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# A Community-led, Science-Informed Conversation around the Future Use of the Avon River Residential Red Zone



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This research was commissioned by the Avon-Otakaro Network ([www.avonotakaronetwork.co.nz](http://www.avonotakaronetwork.co.nz)) and conducted with financial assistance from the Pacific Development Conservation Trust and the Royal Society's Marsden Fund. We gratefully acknowledge the input provided by the interviewees, survey respondents, numerous community groups, and members of the broader the scientific community.

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# Key Points

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Lincoln University was commissioned by the Avon-Otakaro Network (AvON) to estimate the value of the benefits of a 'recreation reserve' or 'river park' in the Avon River Residential Red Zone (ARRRZ).

*Primary* data from the qualitative research phase identified the following 'compatible and complementary' recreation reserve attributes as including:

- Ecological services and functions including flood control, storm water management, water quality improvements and biodiversity/restoration
- Active recreation facilities and provisions for locals and tourists
- Opportunities for 'light' or 'boutique' commercial/retail activities
- Community gardens/allotments/food forests and urban food security
- Preserving iconic historic suburban houses, gardens and heritage/native trees
- Protecting future generations from sea level rise
- Rejuvenation of the eastern suburbs
- Indigenous and cultural values
- Education in a 'living laboratory'
- A 'living' earthquake memorial

*Primary* data from the quantitative research phase (choice modelling) indicate significant public support for such a reserve.

Using a mix of primary and secondary data, we estimate the total annual value of benefits to Christchurch residents, savings in public health costs deriving from a recreational reserve and the value of ecosystem services in the ARRRZ to be approximately **\$94.1 million/pa<sup>1</sup>**.

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<sup>1</sup> The margin of error for these estimates is 5.7%. This means that there is a 95% probability that the true value lies in the range  $\pm 5.7\%$  of the value reported here.

This figure comprises the following three parts:

- 1) Based on calculated usage, we estimate annual savings to public health costs from avoided treatment expenditure due to increased active leisure pursuits generated from a recreation reserve per average recreationalist to be:

Table 1: Annual savings to public health costs per average recreationalist

Recreation Type	Avoided Public Health Costs
Cycling	\$587
Walking	\$398
Jogging	\$192

In aggregate, savings in public health costs are in the order of **\$50.3million**.

- 2) *Primary* data based on the quantitative phase (choice modelling) indicate significant annual benefits per household for various attributes of a recreation reserve in the order of:

Table 2: Annual household benefits of various attributes

Attribute		Value
Recreational Spaces:	Cycle/walking/jogging paths	\$34.2
	Water based opportunities	\$15.4
Environmental Enhancement:	Improved river water and habitat quality	\$20.1
	Mostly native plants and habitat	\$31.4
	Restoration of wetlands	\$14.9
Heritage Protection:	Preservation of heritage gardens including flowers and fruit	\$32.7
Connection with Eastern Suburbs:	Paths connecting CBD to Brighton and beyond to South Shore, Bottle Lake	\$18.9
Commercial Activities:	Cafes	\$12.1
Percentage of Red Zone used for Park:	80 per cent in Park	\$10.9
	100 per cent in Park	\$21.1
Enhanced Community Engagement:	Regular festivals and markets	\$24.4
	Community food gardens	\$12.5

Total benefits (willing to pay) to Christchurch residents (*excluding tourists*) of a recreation reserve could be as high as **\$35 million** each year.

3) Based on *secondary* data, we estimate costs saved through ecosystem services to be *in the order of* \$19,600.00 per hectare/year for flood mitigation, water supply and improvement, and nutrient recycling. Based on a land area of 450 hectares, benefits of ecosystem services come to approximately **\$8.8 million** per year.

The \$98.1 million figure excludes increased property equity in neighbourhoods surrounding the reserve, potentially significant returns from tourists and other tangible benefits associated with economic rejuvenation in the East.

The costs of developing such a recreation reserve were not calculated as this was outside the scope of the present report. We did, however, undertake a basic evaluation of the possible costs of two other options: a) 'land lies fallow' and b) residential redevelopment. We estimate the costs of the former to be in the order of **\$46 to \$108 million**. We estimate the costs of land remediation to enable the latter option in the ARRRZ to exceed **\$639 million**.<sup>2</sup>

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<sup>2</sup> These figures should be seen as, at best, indicative due to the limited information available at this time.

