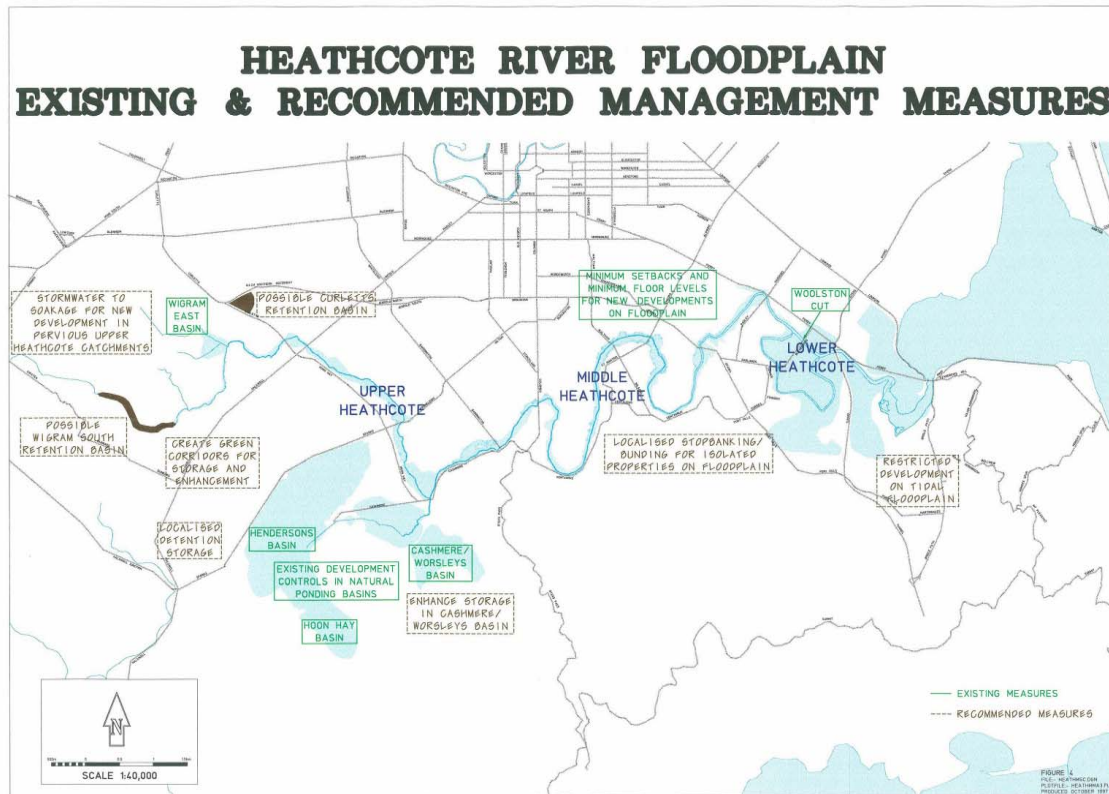
The Woolston Cut looking downstream from the barrage, 2008



Looking upstream of the Cut at tree restoration alongside the Heathcote River, 2008



The Woolston Loop meandering through Christchurch's historical industrial area. Because of the Cut, the Loop is no longer a constriction to flood flows so natural and assisted restoration is now taking place



(CCC NPGU)

The adverse environmental impact of the Woolston Cut gave rise to a determination by both community and Council to seek ‘non-structural’ approaches to flood mitigation. Further flood studies were undertaken and the Heathcote River Floodplain Management Strategy (above) was subsequently produced and adopted jointly by the Canterbury Regional Council and the Christchurch City Council in 1998.

The Strategy places emphasis on reducing flood damage rather than flood levels and planning measures rather than physical works. Within the upper catchment large areas of natural ponding are to be protected. Consents are to be sought for improving their detention storage and for the infiltration of stormwater in areas having pervious soils and low groundwater levels.

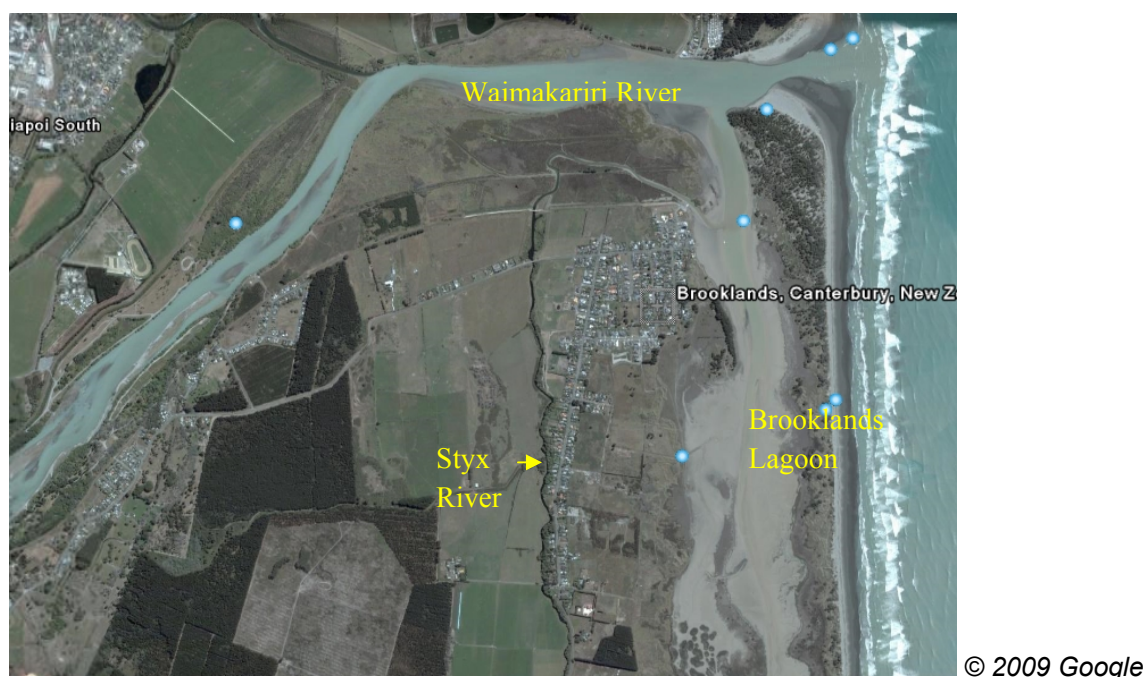
No further engineering works will be undertaken on or alongside the Heathcote River. The margins of the river are now being managed as a linear park with emphasis on ecology, landscape, recreation, heritage and culture. Channel modification will only occur to allow ecological water’s edge planting to be done in a way that avoids flow restriction.

The Woolston Cut experience brought engineers and ecologists together at a time when the country as a whole was discussing environmental issues and resource management law. This period was the beginning of a movement to manage the city’s surface water system for all its values. For anyone interested in the effect of sea level rise on small coastal rivers, the Woolston Cut experience would provide a useful study.

Brooklands – the first site-sensitive design

Brooklands is noteworthy because it was the first part of Christchurch where non-conventional planning and design approaches were pursued. This was done in order to address significant natural hazard and natural environment issues. It involved integrated stormwater and street design, and collaboration with land-use planners.

Brooklands is a small settlement located in the north-east corner of the City's district. The land is low-lying with groundwater levels rising close to or above ground surface following periods of prolonged rainfall. The Waimakariri River to the north, the Styx River to the west, and Brooklands Lagoon to the east, make it a hazard-prone location.



Brooklands: set amidst ground and surface waters

Although the settlement was already subdivided, prior to 1990 only about a third of the lots had dwellings on them and further building was prevented due to water-related human health concerns. To allow further development, the provision of sewerage, reticulated water supply and street improvements together with surface and groundwater management was going to need to be funded by the wider Christchurch community.

The effect of sea level rise on the area was a matter of concern. The coastal dunes, the river mouth, the lagoon and surrounding wetlands would, over time, become significantly altered. The settlement would be subject to tidal inundation and eventually, if the dunes became eroded, direct attack by ocean waves.

The following question was asked: If sea levels are going to rise is it sensible to spend public money on providing infrastructure that will allow many more houses to be built? At that time (1990) sea level rise was highly controversial and although an important issue for the country as a whole, a National Coastal Policy Statement on the matter did not exist. Should a stand have been made? Only time will tell!



Roadside swales with subsoil drains: a system that collects and cleans stormwater and controls groundwater levels

Instead, a surface and groundwater management system was devised that provided roadside grassed swales with continuous perforated pipes below the swale invert. Individual properties have their roof stormwater connected to a soakage chamber located close to the street boundary.

City Plan changes were needed to help retain the rural character of the settlement, protect natural habitat and reduce future flood damage.

Under the new rules the minimum lot size for future subdivision was set at 1000 square metres. Lot and floor levels were set that included an allowance for a 400-mm rise in sea level. Residential land-use boundaries were modified to prevent development from occurring on dunes and saline wetlands.

The planning process recognised the special character of Brooklands and today it has many more new houses on both existing lots and new subdivisions. It has proved to be a popular place because of its rural character and natural surroundings.

Corsers Stream, Travis Swamp and Anzac Drive – saving waterways and wetlands by reversing past decisions

A large area of low-lying land north of the Avon River / Ōtākaro was originally zoned entirely for residential use. A valuable existing wetland covering part of the area was subsequently saved and green corridors to the Avon River / Ōtākaro created as part of residential development and expressway construction.



Travis Swamp and its connections to the Avon River / Ōtākaro

Corsers Stream – a piping plan that changed to a pipe dream, then reality

Corsers Stream began life as a rural utility drain within low-lying paddocks north of the Avon River / Ōtākaro. Its main function was to drain groundwater. Tidal backflow from the river was prevented by a hinged tide-gate.

To satisfy district plan provisions for residential land use, in this area existing ground levels needed to be raised with filling by about one metre. It was proposed to replace the open drain with a large-diameter pipeline. The 5.4 million dollar (1988) cost of the pipeline was to be cost-shared by developers within the catchment, with the Christchurch Drainage Board acting as banker.

The scheme was reviewed after amalgamation, by the new Christchurch City Council, for the following two reasons:

(1) The Council intended to purchase that part of the land within the catchment known as Travis Swamp in order to protect and restore its natural values. This involved lengthy negotiations with the owners, who had the right to fill and develop the swamp for residential use under the Waimairi District Plan. The purchase was eventually achieved, but not before a drainage scheme needed to be adopted to provide for ongoing development in other parts of the catchment.

(2) The sequence of development meant significant financial outlay by the Council on the pipeline at the downstream end but with a long period before receiving financial contributions.

A new scheme was prepared. It proposed that Corsers Drain be naturalised within a corridor of land in Council ownership. The first stage of the work involved the purchase of six lots of a recently approved subdivision. As the Council had no experience with such a project, the option of piping was kept open as a backup should the naturalisation work prove to be unsatisfactory. Fortunately, it was very successful.



Corsers Stream: designed with generous capacity for both storm flows and vegetation

The naturalisation of the drain continued for the full length of the original piping scheme, with the support of all the developers. The advantages of the scheme compared with conventional piping were significant and included:

- Lower cost – about two-thirds that of the original piping scheme
- The provision of a public walkway alongside the waterway
- The creation of a ‘green corridor’ linking Travis Swamp with the Avon River
- An attractive outlook for adjoining properties
- A flatter hydraulic gradient allowing lower fill levels and consequent cost savings

Perhaps the most significant advantage was the ability to demonstrate the many benefits of waterway naturalisation and restoration within a corridor in public ownership. In the case of Corsers Stream, most of the land was obtained as reserve contribution from the developers.

Travis Wetland Nature Heritage Park – a planning mistake that ended in triumph

The following is an extract from the website of the Travis Wetland Trust.

‘Travis Wetland is located in north-east Christchurch, close to sea-level, and is typical of pre-European Christchurch and Canterbury plains swamp lands.

1600 years ago it was an estuary similar to the Avon/Heathcote Estuary of today. A sandbar gradually shut out the sea, decreasing salinity and allowing wetland plants to take over from salt marsh species.

Travis is the largest freshwater wetland in Christchurch with an area of 120 hectares.



Māori history of Travis wetlands

Travis Wetlands were one of the *mahinga kai* (traditional resource gathering areas) and used by Waitaha from about 900AD, Kati Mamoe from about 1600, and by Ngai Tahu from about 1650. Queen Elizabeth II Park now occupies the land (known as Oruapaeroa) that was the residential area for the families of Ngai Tahu who harvested these wetlands. Eel, fish, kereru, raupo seeds, and other wildlife were in abundant supply. Harakeke was used for weaving baskets, clothing, and roofing, and raupo was used for thatch. In the mid 19th century the whare of Oruapaeroa were still standing but were burnt down in 1862 when a European settler gained crown grant of the land. Māori had requested that this ancient pa site be excluded when Kemp's Purchase of 1848 was drawn up, but this did not happen.

Only a decade ago, these wetlands were grazed by cattle and looked like becoming yet another housing development. The Travis Wetland Trust lobbied the Christchurch City Council to step in and buy the land, which they did in 1996.

Travis Wetland is an important site for local and regional conservation of wetland plants.'



Travis Swamp: a diversity of wetland habitats (2008)

Anzac Drive Corridor

Planning for the New Brighton – Burwood Expressway resulted in the purchase of several large lots of privately owned undeveloped land. The intention was to later sell the land that would be surplus once the expressway had been designed and its overall width and position determined. A newly appointed landscape architect (the first ever in the land drainage team) saw the opportunity to design a multi-purpose green corridor. Concept plans were prepared in collaboration with road designers, land-use planners, an ecologist, drainage engineers and adjoining landowners. City councillors responded very favourably with one councillor saying that this was the kind of integrated planning they hoped would occur following local government amalgamation.



Anzac Drive: a green corridor and a glimpse of a pre-settlement landscape

The Avon River / Ōtākaro, Central City – a small but significant departure

The margins of the Avon River through the central city have been the favoured location for many fine buildings and public gardens. Important community assets include the Canterbury Provincial Chambers (pictured below right), the Christchurch Town Hall, the Central Library, the Municipal Baths and the Law Courts together with several charming Victorian bridges, Victoria Square and the Botanic Gardens. They are testimony to how influential an attractive natural waterway within public land can be on the quality of the surrounding built environment.

In recent times the natural water's edge vegetation has been allowed to grow, rather than be cut back, in order to provide invertebrate habitat and shelter for fish. Initially, there was comment that the well-groomed banks had become scruffy, but in time people got used to the different look.

The practice of excavating areas of shoaling has also ceased in favour of planted shallows.

These small but significant changes mean that all of the six values, i.e. ecology, recreation, landscape, heritage, culture and drainage, are now present right through the heart of the City.



The Avon River / Ōtākaro: A pleasing blend of natural and built environments

Part Three: Vision to Reality pathways

In 1989 the new Christchurch City Council was formed from the amalgamation of the Christchurch Drainage Board and several existing district councils. This reorganisation, together with the Council's new statutory responsibilities, was a great opportunity to take a fresh, comprehensive look at surface water management. The events described in Part Two provided the kind of experience that was needed for this task. The work was not undertaken as a logical, well-planned series of steps. Rather, it meant being influential when decisions needed to be made relating to staff recruitment, budgeting, district plan preparation, operation and maintenance contracts, design standards, asset management, land acquisition, organisational structure and relations with key stakeholders. Justifying the adoption of a totally new philosophy for surface water management during this very busy time was difficult. However, waiting until later, when all the old conventions were re-established, would have been even more difficult.

An advance in management philosophy occurred when civil engineers, together with new staff in the fields of landscape architecture and ecology, discussed asset management as it related to the natural component of the city's land drainage system. A set of six values seemed to cover all the expectations of the RMA and community groups as they were known at that time. They were later confirmed by key stakeholders and the Council when a natural asset management strategy was adopted.

The adoption of the six values i.e. ecology, landscape, recreation, heritage, culture and drainage, aided articulation of the new management philosophy. People could relate to the values more readily than lofty policies and they were much easier to remember.

Waterway Enhancement Programme – restoring our natural heritage

The Waterway Enhancement Programme began from modest and somewhat tentative beginnings in the early 1990s. It was an initiative aimed at restoring the natural values that had been lost through urban growth and the focus on drainage. This description of the successes of the programme and the reasons for its subsequent demise is an important aspect of *The Christchurch Waterways Story*.

Under the programme over 28 km of stream restoration occurred in suburbs such as Halswell, Woolston and St Albans and around the University of Canterbury.

The first enhancement project was Shirley Stream. It was a small natural waterway that meandered along the rear of existing residential lots. It carries a natural base flow. The stream had lost much of its natural character, was largely fenced off and was difficult to maintain. This closed-off corridor became an out-of-sight, out-of-mind dumping area. Some residents saw it as providing concealed access for burglars.

At a boisterous meeting of staff, councillors and residents the condition of the stream and options for its future management were hotly debated. One councillor promised that the stream would be piped. A brave staff member challenged the sustainability of such an approach if applied throughout the city.

Amidst much protest, residents were advised that staff would investigate a waterway restoration option. The residents were understandably sceptical given the single-focus, drainage-value-only approach that had prevailed until that time.

In the end the fortitude and perseverance of staff paid off. Rear fences came down exposing an enhanced waterway that residents could enjoy as part of their garden. It also became a place for neighbours to socialise.

The Shirley Stream enhancement project was well regarded by the majority of the people involved. There were others who were not involved that criticised it because they saw it as private property improvement at the cost of the ratepayer. This criticism grew as more enhancement projects were undertaken. Unfortunately the critics had insufficient knowledge of all the elements of the bigger picture to appreciate how important the work was in sustaining the natural and physical resources that make up the City's waterways, wetlands and drainage. The reality was that half the total length of the city's tributary waterways passes through private property and the Council needed to address how to manage these waterways.

A compromise policy was developed that allowed restoration in private property provided the owners contributed to the cost and allowed a conservation covenant to be placed on their certificate of title. However, waterway enhancement as a budget item was always regarded as an optional or discretionary activity by corporate managers and elected representatives. The opportunity to present the bigger picture came with the development of The Natural Asset Management Strategy for Waterways and Wetlands (see below).

An important first step in developing the big picture was the establishment of CREAS (Christchurch Rivers Environmental Assessment System)³, a GIS-based strategic management tool developed by environmental consultants NIWA.

The enhancement of utility and degraded natural waterways was most successful when carried out within parks and schools. Here many more people were able to see the value of the work.

Perhaps the most celebrated enhancement was that carried out on the Rehua Marae, within the City's urban area. The waterway was timber lined and located on the fenced boundary. It carried a continuous spring-fed base flow. Again, there were sceptics to begin with, but in the end the enhancement was much praised and local Māori became supporters of the new surface water management philosophy.