# Background

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*4<sup>th</sup> September 2010*

On the 4<sup>th</sup> September 2010, the Canterbury region of New Zealand was rocked by an earthquake measuring 7.1 on the Richter scale. Though the epicentre was located some 50km away in Darfield, the quake and its immediate aftershocks caused extensive land, infrastructure and building damage (see Figure 1) in the Eastern suburbs of Christchurch city and in the smaller settlement of Kaiapoi in the neighbouring Waimakariri District.

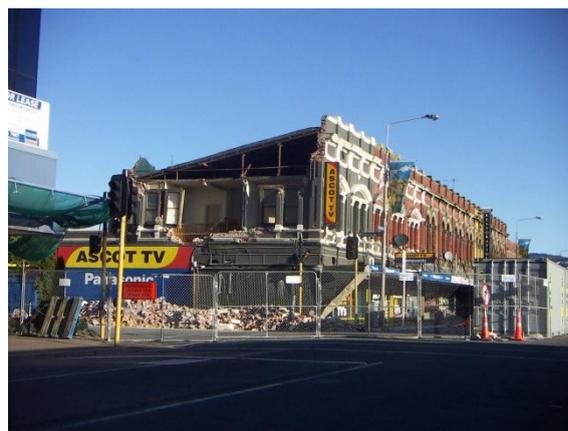


Figure 1: Damage to housing, river banks, infrastructure and suburban centres

The damage was caused by lateral spread (where the ground essentially splits apart) along the faultline and/or areas adjacent to river banks, or liquefaction. Often used colloquially as a noun with reference to ‘sand volcanoes’, liquefaction (Figure 2) is a process whereby some soil types settle and consolidate after prolonged shaking.

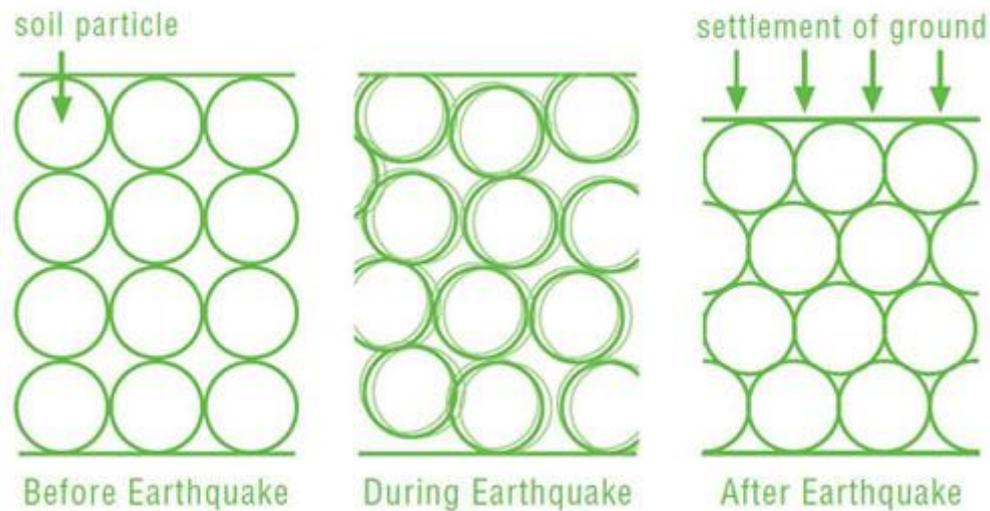


Figure 2: The process of liquefaction (www.ecan.govt.nz)

The consolidation of soil particles usually occurs unevenly even within areas prone to liquefaction, and this causes damage to built and natural features on, and in, the ground. Initially, it was thought that this was a 1:200 year event, and that the likelihood of existing residents and infrastructure suffering another earthquake was remote. Consequently a massive repair and rebuild programme was proposed and was particularly well-advanced in the Waimakariri District. In Kaiapoi, by the end of 2010 the council had undertaken a series of community engagement programmes around the Kaiapoi Town Centre and neighbourhood rebuilds (including Pines Beach and Kairaki), and had developed a cluster-based remediation and infrastructure re-build programme that would have enabled the rehousing of affected residents within 3 years.<sup>3</sup>