Ecological considerations meant that natives were the preferred plant species for riparian areas. An intense debate arose at Councillor level about the exclusive use of natives for waterway enhancement. The issue also became the subject of Letters to the Editor in *The Press*. The natives vs exotics debate was resolved by botanists listing a selection of plants that met established criteria for riparian areas.

More information on stream restoration in Christchurch is available from NIWA⁴.

³ http://resources.ccc.govt.nz/files/Biodiversity_2198_CREASUrbanImpactScoreMap-docs.pdf

⁴ <http://www.niwa.co.nz/news-and-publications/publications/all/wa/10-2/restoration>

The City Plan – getting the law on the right side

An important task for the new Christchurch City Council was the 1991 preparation of the City Plan. It involved translating the provisions of the Resource Management Act (RMA) into a set of documents that ensured the sustainable management of Christchurch's natural and physical resources.

The preparation of the plan had a unifying effect on the new organisation. As people from different backgrounds came together, narrow parochial views gave way to a collective vision for the whole city. It was a liberating experience for those who had a desire to work collaboratively toward common objectives.

In describing the City's landscape, the Plan mentions the existence of a diversity of surface water environments. The objectives and policies contained in volume 2 make many references to natural water and water environments. They can be found in chapters relating to the natural environment, tangata whenua, natural hazards, urban growth and subdivision.

The implications for the future management of surface water and groundwater were very clear. The narrow focus of the Christchurch Drainage Board was at an end.

Volume 2 also sets out the methods available to the Council for achieving the objectives and policies. The two main methods for surface water are:

- Works and Services, e.g. the operation of a land drainage system
- Waterway setback rules

Rules important to the protection of waterways prescribe minimum set-back distances. The distances were determined by the nature and size of the waterway. Appendix 1 includes a summarised extract from the City Plan that explains the reasons behind these rules.

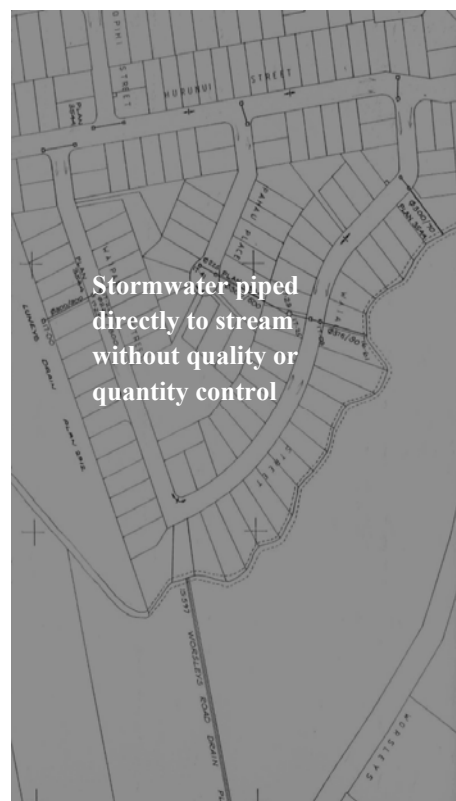
Waterways and Wetlands Natural Asset Management Strategy – the big picture

Like most other cities, Christchurch's land drainage system gradually evolved through the modification and expansion of the existing natural system. Over this evolutionary period little attention was given to the protection of natural values. The main focus was on drainage. River margins within public space were given the English Garden City treatment of lawns to the water's edge and spaced exotic specimen trees. Tributary waterways and constructed open drains were mainly in private urban and rural properties. The Christchurch Drainage Board maintained all waterways other than private drains. Aquatic plants and bank vegetation were regularly cut. Constructed drains were concrete or timber lined when bank and bed conditions were unstable. The emphasis was on drainage efficiency.

A matter of continual aggravation for many property owners was the Board's policy related to natural waterway maintenance. Bank erosion and stability were considered to be the responsibility of the property owner. Any garden plants that impeded flow were cut back or, if large, notices issued to the property owner for their removal. Many of these waterways lost their natural attributes as a consequence of catchment urbanisation. Storm flows increased in magnitude and frequency, causing erosion. Waterways were affected by silt deposition arising from subdivision earthworks within their catchments.

Some waterway margins were reduced in size by property owners who built retaining walls and filled behind them to create more usable flat land for buildings, paved areas and lawns.

There was a tendency to use piped diversions along streets to overcome the capacity limitations of waterways within private property.



A fenced off timber-lined drain – no natural margins for this stream (CCC NPGU)

To avoid such problems in the future it became the practice with any new subdivision to require existing waterways to be piped. These pipelines were designed to be part of a larger system that would be built if and when further urban expansion took place.

Today the City's land drainage infrastructure comprises many hundreds of kilometres of pipelines, concrete channels, utility waterways and degraded natural waterways. If past trends had continued, the built component would have steadily increased and the natural component would have disappeared.

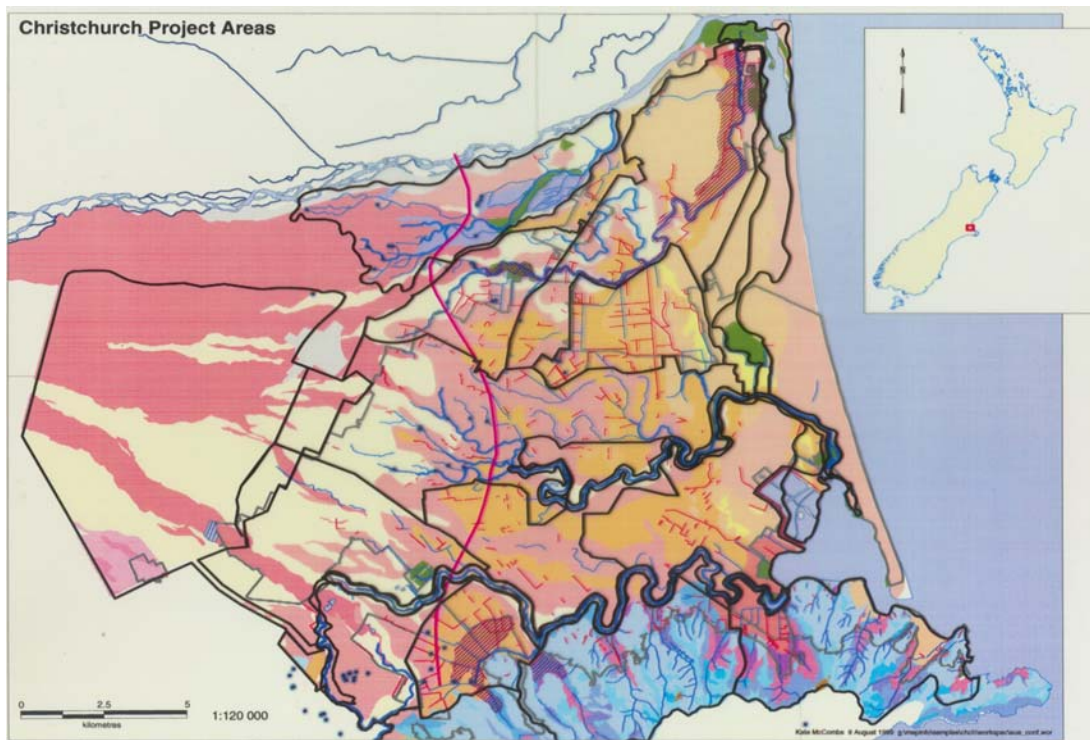
The management of infrastructural assets became an important issue worldwide in the 1980s. Some spectacular pipe failures occurred in the streets of London and their magnitude was being measured in how many Austin Minis would fit into the crater formed by the collapse.

Asset management utilises computer-based records of the age, capacity, condition and strategic importance of individual system components. These data, along with other issues such as level of service, urban intensification and expansion, provided the basis for the determination of expenditure and revenue needs.

The conventional utility asset management approach seemed well suited to the built component of the land drainage system. However, it was not compatible with the natural component as there were other values to consider. Also, a uniform level of service was inappropriate as natural waterways vary greatly in their character.

What would the people of Christchurch expect from a well-managed system of waterways, wetlands and drainage? The response to this question was needed in order to satisfy the 'level of service' requirement of the Auditor General. Acceptable stormwater drainage standards were determined as part of a general level-of-service survey of utility assets. A workshop concerned with the natural component of the system, involving representatives from key stakeholders and other interest groups, produced a wonderful array of ideas. It was possible to group these ideas under each of the six values: ecology, landscape, recreation, heritage, culture and drainage.

The next step was to divide Christchurch into project areas. This was done to acknowledge the diversity of surface water environments, local communities of interest and topography within the City, e.g. The Port Hills are different from the Avon River corridor or the Marshland market garden area. For each area a set of issues was identified and from these a set of objectives and an overall vision developed (see Appendix 2 for details). This then ensured that individual asset management initiatives were planned and designed in a way that supported the objectives and overall vision. Plans and illustrations were prepared to help stakeholders visualise the transformation that would occur within the different project areas. These images contributed to a favourable impression of the strategy as a whole.