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<sup>3</sup> Further details are available in Vallance, S. (2013). *The Waimakariri District Council's Integrated, Community-based Recovery Framework* available on <http://hdl.handle.net/10182/5512>

22<sup>nd</sup> February 2011

There is some debate as to whether the February 22<sup>nd</sup> quake was an ‘aftershock’ or an earthquake in its own right given it was on a different faultline. At magnitude 6.3, this event was technically smaller but shallower, with a much higher Peak Ground Acceleration of up to 2.2g<sup>4</sup> and an epicentre located almost directly under the city of Christchurch. According to Professor Yeats, Professor Emeritus of Geology at Oregon State University in Corvallis, USA, this would have ‘flattened’ most world cities.<sup>5</sup> As it was, there were 181 immediate fatalities (most of these in two building collapses in Christchurch’s CBD), and further liquefaction in the Eastern suburbs of Christchurch and neighbouring Kaiapoi. Some hillside suburbs were also affected as the ground became unstable as cliff faces fell away, or became more vulnerable to rockfall from above. The CBD was completely cordoned off with assistance from the New Zealand Army.

There would have been far more fatalities were it not for New Zealand’s strict building codes which require a building with a 50-year design life to withstand predicted loads of a 1 in 500-year event. Though the force of the February earthquake “was ‘statistically unlikely’ to occur more than once in 1000 years”<sup>6</sup> most buildings retained enough integrity to allow those inside to escape. A far greater number required extensive repairs, some of which were estimated to exceed the cost of a complete rebuild. As the situation became more complex in terms of reinsurance, apportionment, geotechnical expertise and geographic spread, in March 2011 a new Government Department was established - the Canterbury Earthquake Recovery Authority (CERA) - to replace the Canterbury Earthquake Recovery Commission (CERC).

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<sup>4</sup> In contrast, the 7.0 M<sub>w</sub> 2010 Haiti earthquake had an estimated PGA of 0.5g (Lin, Rong-Gong; Allen, Sam (26 February 2011). "New Zealand quake raises questions about L.A. buildings". *Los Angeles Times* (Tribune). Archived from the original on 3 March 2011. Retrieved 27 February 2011.

<sup>5</sup> [www.stuff.co.nz/national/christchurch-earthquake/4711189/Tuesday-quake-no-aftershock](http://www.stuff.co.nz/national/christchurch-earthquake/4711189/Tuesday-quake-no-aftershock)

<sup>6</sup> Dearnaley, Matthew (25 February 2011). "Christchurch earthquake: Wrecker's tip for leaning tower". *New Zealand Herald* (APN Holdings). Retrieved 26 February 2011.

An additional layer of complexity directly relevant to the Avon Residential Red Zone was the probability/cost of (re)build equations that had been altered by the identification of more faultlines in the area, as evidenced by the February event. September the 4<sup>th</sup> was now considered a '1 in 100 year event' and this meant that a building with an expected life of 50 years had a 50 per cent chance of experiencing a September-like quake. In light of such probabilities, land remediation work, the design of building foundations and building integrity had to be of a much higher standard.

### *13<sup>th</sup> June 2011 and the Red Zoning decision*

On June 9<sup>th</sup> 2011, the Minister for Earthquake Recovery Gerry Brownlee requested a deferral of works in the Waimakariri where the rebuild programme was due to begin in Kairaki the following week.

On the 13<sup>th</sup> June the region was rocked by another two earthquakes of 5.5 and 6 magnitude. On the 14<sup>th</sup> of June, the Minister for Earthquake recovery 'Red Zoned'<sup>7</sup> Kairaki in the Waimakariri District where machinery was already on-site to start remediation work. The likelihood of repeat events, combined with the social and economic costs of remediation, repair and rebuild, meant 'retreat' rather than rebuilding was now considered to be the best option. Because the soil substrate varies greatly across the Canterbury plains, it was understood that other areas of housing on, often, reclaimed land that had suffered serious damage would follow suit. The criteria for Red Zoning<sup>8</sup> were that:

- there is significant and extensive area wide land damage;

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<sup>7</sup> Other Zones were also created depending on the extent of land damage. These have subsequently been further divided into 3 technical categories which reflect how the land is expected to perform in future earthquakes and determines, for example, the types of foundations that may be used in future rebuilds and development.

<sup>8</sup> In total 7,860 houses have been Red Zoned throughout Canterbury ([www.cera.govt.nz](http://www.cera.govt.nz), accessed June 2013)

- the success of engineering solutions may be uncertain in terms of design, its success and possible commencement, given the ongoing seismic activity; and
- any repair would be disruptive and protracted for landowners.

On 23<sup>rd</sup> the Avon River Residential Red Zone (see Figure 3 below) was created, and it is this particular piece of land that forms the focus of this research.

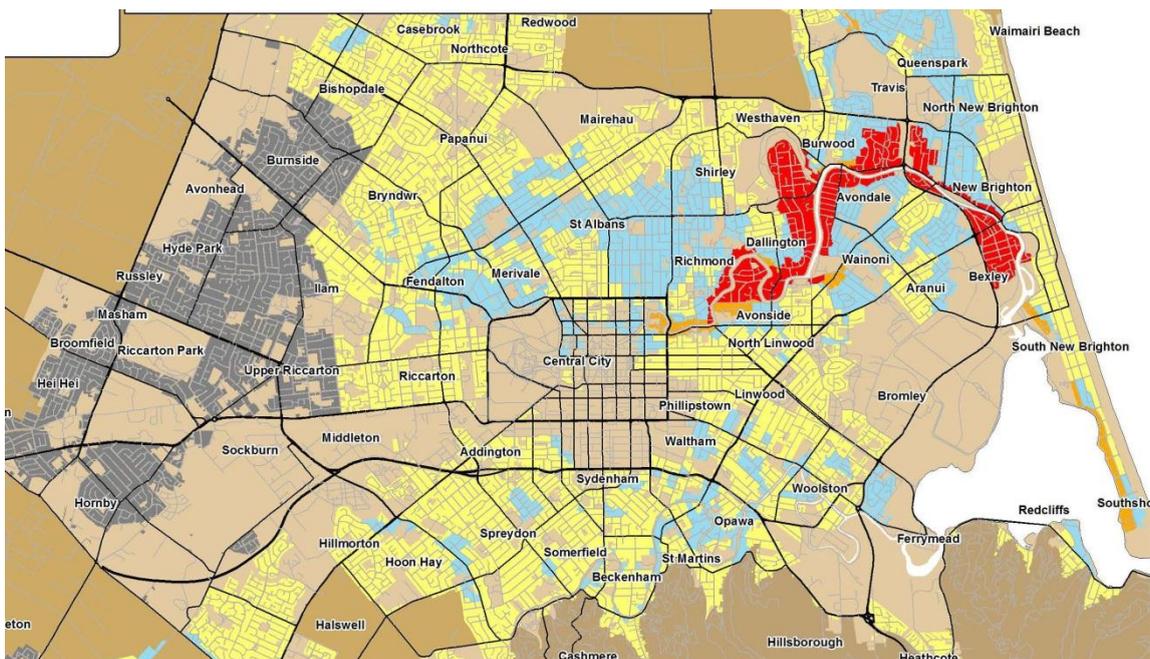


Figure 3: Christchurch's Avon River Residential Red Zone (<http://rwshirley.co.nz/5810/Earthquake-Updates>)

### *The Avon River Residential Red Zone (ARRRZ)*

The Red Zoning decision was accompanied by several buy-out options and, as of May 2013, the vast majority of home owners (6, 059) have sold their property to the Crown. CERA is now in the process of coordinating the 5,000 or so individual property clearances (by demolishing or removing built structures) in the ARRRZ, but are leaving some vegetation 'prior to the larger scale block clearances' ([www.cera.govt.nz](http://www.cera.govt.nz)). It is

anticipated that 3,000 demolitions will have been completed by September 2013. Three areas already have sufficient acreage to justify the block clearance approach: These include the land around Courtney Drive in Kaiapoi, and parts of New Brighton (65 properties) and Dallington (18 properties) in Christchurch City's ARRRZ. These areas have had superfluous vegetation removed, fences erected and grass planted. While this is an expedient short-term solution, speculation is rife over the long-term future of almost 450 hectares of land (comprising residential and public land) stretching along the Avon River corridor, from the CBD to the sea.