Asset management project areas (CCC NPGU)

PORT HILLS
'Forested Valleys'

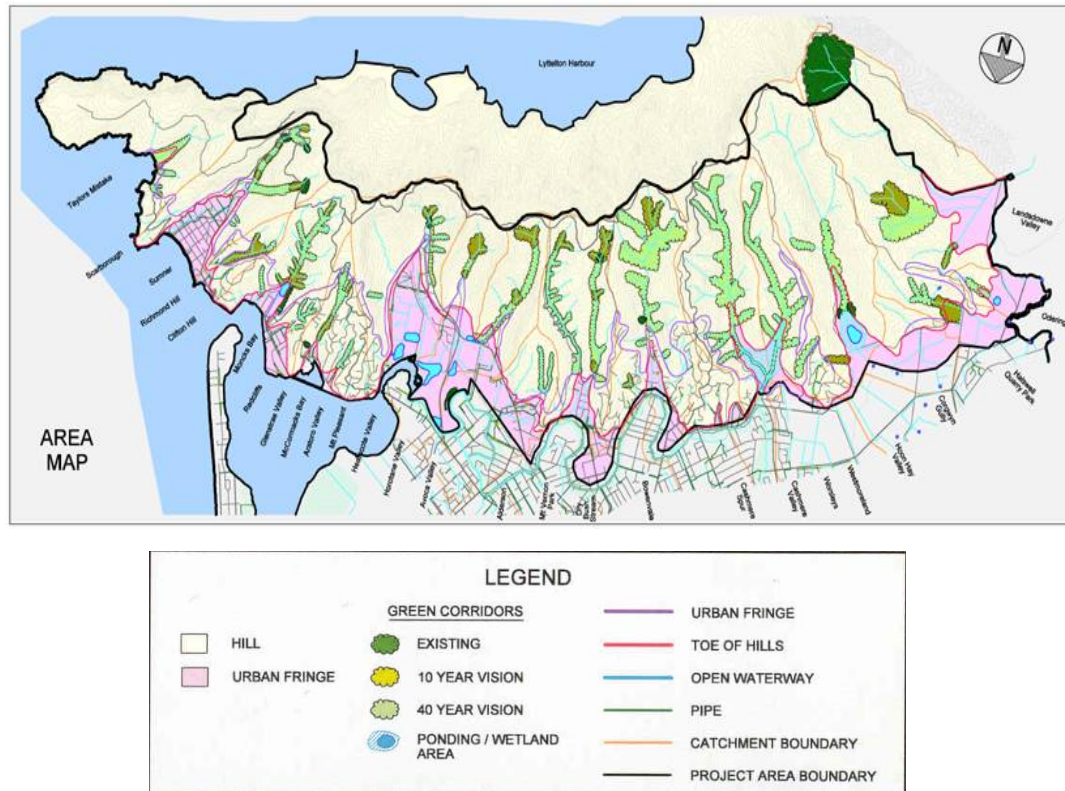
VISION

A breathing place of green gullies, clear water and open tussocklands.
A refuge for wildlife and an immediate space for people to enjoy.

STRATEGIES

- ① Ensure soil conservation valley and side-gully restoration planting, and sustainable tussock grassland and stock management.
- ① Establish ecological and recreational linkages along waterway corridors and wetland systems.
- ① Map residential area flood hazards, and identify and protect secondary flow paths.
- ① Open and naturalise waterways in residential areas where possible (daylighting).
- ① Define and implement practices to attain sustainable greenfields residential development.
- ① Develop a sea level rise strategy.

Port Hills vision and strategies (CCC NPGU)



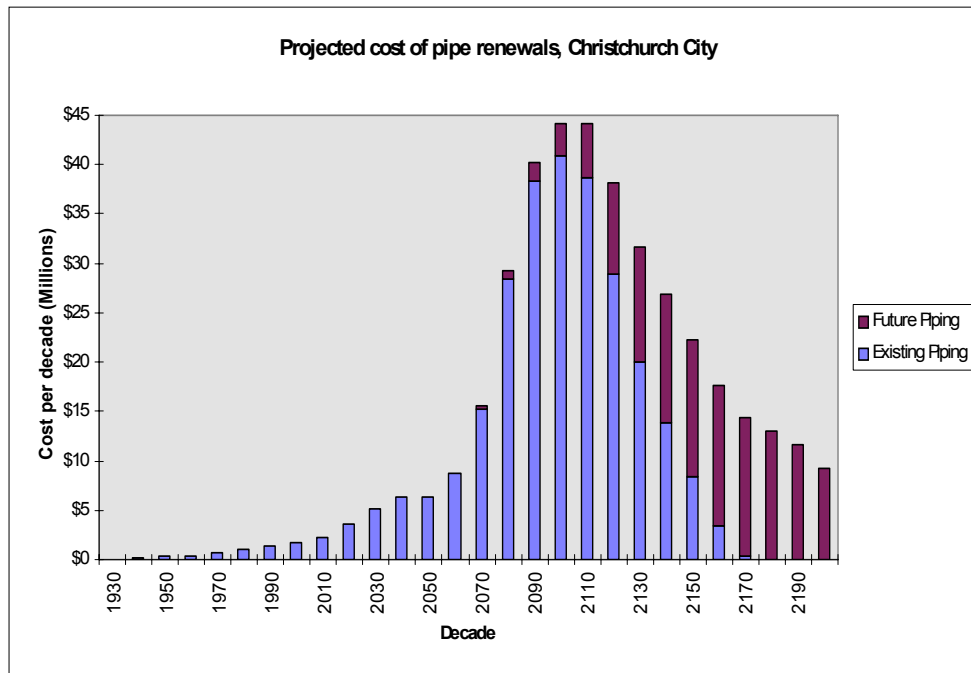
Port Hills greening (CCC NPGU)

The Strategy lists over 300 projects totalling \$160 million and scheduled over a 40-year period.

The Strategy was adopted by the council in 2000. It represents a commitment to wise resource management as inspired by the RMA, the City Plan and key stakeholders. Councillors and stakeholders all gave enthusiastic responses to the Strategy.

The Natural Asset Management Strategy can be simply described as an investment in the sustainable management of the natural and physical resources that make up Christchurch's system of waterways, wetlands and drainage. Restoration and protection are the main capital expenditure items, but the Strategy also requires the employment of people with appropriate skills. There is now an expert group of staff and consultants with considerable experience who work collaboratively on surface-water management projects. Organisational changes within Christchurch City Council have assisted in this regard by combining surface water management with parks and recreation management.

The financial cost of the strategy can be compared with the past investment in drainage infrastructure. The following diagram illustrates the cost to future generations in replacement and rehabilitation of the existing piped system.



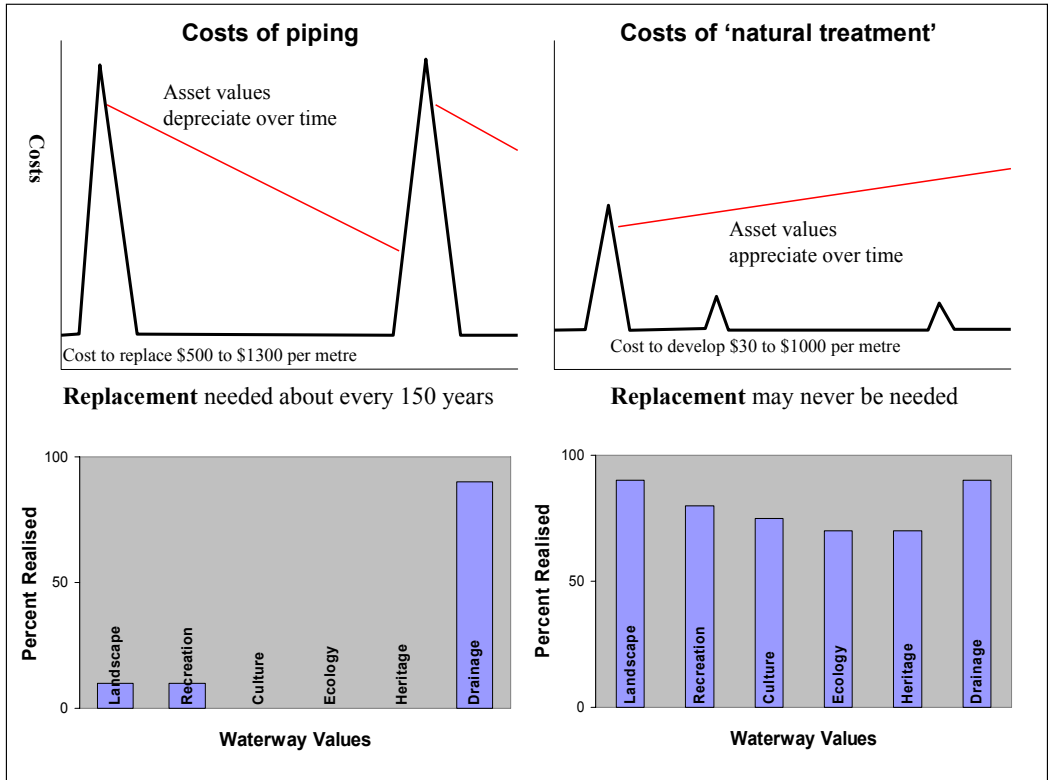
Projected pipe replacement (CCC NPGU)

Pipes and other built items have a life determined by their condition or capacity limitations. Pipe replacement often involves considerable disruption to roads and private property.

Within greenfields development the installation of concrete channels and large pipes often costs more than either the creation of a naturalised waterway (including the cost of the land) or the restoration and protection of an existing waterway.