This research, undertaken by Dr Suzanne Vallance (Lincoln University) and Dr Peter Tait (AERU) was commissioned by the community-based Avon-Otakaro Network (AvON) with funding from the Royal Society's Marsden Fund and the Pacific Development Conservation Trust in order to explore different cost-benefit options for future use of the Avon River Residential Red Zone (ARRRZ).

These are:

- Letting the land lie fallow
- Residential redevelopment
- City-to-sea, recreation 'eco-reserve' (Avon River Park)

Given the lack of available data and funding constraints, the first two options are not evaluated in any depth for this study. Most of the information contained in this report focuses on Option C: A City-to-sea recreation eco-reserve.

## Option A: Lying Fallow

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This option involves eventual block clearance of the ARRRZ, followed by replanting in grass and on-going maintenance.

If 25,000m<sup>2</sup> (or 2.5 ha) of Red Zoned land in Kaiapoi cost \$75,000 to block clear and re-sow, and if the ARRRZ comprising both private and public land is approximately 450 ha, at these rates it will likely cost around \$13.5 million to do something similar.

The clearance and maintenance methodology proposed by Boffa Miskell<sup>9</sup> is based on an average section size of 650 square metres with each needing about 16 maintenance visits a year at a cost/visit of \$300, or \$4,800 in total.<sup>10</sup> If there are about 6,400 ARRRZ sections, this would cost about \$31 million, but this figure excludes public lands such as parks and reserves.

On-going maintenance costs of cleared sites as well as public land will also be incurred. Established unit rates per annum for the servicing of other 'easy care' public parks in Christchurch (including, for example, litter collection, mowing 27 times, pest and weed control) is \$9,497.00 per hectare. If the ARRRZ is approximately 450 hectares, the costs of maintenance per annum would be in the order of \$4.3 million (allowing for some economies of scale) if the area was sown in grass.

An early proposal to allow interim use in the ARRRZ was subsequently retracted; however, a levy of \$27+gst per m<sup>2</sup>, per annum was to be charged which may have reflected the costs of demolition as well as re-sowing and maintaining the ARRRZ. This works out to be about \$120 million.

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<sup>9</sup> Where all non-pest flora is retained so long as it does not impede demolition to allow for the identification and retention of 'protected' trees, followed by –essentially – clear felling, contouring and sowing of grass.

<sup>10</sup> <http://www.stuff.co.nz/the-press/news/christchurch-earthquake-2011/8489439/Green-dreams-for-river-red-zone>

It is difficult to predict the expected return on investment from such land use and the choice modelling survey found that residents did not gain any benefit from 'open grassed areas' (although, taken in the context of a reserve, this is slightly different to lying fallow). This option does, however, retain the possibility of future residential redevelopment.

## Option B: Residential Redevelopment

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There is debate as to whether it will ever be possible to remediate the ARRRZ land to an acceptable standard for residential redevelopment, given the likelihood of future seismic events and predicted sea level rise. Any developer would have to recover the costs of remediation, costs that would not be incurred on substitute sites. Given that the housing market is assumed to be competitive, this option seems unlikely to occur until the long term, when remediation costs are more certain and house prices have risen sufficiently to bridge the gap between costs and sale prices. That said, there are areas of land in the ARRRZ that were, relatively speaking, less prone to liquefaction and surface rupture and that are on more elevated tracts of land. Without residents and neighbours to disturb, remediation may be more viable in selected areas.

Concrete figures are difficult to obtain<sup>11</sup> and the costs of remediation are unclear. We can only deduce certain estimates and assume that if the costs of remediation were considerably less than the buy-out/insurance option, remediation rather than Red Zoning would have been the preferred option.

If the Crown pays out approximately \$1.7 billion on 7, 860 Red Zoned properties, each is worth (an average of \$216,300). If about 5, 789<sup>12</sup> of these are in the ARRRZ then the buy out costs for this area are likely to exceed \$1.2 billion.

The Crown should recover some of these costs from the insurance policies it will inherit on houses and property. According to a Press report<sup>13</sup> based on figures obtained under the Official Information Act and CERA's Annual Report, this is likely to be in the order of \$565 million for all (approximately 8, 000) red zoned properties (or \$70, 000

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<sup>11</sup> Some information is available on <http://cera.govt.nz/sites/cera.govt.nz/files/common/cera-annual-report-2012-20121018.pdf>

<sup>12</sup> This figure was obtained through personal communication with a CERA employee 10<sup>th</sup> Sept 2013 and was said to exclude Brooklands, Port Hills and Kaiapoi (i.e. the Avon River Residential Red Zone) and public land.