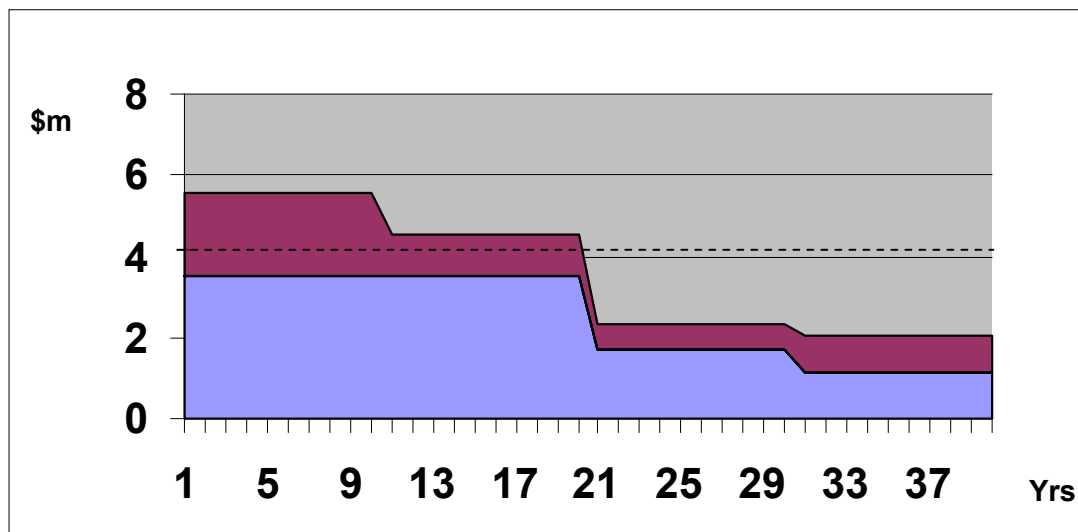
A well-designed waterway has adequate space for a natural succession of plants from the water's edge to the drier upper bank. Gentle bank slopes and generous space for public access will often confer a greater ability to attenuate peak storm flows.

A restored and protected surface water environment will not require replacement in the future and, provided ample hydraulic capacity is provided in the design, no significant vegetation control will be needed. The following diagram provides a simple representation of this for a waterway on public land. Note the realisation of the six values.



Piping vs waterways (CCC NPGU)

The projected investments in protection and restoration are shown in the following diagram. It is anticipated that this investment will eventually result in a waterways, wetlands and drainage system that sustains natural and physical well-being – and which is less costly for future generations than the default, utility system. The costs are in year 2000 dollars and are partly recoverable as development contributions.



Hard (blue) vs Soft (maroon) infrastructure. The \$4.1m horizontal line compares the new investment with the alternative of a continuation of the past average annual expenditure on piping and channelling (CCC NPGU)

Avon River / Ōtākaro, through the suburbs – the six values at work

The Avon River / Ōtākaro becomes slower and wider as it gets closer to the Avon–Heathcote Estuary, creating conditions amenable for small boats. River maintenance now allows water's edge plants and aquatic plants to grow close to the banks in order to sustain spawning for whitebait, and shelter and habitat for fish and invertebrates.



Avon River / Ōtākaro: ecologically sensitive waterway maintenance creates better 'whitebaiting' (left) but still allows clear passage for rowers (right)

River habitats are the home of a distinct type of vegetation known as aquatic plants. These live beneath or on the surface of the water and comprise a mixture of filamentous algae and specialised flowering plants. Some of these aquatic plants grow so vigorously that they become a nuisance by clogging waterways and affecting water flows. This has led to the common use of the term 'weed' to describe these plants and a familiar sight in Christchurch waterways is the weed-cutter chopping these plants and dumping them on the banks awaiting transport away.

But this designation is misleading and hides the true identity of these plants. Many of the submerged aquatics are actually native, and the major nuisance is created by one of only two common exotic species, curly leaf pondweed (*Potamogeton crispus*). This shallow-water aquatic dominates the margins out in the open and comprises the vast majority of the plant material removed. In deeper water, or under partial shade, less troublesome species or in some cases native species that appear similar can dominate, but at nothing like the biomass of the curly leaf pondweed. The situation could be much worse, however, if three aggressive exotic species that have invaded waterways elsewhere were present or uncontrolled.

Stream and street renewal in Papanui – a silo-busting initiative

A group of streets in one of Christchurch’s older suburbs were recently reconstructed with linkages through to a naturalised utility waterway.



The streets incorporate landscaped water detention and treatment within space created by the selective narrowing of carriageways, and property purchase

The waterway naturalisation was undertaken in conjunction with development of an adjoining retirement village development. The boundary fence of the village was intentionally designed as a ‘see through’ fence to enable residents to enjoy views of the waterway. Collaboration between the former City Streets Unit, the Parks and Waterways Unit and the developer of the retirement village was initiated by a small group of Council staff determined to overcome organisational silos. It is the kind of collaborative effort that many hoped would have occurred with local government reform.



Reconstructed streets with landscaped stormwater treatment trains (left) and a naturalised waterway with ‘see through’ boundary fences (right)



Papanui Stream under construction: a transformation from a timber-sided utility drain to a stream formed with meanders, pools, riffles and runs along with logs and rocks to provide a diverse aquatic habitat. This was a collaborative, multidisciplinary project (CCC NPGU)

Planning protocols and the South-West Area Plan – getting in at the start

The Natural Asset Management Strategy for Waterways and Wetlands was primarily intended to achieve the sustainable management of Christchurch's surface water environment for all its values. It incorporated measures needed for floodplain management accompanying urban expansion and intensification. It also included some water quality improvement measures, but these were not based on any comprehensive city-wide assessment mainly because the water chapter of the natural resources regional plan was still under preparation.

The Strategy provided a useful background for collaborative planning that was then beginning to occur within the Council, especially on the Long Term Council Community Plan and area development plans. The latter were formalised by an internal protocol for integrated area planning. This protocol acknowledged the importance of an approach that examined a catchment-based area, not just the area proposed for urban expansion or intensification.

The area-planning approach was developed from work carried out for a large urban growth area located in south-west Christchurch. The study area chosen was defined mainly by the upper Heathcote River catchment – an area larger than the likely development area. The scope that the larger area provided turned out to have greater benefit than first thought.

The South-West Area Plan:

The preparation of this plan provided a further opportunity to promote a multiple-benefit approach to surface water management. Happily, much enthusiasm has been expressed by staff and councillors for the plan that emerged.

The natural hydrology of the catchment has four distinct areas:

- (1) The northern part, where soils are pervious, groundwater levels well below the surface and there is little natural runoff
- (2) The middle part, where soils are poorly drained, springs and waterways exist and groundwater levels are shallow and natural runoff occurs
- (3) The southern part, where groundwater levels are high, and extensive natural ponding areas exist
- (4) The valleys and spurs of the Port Hills

The surface water management scheme will implement all those measures identified for the upper catchment in the Heathcote Floodplain Management Strategy. The post-development discharges into the Heathcote River will approximate those of the original natural catchment.

Landscape, ecological, recreation, heritage and cultural studies were undertaken.

Naturalised and restored waterways and wetlands are intended to be in public ownership and will form the skeleton of the green-space framework. They will also provide extensive recreational corridors linking lowland areas with the Port Hills.

The foregoing investment in planning is essential for greenfields development. It identifies land that needs to be excluded from development or acquired by strategic purchase. These costs can in due course be recovered when a plan change takes place, as development contributions.

Joint CCC/ECan Planning and Consents Protocol for Surface Water Management:

This document provides for integrated catchment management plans to form the basis for area-wide resource consent applications by the CCC as the land drainage system operator. See Appendix 3 for the joint statement that outlines the purpose of the Protocol.

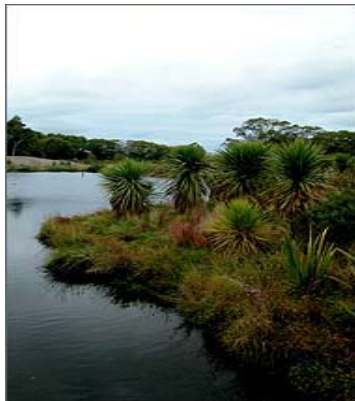
The Styx Vision – a great legacy in the making

The Styx River lies near the northern boundary of Christchurch City and, like the Avon and Heathcote, is a small spring-fed coastal river. It has been affected by urban development to a minor degree only and has the potential to be a natural asset for the City as significant as the Port Hills, the coastline and Travis Wetland.

The Styx River catchment forms two of the 14 project areas covered by the Natural Asset Management Strategy. It is worthy of special mention because it provides a rare opportunity to protect and restore a river well before the catchment becomes urbanised.

The five visions for the Styx River⁵ and its catchment are:

- To achieve a viable spring-fed ecosystem
- To create a source-to-sea experience
- To develop a living laboratory
- To establish the Styx as ‘a place to be’
- To foster partnerships as ‘we move forward together’



Styx Mill Reserve: a large green corridor separating Christchurch from Belfast township (CCC NPGU)

More information about the Styx Mill Reserve is available from the Christchurch City Council website⁶.

⁵ <http://www.thestyx.co.nz/new-zealand/visionone/>

⁶ <http://www.ccc.govt.nz/cityleisure/parkswalkways/popularparks/styxmillconservationreserve.aspx>



Typical rural scene – willows and grass



Harakeke harvesting area



Jetty in Janet Stewart Reserve



Manatu – doing well in the reserve



Pukeko, NZ scaup and mallard ducks, together with townhouses by a stormwater pond connected to Styx Mill Basin Reserve



Wetland stormwater treatment and basin, Redwood

The Styx Vision Underway

These photographs contrast the existing Styx River (top left) with maturing indigenous vegetation thriving within large riverside reserves. A predator-proof fence partly surrounds Styx Mill Basin.

Waterways, Wetlands and Drainage Guide – a DIY reference for all

Design manuals are very influential documents. They determine how designers conceptualise, draw and specify the work to be done. There is the expectation that strict adherence to the manual and related standards will result in designs being more readily accepted by the approving authority. Over time, designers develop efficient practices that tend to produce uniform solutions. At least that is what traditionally has occurred in the design of streets and stormwater drainage.

Today, more imaginative and creative multi-benefit design approaches are expected for our public spaces. The process may need to be guided by high-level strategies, policy objectives, public engagement and the ability to purchase property.

The *Waterways, Wetlands and Drainage Guide* is in two volumes. The first, *Part A: Vision*, is concerned with the physical context for the six values, natural asset management, realising visions and involving the community. *Part B: Design* describes waterway and wetland flora and fauna, habitat requirements, stormwater treatment and wetland restoration. Hydrologic, hydraulic and inundation data are also included. The Guide was being reviewed in 2011.

More detailed information on the contents and how to order the Guide is available from the Christchurch City Council website⁷.

⁷ <http://www.ccc.govt.nz/cityleisure/parkswalkways/environmentecology/waterwayswetlandsdrainageguide/index.aspx>

Part Four: The people and reflections – a philosophical summary

‘You must be the change you wish to see in the world.’ Mahatma Gandhi

The life force behind *The Christchurch Waterways Story* is the liberation of people so that they are able to protect and restore something they love. It is a consequence of the passion that has grown in this country for quality of life and quality of the environment.

There is no doubt that the people who helped evolve and practise the new surface water management philosophy had the right mix of knowledge and experience. But what made it all happen was dedication borne of passion.

So, given that New Zealanders are **not** ‘passion-less people’, what happened in Christchurch that caused some people to feel liberated enough to bring about change?

The most significant events have been described in this story, but the first real movement came from certain key challenges of the Resource Management Act.

Words like: ‘the sustainable management of natural and physical resources’ – ‘present and future generations’ – ‘restoration and protection’ and ‘kaitiakitanga’ inspire us to be spiritual as well as intellectual with our responses. The main outlet for this inspiration was the preparation of the City Plan. It involved many different contributors working collaboratively in multidisciplinary teams. The process had a unifying effect for the staff and councillors who joined the new Christchurch City Council from the amalgamating authorities. Many individuals and groups within the community also contributed to the City Plan.

The events described in this story occurred in parallel with the preparation of the City Plan and each had a beneficial influence on the other. All the while there was a sequence of organisational changes that acknowledged the emerging surface water management philosophy. The culmination was the formation of a Waterways and Wetlands Team. This team included civil engineers, landscape architects and ecologists and was responsible for operation, maintenance, planning and budgeting. Design work for capital projects was undertaken by the Council’s in-house consultants who had similar skills to, and collaborated closely with, the Waterways and Wetlands Team.

The Waterways and Wetlands Team no longer exists. It was dispersed when another round of restructuring combined parks and recreation with waterways and wetlands. This was done because the latter was seen as a ‘green’ activity and that efficiencies would result from the merger. The two main benefits have been in the areas of maintenance and land acquisition. The cost has been a decline in cohesion, sense of direction, dedication and passion.

Fortunately there is now increasing interest in management philosophies that pursue an integrated response to environmental, social, cultural and economic matters. This is reflected in the Council’s most recent restructuring. Such a philosophy, applied with New Zealand determination and passion, must succeed.

Confucius said: 'A man of wisdom delights in water'.

More recent words from China, presented in a paper by water management engineers, called for: 'philosophical rethinking, institutional reform and technical renovation'. This was to be achieved by: 'transforming reductionism to holism, fragmented to integrated management and physical to ecological engineering'. These statements, ancient and modern, are intended to encourage a way of thinking about water that recognises all of its values.

Today, in New Zealand, we endeavour to be influenced by the collective wisdom and knowledge of the community. The people of Christchurch, when asked to describe what they would expect to see in a well-managed surface water environment, expressed many different ideas. These ideas are able to be grouped into six values: ecology, landscape, recreation, heritage, culture and drainage. The adoption of these values enabled a fundamental mind-shift away from past practice to occur. Over time this influenced how investments in the surface water system were planned, designed and maintained.

Having accepted and responded to the desire for change, what are the strategically important things to do?

Exemplar projects are important initial investments in the change process. If designed well by a multidisciplinary team, they attract favourable attention. In due course they influence planners, consultants and developers. They also provide a valuable learning experience.

Perhaps the first step, however, is to become acquainted with the existing (or pre-existing) natural systems. Knowledge of the area's flood history, groundwater recharge areas and ecology would help define the spatial needs of the surface water environment. This space, together with ecological corridors and patches, would form part of the green-space framework.

Water supply, wastewater reticulation and treatment, and land drainage are constructed systems that are fundamental to the health of a community. These systems take from, and discharge to, natural water. In doing so they should not adversely affect the water environment or the values we associate with water.

There are techniques for detaining and infiltrating water that, if suitably dispersed within the catchment, would simulate its natural hydrology. There are also ways of treating wastewater and stormwater to reduce contaminants to acceptable levels.

Is treatment the only or best option? Should we be planning to prevent contaminants from entering the biosphere in the first place? Until science, technology and management practices provide all the answers that are needed we tend to adopt pragmatic and safe or conservative philosophies. This is OK provided it does not cause permanent or irreversible damage.

Of prime importance is the securing of space in the landscape for the protection and restoration of surface water environments and all their values. This is best done as part of a planning process. Protection measures include land purchase, provision of esplanade reserves and strips, conservation covenants, reserve/financial contributions and waterway setback rules. Such measures are commonly used for greenfields developments but could also be applied to areas of intended urban intensification.

Streets, roads and other paved areas are significant sources of contaminated stormwater. They are also the most immediate public space for us all. There is growing realisation that these spaces have tremendous potential to improve social and environmental well-being. A 'values' based approach to their design, whether new or retrofitted with mitigation measures, is beginning to occur but needs greater support and momentum.

The Low Impact Urban Design and Development (LUIDD) approach, developed jointly by Landcare Research, Auckland University and the Auckland Regional Council, provides much of the inspiration needed for systems within urban sub-catchments. *The Christchurch Waterways Story* is intended to provide the inspiration needed for the sustainable management of urban receiving waters.

The following Christchurch City Council staff led the transition to the new management philosophy:

- Allan Watson as manager of the Unit responsible for land drainage
- Robert Watts as land drainage manager and waterways and wetlands planner
- Ken Couling as Waterways and Wetlands Team leader
- Christine Heremaia and Chris Fourie as landscape architects and creators of visionary plans, especially for the Styx River
- Rachel Barker for waterway protection and restoration
- Chris Rance for developing waterway and wetland maintenance methods sensitive to ecology
- Tony Oliver for river catchment and floodplain management studies
- Eric Banks for compiling the natural assets lists of projects



(CCC NPGU)

'I would feel more optimistic about a bright future for man if he spent less time proving that he can outwit Nature and more time tasting her sweetness and respecting her seniority.'

E. B. White

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Appendix 1 Explanation for waterway setback rules

(summarised from City Plan updated 2006)

Setbacks are designed to provide a buffer between development and the waterway where open space or riparian planting can provide a public amenity with opportunity for maintaining and enhancing water quality through filtering non-point discharges and for protection of aquatic habitat.

Seven main reasons are given in section 5.8.1 of the Plan for requiring setbacks from waterways.

5.8.1 Filling, excavation and building adjacent to waterways and the coastline

- (1) Filling and/or associated building activity can adversely impact the natural function of floodplain areas adjacent to waterways, by impeding flood discharges and exacerbating inundation upstream of a site.
- (2) Filling, particularly associated with bank works, can damage or destroy the ecological value of rivers and river margins by creating an artificial or sterile environment, as well as temporary adverse effects such as sedimentation.
- (3) Filling and building can detract from the amenities of adjoining properties. Filling can have an adverse visual effect as well as artificially modifying the natural character of river margins. Likewise building may affect the visual qualities, spaciousness and natural values along the waterways.
- (4) Filling, excavation and particularly building can reduce the opportunity to protect riparian margins where there are high conservation values.
- (5) Building activity can permanently alienate potential river access as well as exacerbating risk of flood damage to the structures on the site.
- (6) Setbacks provide for improvement of the waterway which may involve any of the following: bank regrading, riparian planting and modifications to the stream bed to create diversity of aquatic habitat.
- (7) The ability of the Council to undertake necessary waterway management and maintenance can be diminished by filling, excavation or building adjacent to waterways.

Christchurch City's waterways have been classified into categories:

- *Downstream rivers* are large waterways with wide floodplains and are tidal in their lower reaches. They have distinctive natural character with high potential for restoration.
- *Upstream rivers* are the mid to upper reaches of rivers and major streams. Width-wise, they are intermediate between downstream rivers and environmental asset waterways. They have a distinctive natural character with a high potential for restoration.
- *Environmental asset waterways* are tributaries of upstream rivers, downstream rivers, estuaries or other environmental asset waterways, and are smaller in width than upstream or downstream rivers. Generally they have some natural character with a high potential for restoration.
- *Hill waterways* are relatively steep watercourses on the Port Hills which have seasonally dry channels. They have a high potential for restoration.
- A *utility waterway* is generally an artificial waterway without a natural floodplain but often having potential for enhancement.
- A *new waterway* is any waterway that is created, usually associated with development. New waterways are treated as environmental assets.