<sup>13</sup> <http://www.stuff.co.nz/the-press/news/christchurch-earthquake-2011/8655374/Govt-faces-1b-red-zone-shortfall>

per property). If there are 5, 789 properties in the ARRRZ, and \$70, 000 is received for each, the Government may recover about \$405 million. If the buy out costs for ARRRZ properties is \$1.2 billion, and \$405 million is received, there will be a shortfall of about \$795 million for this particular tract of land.



The vision of a recreation reserve is broadly consistent with at least three elements of CERA's *Recovery Strategy For Greater Christchurch*. The Social Recovery Component notes (p.31) that "Restoring social wellbeing is a holistic and collaborative process. It empowers communities who are in transition as people leave familiar neighbourhoods and resettle in new areas". A collaborative approach that reflects and addresses the needs of communities in transition is reflected in recovery best practice where many have argued that 'getting involved' after a disaster can be cathartic, and that taking positive action can make victims feel empowered which, in turn, facilitates recovery (Sullivan, 2003; Coghlan, 2004; Coles and Buckle, 2004; Etye, 2004; Waugh and Streib, 2006; Murphy, 2007; Ganapti and Ganapti, 2008; Wilson, 2009; Chamlee-Wright & Storr, 2011). Other research describes stalled recoveries that were only resurrected with greater citizen engagement and the introduction of more deliberative and inclusive participatory models (DIPs). New Orleans post-Katrina is a well-documented example of a faltering recovery delayed by the failure to adequately engage local residents (Dirmeyer, 2008; Wilson, 2009; Olshansky and Johnson, 2010). Recovery scholarship notes, however, that 'despite often-good intentions, [meaningful] levels of participation are rarely obtained and the [community's] capabilities...are often significantly wasted' (Davidson, Johnson, Lizarralde, Dikmen & Sliwinski, 2007, p.100). This failure is often attributed to the nature of the relationship between the community and formal recovery authorities and barriers to effective participation have been noted, including a lack of trust; government's reluctance to share power and lose control of the process; recovery agencies using community 'sweat' as a proxy for engagement;

and demands for visible results which place time pressures on recovery authorities (Lawther, 2009).

Though implementation can be challenging, CERA's Social Recovery Strategy reflects best practice principles with its goals including strengthening community resilience, safety and wellbeing, and enhancing quality of life for residents and visitors - by:

- 3.1 Enabling and empowering local communities to shape and lead their own recovery;
- 3.2 Growing capacity, knowledge and skills within the community to build resilience;
- 3.3 Delivering community, health, education and social services that are collaborative, accessible, innovative and inclusive;
- 3.4 Supporting people, in particular those facing hardship and uncertainty, by providing quality housing, education and health services; and
- 3.5 Supporting communities as they go through the processes of resettlement.

The development of a community-led, science informed recreation reserve in the ARRRZ speaks to the Social Recovery Strategy's first point. The last point regarding supporting communities in their resettlement is also highly relevant to the future use of the ARRRZ as resettlement involves leaving the area and, for some, it is important to think that the area will be well-used rather than left fallow. Others who feel they were in a sense forced from the land by factors beyond their control find the notion of future residential redevelopment offensive and painful.

Another component of the Strategy addresses Cultural Recovery, and encompasses the arts, culture, heritage buildings and places, and sports and recreation. The Cultural Recovery goal is to renew Greater Christchurch's unique identity and its vitality - expressed through sport, recreation, art, history, heritage and traditions - by:

- 4.1 Acknowledging and celebrating the rich and diverse Ngāi Tahu, colonial and other heritages and connections;
- 4.2 Resuming cultural, community and sports events and activities;

4.3 Encouraging participation in a range of entertainment, cultural, recreational and sporting activities;

4.4 Restoring historic buildings, where feasible, for the benefit of the community; and

4.5 Acknowledging losses and creating spaces to remember, while embracing necessary changes to the city's character and urban form.