Different setback widths are specified for the different categories of waterway, generally being greater *downstream* where water volumes are greater and floodplains wider. Large development setbacks are required on the *upstream and downstream rivers* for restoration, enhancement of amenity values, to avoid flood damage, particularly the inundation of buildings, and for the natural functioning of their floodplains. *Environmental asset waterways* have a high potential for restoration, and the greater setback is primarily required for restoration, enhancement of amenity values, and the natural functioning of their floodplains. *Hill waterways* (also subject to regional rules) also have higher setbacks because of the steeper nature of their margins and higher risk of erosion and sedimentation. *Utility waterways* often have potential for enhancement but a smaller setback is generally sufficient to achieve this.

Specifically:

Some waterways will be redeveloped into open 'natural' watercourses upon development of adjoining land, particularly in the north of the city.

Most of the city's coastline is protected within conservation zones and subject to separate rules, but a 20-m setback has been required on other parts to ensure a minimum buffer for ecological, access, recreation and erosion protection reasons. This includes small sections of coastline within living zones in areas such as South New Brighton and Redcliffs.

Waterways and activities that affect them are potentially of concern to tangata whenua and accordingly the Rules emphasise attention to waterway values and potential impacts on water quality or on sites.

A 100-m setback from the Waimakariri River stopbank has been imposed to reduce the possibility of loss of life and extensive damage to property in the event of stopbank failure or overtopping. Stopbank failure may result from decreased channel capacity; gravel accumulation; the river changing courses; or from structural damage to the stopbank.

Exemptions from the Rules have been provided for works that have minor effects, are essential utilities, or are undertaken to protect stop banks.

Appendix 2 Visions and strategies for Christchurch City

PORT HILLS

‘Forested valleys’

VISION ‘A breathing place of green gullies, clear water and open tussocklands. A refuge for wildlife and an immediate space for people to enjoy’

STRATEGIES

- Ensure soil conservation valley and side-gully restoration planting, and sustainable tussock grassland and stock management.
- Establish ecological and recreational linkages along waterway corridors and wetland systems.
- Map residential area flood hazards, and identify and protect secondary flow paths.
- Open and naturalise waterways in residential areas where possible (daylighting).
- Define and implement practices to attain sustainable greenfields residential development.
- Develop a sea-level-rise strategy.

MARSHLAND

‘The Northern Gateway to Christchurch City’

STRATEGIES

- Develop methods of renewal and maintenance that respond to changing land use, contribute to the character and pre-existing values of the locality and are sustainable in the future.
- Contribute to a ‘Northern Gateway to Christchurch City’ experience by means of design which reflects the special values and characteristics of Marshlands.
- Prepare catchment management concept plans in consultation with community groups, tangata whenua and key Council partners.
- Promote ecological linkages between significant habitat areas adjacent to the Styx River, Horseshoe Lake and Travis Swamp.
- Promote the further study of the ‘peat’ lands and ‘flood basin’ areas through research and consultation to ensure their wise use in the future.
- Advocate land uses and mitigation measures that protect the quality of receiving waters.
- Ensure that waterways are developed to reflect and enhance local indigenous ecosystems.
- Use natural techniques suited to local conditions when renewing waterways.
- Identify, protect and restore sites of importance to tangata whenua
- Improve access to waterways when renewing via interpretation areas.
- Acknowledge the strategies as a means of implementing Community Board objectives.

THE OTUKAIKINO RIVER

'A spring-fed gem at the northern edge of the City'

STRATEGIES

- Form a stakeholders' consultation group.
- Accurately map all streams, springs and wetlands.
- Assess the condition of all streams, springs and wetlands.
- Consider inclusion of waterways into the Christchurch drainage district.
- Jointly monitor with ECan water quality in all waterways.
- Prepare a river management plan in consultation with the key stakeholders – landowners, Clearwater Resort, leaseholders, community groups, tangata whenua, Fish and Game, DOC, and Parks.
- Assist farmers with riparian management.
- Protect and enhance selected wetlands.
- Improve water quality in all waterways and enhance riparian vegetation through the river management plan.
- Protect and enhance habitat for selected aquatic species including trout and salmon.
- Enhance public access for anglers, walkers, etc. in selected areas along the river margins.
- Expand The Groynes through land purchase.
- Undertake a feasibility study for an international rowing course.
- Promote linkages with existing recreational areas.
- Link the strategies to the objectives and policies in the Christchurch City Plan.
- Promote the strategies as a means of implementing Community Board objectives.

THE AVON TRIBUTARIES

'Living in harmony with natural waterways'

STRATEGIES

- Recognise that the numerous spring-fed tributaries of the Avon River are an essential part of the character of Christchurch.
- Recognise that significant lengths of waterway are degraded and that restoration is necessary for the benefit of present and future generations.
- Sustain spring flows through restoration, groundwater management and monitoring.
- Maintain aquatic habitats by protection from sedimentation and over-widening of low flow channels and restoration of water's edge plant species.
- Promote the multiple benefits of canopy trees alongside waterways (including shade for aquatic habitats and birds).
- Promote the protection and restoration of riparian planting to satisfy ecological and human well-being values.
- Demonstrate all the potential values of waterways and wetlands by enhancing stream flows, aquatic habitats and riparian environments within public areas, e.g. parks, streets, schools, university and shopping areas.
- Promote understanding of ecological and wildlife values for amateur naturalists and residents by on-site talks and demonstrations.

- Support the establishment of neighbourhood stream care groups and school ecological monitoring groups.
- Establish partnerships with neighbourhood groups of residential property owners for waterways and wetlands restoration and protection.
- Protect restoration work within private property where there is significant Council funding by appropriate legal means (e.g. voluntary esplanade strips without public access).
- Increase visibility of waterways at road boundaries and crossings.
- Erect signs and interpretation boards that enhance knowledge of the names of waterways and their attributes, especially in conjunction with streamside walking routes.
- Acknowledge the strategy as a means of implementing Community Board objectives.
- The Strategy is to be regarded as one of the methods of achieving the City Plan Objectives and Policies for the relevant Project Area. Key sections include:
 - Tangata whenua and their resources
 - Natural environment features and habitat, natural hazards, coastal environment
 - City identity/form
 - Recreation and open space provision and diversity
- The Strategy is to be implemented by making appropriate budgets for protection, restoration, maintenance and management.

CENTRAL CITY NEIGHBOURHOODS

***VISION** 'To create delightful and interesting neighbourhood green space in high density living areas through the imaginative design of stormwater management systems in an integrated way with streets and parks'*

STRATEGIES

- Provide mitigation for the adverse effects of increased urban runoff from high density development in an environmentally sensitive way.
- Enhance and add meaning to urban neighbourhoods by opening views to waterways and incorporating heritage values in design. Compensate for the loss of private green space that occurs in high density living areas by contributing to urban renewal projects.
- Improve community understanding and involvement with the waterway network by the use of icons, artworks and interpretation.
- Acknowledge the strategies as a means of implementing Community Board objectives.
- Work in an integrated way with Parks Unit, City Streets and the Urban Design Team.
- Establish recreational opportunities, access and linkages along waterway corridors and to streets and parks.

PAPARUA STOCKWATER RACES

'Form follows function'

STRATEGIES

- The Strategy is to be implemented by making appropriate budgets for protection, restoration, maintenance and management.
- Highlight the entrances to the City by providing safe, green riparian corridors along main roadways, e.g. State Highway 73.
- Develop a safe and green linkage, encompassing selected water races, between areas where future urban growth is likely, e.g. Marshs Road. Investigate options for alternative uses of the water races in areas where their utility function is less important, e.g. life-style blocks.
- Work with existing landowners to promote sustainable management by developing plans which incorporate existing waterways into private and public land developments.
- Investigate opportunities to use existing water races to restore flows to dry and ephemeral stream channels in the Styx, Avon, Heathcote and Halswell river catchments.
- Investigate opportunities to create and maintain new wetland areas by converting discharge basins into retention ponds.
- Support the 'Savannah' dry grassland concept – emphasising the role that water races could play in adding value to this plan.
- Highlight and improve the recreational, landscape, ecological and historical values of the water races while preserving the heritage values of the stock water race system.
- Manage the sustainable future of the races, recognising and planning for changing land and water use patterns.

HALSWELL–WIGRAM GROWTH AREA

'Welling up of groundwater – Halswell and Heathcote river headwaters'

VISION *'To claim, restore and emphasise waterways and wetlands in a way that accommodates and also mitigates the effects of existing and future urban development, while adding value to quality of life'*

STRATEGIES

- Develop partnerships with key stakeholders, including landowners, developers, tangata whenua and the community, to raise the profile, protect and restore waterways and wetlands.
- Explore imaginative solutions for street design and streetscape that give effect to the Heathcote River Floodplain Management Strategy through stormwater detention, water quality treatment and soakage to ground.
- Where space and ground conditions allow, develop mechanisms within existing waterways to reduce peak flows and allow future downsizing of existing pipe systems through detention, retention and soakage.
- Develop and encourage sustainable rural management practices for open space areas adjacent to riparian buffer strips.

- Protect and highlight natural heritage features such as river terraces, channels, swales, and local soil types, and also to capitalise on opportunities offered by disused gravel pits and high groundwater.
- Emphasise the characters of the area through use of appropriate plant associations around waterways and wetlands, while maintaining views to the Port Hills and Alps.
- Establish ecological corridors along waterways and wetlands through appropriate planting and improve public access and recreational opportunities.
- Increase the diversity and abundance of terrestrial, wetland and migratory birds.
- Protect springs, wetlands and other sites in the area of significance to tangata whenua.
- Acknowledge the strategy as a means of implementing Community Board objectives.
- The Strategy is to be regarded as one of the methods of achieving the City Plan Objectives and Policies for the relevant Project Area.
- The Strategy is to be implemented by making appropriate budgets for protection, restoration, maintenance and management.

ESTUARY TO LAGOON GREEN CORRIDOR

VISION 'To understand the dynamics of coastal processes and the spatial requirements of the natural functions of waterways and wetlands'

STRATEGIES

- Protect indigenous plant communities and wildlife.
- Acknowledge the special qualities of the area for the physical and spiritual well-being of the people of Christchurch.
- Restore the mauri of Ihutai by 2010 for the purpose of wildlife, recreation and traditional food gathering.
- Recognise land & water relationships by retaining space for natural processes to develop.
- Understand and promote the natural processes through education and interpretation of the area.
- Acknowledge the strategies as a means of implementing Community Board objectives.

LINWOOD–WOOLSTON

'Recovery and revitalisation'

VISION STATEMENT 'Improving the living environment by imaginative and innovative ways of responding to problems associated with impervious soils, high groundwater levels and old landfills'

STRATEGIES

- Undertake investigations that provide a greater understanding of the influence that groundwater has on living environments and how these can be managed through waterways and wetlands.
- Support the Estuary Green Edge Project.

- Manage the Linwood Canal and its margins for its ecological and open space values.
- Achieve the water quality objectives of the Regional and City councils.
- Manage the water quality and quantity effects of high density urban land use using innovative methods that add amenity value to neighbourhoods.
- Add amenity value to existing utility waterways to make them more acceptable within living environments and also to avoid high-cost piping solutions.

THE AVON RIVER / ŌTĀKARO

'A story of the city told through the river'

STRATEGIES

- Ensure that structural river works of the central city area reflect and enhance the heritage and setting of the urban surrounds.
- Integrate the river corridor into the management of Hagley Park.
- Identify, protect and restore sites of importance to tangata whenua.
- Strengthen and promote linkages with green space adjacent to the river.
- Use natural techniques suited to local conditions when renewing riverbank stabilisation.
- Implement flood management, mitigation and maintenance where necessary.
- Control weed growth and siltation of the riverbed where required.
- Improve and maintain water quality and collection of river debris.
- Improve access to the river with beaches, steps, ramps and jetties.
- Ensure that river management provides for recreation and tourism values.
- Create habitat for selected aquatic species and water fowl.
- Prepare river management concept plans in consultation with community groups, tangata whenua and Council key partners.
- Acknowledge the strategies as a means of implementing Community Board objectives.
- Manage the river as an icon of the city for the appreciation of visitors and local residents.

HEATHCOTE RIVER / ŌPĀWAHO

'Neighbourhood River Park'

STRATEGIES

- Prepare concept plans for the River Park in conjunction with Council key partners, neighbourhood improvement plans, and through consultation with individual neighbourhoods.
- Widen the river corridor by street design, tree planting and the incorporation of open green spaces.
- Develop partnerships with schools to provide access, education and recreation opportunities.
- Create habitat for selected aquatic fauna.
- Work in partnership with tangata whenua to identify, protect and restore sites of importance.
- Create linkages such as cycleways and walkways to the Port Hills, surrounding neighbourhoods and other green spaces.
- Improve accessibility to the river with steps, landings, canoe ramps, etc.

- Seek additional green space in land prone to flooding, through purchase and partnerships with private development.
- Improve the serenity and safety of river-side recreation areas by road narrowing or closure.
- Provide distinctive focal points within individual neighbourhoods with destination sites, recreation opportunities, art works, restored heritage structures, cafes and community shopping centres.
- Over time replace culvert and pipe outlets and hard structures with natural contours, planting and stone protection.
- Implement flood management and mitigation measures where necessary.

CASHMERE STREAM AND PONDING AREAS

‘Ephemeral Wetlands’

***VISION** ‘To achieve enduring protection of natural ponding areas to provide for flood mitigation for peripheral urban development, which will allow the restoration of core ecological habitat zones within a rural buffer.’*

STRATEGIES

- Implement the recommended management measures identified in the Heathcote River Floodplain Management Strategy.
- Review land use zoning for all natural ponding areas, to better protect against incremental filling, subdivision and development.
- Work with landowners and developers to effect land protection through purchase, partnerships, and the identification of compensatory development zones.
- Establish ecological corridors along waterway and wetlands through appropriate planting and improve public access for recreation.
- Achieve a continuous green corridor along Cashmere Stream, with public access for recreation.
- Increase the diversity and abundance of terrestrial, wetland and migratory birds.
- Protect and restore native fish habitat.
- Protect springs, wetlands and other sites in the area of significance to tangata whenua.
- Define and implement practices to attain sustainable greenfields residential development which provide for flood detention within waterways either on or off site.
- Develop and encourage sustainable rural management practices for open space areas adjacent to riparian buffer strips.
- Acknowledge the strategy as a means of implementing Community Board objectives.
- The Strategy is to be regarded as one of the methods of achieving the City Plan Objectives and Policies for the relevant Project Area. Key Sections include:
 - Tangata whenua – Māori and their resources
 - Natural environment – natural features and habitat, natural hazards, coastal environment
 - City identity – form
 - Recreation and open space – provision and diversity
- The Strategy is to be implemented by making appropriate budgets for protection, restoration, maintenance and management.

Appendix 3 Joint CCC/ECan Planning and Consents Protocol for Surface Water Management

Water is one of Christchurch's most valuable resources. To safeguard our water for future generations, the Christchurch City Council and Environment Canterbury have agreed to work together to manage surface water in a more integrated and effective way. This Protocol for Surface Water Management sets out how we have agreed to do this.

The Protocol provides agreed processes to guide the development of Integrated Catchment Management Plans (ICMPs) throughout Christchurch. These form an integral part of the area plans being drawn-up for some of the city's high-growth areas. ICMPs will form the basis for catchment-wide consent applications, with South West Christchurch being the first test area. Integrated Catchment Management Plans, and their associated consents, will help meet the requirements of the Proposed Natural Resources Regional Plan (PNRRP). They will promote the integrated management of land and water resources throughout the region.

This new approach is supported by the City Council and ECan to move away from the current situation where the City Council holds over 100 separate resource consents, incorporating over 800 conditions, for the operation and maintenance of the City's land drainage system. To improve surface water quality, a change in focus from individual sites to a catchment-wide approach is needed. Although the Protocol has not specifically included Banks Peninsula, the principles and practices can readily be applied there.

We the partners therefore agree to uphold the key principles of the Protocol for:

- Integrated land use planning
- Interim consenting
- Interim arrangements for integrating discharge permits and subdivision consents Meeting PNRRP requirements
- Meeting Rule WQL7, which concerns the discharge of stormwater within areas covered by an ICMP.

We the partners agree to the following practices:

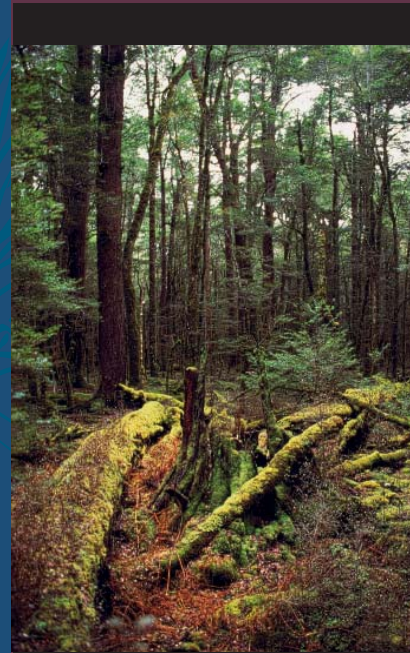
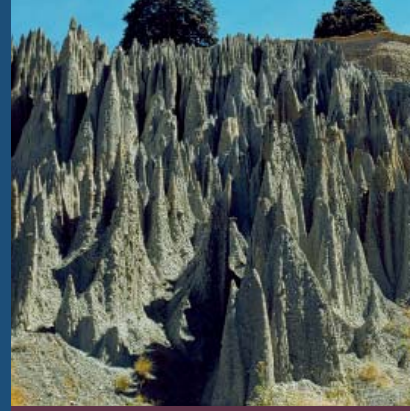
- Ensuring that actions governed by the Protocol are consistent with the PNRRP
- Prioritising catchments within Christchurch for preparation of ICMPs and applications for catchment-wide consents
- Continuing to process applications for individual discharges until catchment-wide consents are obtained
- CCC and ECan focus on catchment-wide management rather than individual non-compliances
- Taking sewer outflows into account when preparing ICMPs

- Surrendering relevant existing discharge permits once catchment-wide consents have been obtained
- Using a pilot area for preparation of an ICMP and catchment-wide consent authorisation by CCC of discharges into the stormwater network system where catchment-wide consents have been obtained

Mayor
Christchurch City Council

Chairman
Environment Canterbury

March 2006



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