It is stated in the Strategy that “The cultural recovery of Greater Christchurch is vital for a functioning and liveable city. There are opportunities to consider cultural, sporting and recreational requirements as a whole. All partners can work together to identify community needs and, where appropriate, consider facilities that offer a range of cultural activities. New opportunities will be sought so cultural activities contribute to community wellbeing and economic growth.”

The vision of a recreation reserve in the ARRRZ also aligns very well with the Natural Environment Recovery aspect of the Strategy where it is noted that the recovery programme “need[s] to be undertaken and sequenced in ways that do not harm the health and functioning of the natural environment. [It] should also consider how [it] can help the environment to adapt to global environmental issues such as climate change, sea level rise and resource scarcity” (p. 42). The Natural Environment Recovery Strategy's goals are to restore the natural environment to support biodiversity and economic prosperity and to reconnect people to the rivers, wetlands and Port Hills - by:

6.1 ensuring recovery activities value, protect and sustainably manage the sources of our water;

6.2 ensuring ecosystems are healthy and functioning;

6.3 improving the quality and function of estuaries, waterways and wetlands to support the unique biodiversity that is endemic to Te Waipounamu;

6.4 providing public access to and opportunities for outdoor recreation, cultural, social and economic activities;

6.5 enhancing air quality through managing recovery activities that impact on air quality, such as heating, transport, demolition and construction; and

6.6 storing, sorting and processing waste in an environmentally safe and effective manner, including minimising and recycling construction and demolition wastes.

In addition to contributing to the *Recovery Strategy for Greater Christchurch*, the vision of a recreation reserve is also highly consistent with most of the 17 projects identified in the *Proposed Natural Environment Recovery Programme* (Environment Canterbury, 2013) including:

1. Investigate and plan for natural hazards
2. Investigate and monitor coasts and estuaries
3. Reduce flood risks and restore drainage capacity of waterways
4. Plan for stormwater management
5. Act on opportunities for stormwater treatment and improving the water quality and ecosystem health of waterways
6. Manage sediment from liquefaction
7. Rehabilitate, restore and enhance wetlands changed by the earthquakes
10. Control weeds and pests that have potential to affect biodiversity, or have impact on health and safety
11. Assess, retain and enhance biodiversity
12. Support community gardens, local food production and urban forestry
13. Provide access to and opportunities for outdoor recreation
17. Act on opportunities to restore and enhance mahinga kai

The vision of a recreation reserves also aligns well with the Christchurch City Council's approach to storm water management which is based on the Natural Asset Management Plan for Christchurch's Waterways and Wetlands (1996) which promoted a "values-based approach to land drainage". Accordingly, values other than land drainage are included, such as ecology, landscape, recreation, heritage and cultural. This is an example of a strategy that reflects certain objectives set out in Volume 2 of the proposed City Council Plan including:

- improving the quality of water entering downstream water bodies
- providing habitat for wildlife

- maintaining and enhancing heritage values
- recognising and providing for cultural values and community aspirations
- restoring the relationship of Maori with waterways, ancestral sites and other taoka
- linking existing green areas to form a network of green corridors
- providing facilities for recreation
- avoiding flooding hazards
- implementing cost-effective and sustainable operational and maintenance regimes
- reducing flooding problems.

The proposed recreation reserve has the potential to ‘tick boxes’ against many of the restoration site assessment criteria detailed in Appendix 2 from the Christchurch City Council’s *Waterways, Wetlands and Drainage Guide - Ko Te Anga Whakaora rna Ngii Arawai Repa, Part A: Making Visions Real*, 2003).

Though there are no firm designs for the Avon Recreation Reserve, it is advocated that a range of compatible activities be co-located there spanning ecological, economic, social, cultural, educational and heritage values. Some activities lend themselves more readily to some positions within the ARRRZ than others due to soil typology and topography, activity nodes in the surrounding suburbs, storm water drains and other infrastructure, and the river itself. Though the city already delivers on many of these (e.g. Travis Wetland, Ferrymead, Hagley Park, Willowbank), none of these existing parks fully capture such a range of activities in a single facility.

This research, undertaken with funding from the Royal Society’s Marsden Fund and the Pacific Development Conservation Trust sought to clarify the recreation reserve’s potential value using both primary data sources and proxy data based on a literature review.

## Literature Review

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There are a number of ways of establishing the value of a recreation reserve combining eco-system services and recreation facilities and provisions and the benefits of both active recreation and the role of eco-systems and their value and/or contribution to wellbeing is receiving increasing levels of scholarly and scientific attention.

### *Valuing Ecosystem Services*

The Millennium Ecosystem Assessment (2005) identified a number of crucial, but un- or under-valued, services performed by various eco-systems. The report categorises these in to life supporting services (e.g. pollination), direct provisioning (e.g. food, potable water), regulating (e.g. flood mitigation) and socio-cultural (e.g. aesthetic) functions that all contribute to general wellbeing.

Although there is increasing consensus that these ecosystems perform valuable services, there is debate over how to assign specific economic values to them. One option is to create a 'market' for the item in question, however, this presents difficulties for a proposal like the ARRRZ which hopes to integrate such a range of recreation and ecosystem services and functions. As Redford and Adams (2009, p. 785) point out with regards to eco-system services "Markets only exist for a certain range of services, and some services are not amenable to pricing or valuation, such as the fertilizing effect of atmospheric dust from the African Sahel carried across the Atlantic". Further problems are that markets can change rapidly and, where they do exist, the market reflects their desirability to human consumers rather than intrinsic values. When it comes to putting a value on these eco-system services, conventional economics assumes that people have a) well-formed preferences and b) enough information about those preferences to 'value' nature appropriately, usually through

'subjective' willingness-to-pay, or revealed/stated preferences exercises. As Constanza has argued, however, these assumptions do not always hold true, nor do they necessarily apply in non-monetised economies. Therefore, we need either better information provision and/or more robust ways of establishing the values of such services. A variety of 'objective' (e.g. replacement cost) and 'subjective' (e.g. revealed preferences) accounting methods are now being used (see Table 3 below).

The discipline of ecological economics is arguably still in its infancy; hard data indicating economic returns on ecosystem services are rare, while debates over appropriate valuation methodologies flourish (see Nijkamp, Vindigni and Nunes (2008) for an overview). In a recent review of over 20, 000 restoration projects, for example, the Economics of Ecosystems and Biodiversity project found only 96 of these studies yielded 'meaningful' cost data (Nebhova, 2011). Based on this information, the report concluded that different restoration project costs, for example, varied depending on the ecosystem type, and ranged from several tens of thousands of \$US/hectare for inland waters, to hundreds to thousands for grasslands, rangelands and forests, to millions for coral reefs. Costs also varied over different timescales, criteria for success, degree of degradation and so on.

These difficulties notwithstanding, a number of studies have attempted to 'objectively' quantify the economic value of ecosystem services. Commonly referred to as cost-effectiveness analyses (CEA) these studies tend to compare the replacement costs of manmade or mechanised systems with 'natural' ones that perform the same service. CEA was used in 1996 for New York Catskills Mountains Watershed case where administrators decided that restoring the ecological integrity of the watershed would more cost effective in the long run than constructing a new water filtration plant. The city invested \$1 to \$1.5 billion in restoration projects in anticipation of saving \$6–\$8 billion over 10 years; a rate of return of 90–170% and a payback period of 4–7 years.

Table 3: Ecosystem service monetary valuation methods, from Liu, Constanza, Farber and Troy (2010)

<i>Revealed-preferences approaches</i>
<p><u>Market methods</u>: Valuations are directly obtained from what people must be willing to pay for the service or good (e.g., timber harvest).</p> <p><u>Travel cost</u>: Valuations of site-based amenities are implied by the costs people incur to enjoy them (e.g., cleaner recreational lakes).</p> <p><u>Hedonic methods</u>: The value of a service is implied by what people will be willing to pay for the service through purchases in related markets, such as housing markets (e.g., open-space amenities).</p> <p><u>Production approaches</u>: Service values are assigned from the impacts of those services on economic outputs (e.g., increased shrimp yields from an increased area of wetlands).</p>
<i>State-preference approaches</i>
<p><u>Contingent valuation</u>: People are directly asked their willingness to pay or accept compensation for some change in ecological service (e.g., willingness to pay for cleaner air).</p> <p><u>Conjoint analysis</u>: People are asked to choose or rank different service scenarios or ecological conditions that differ in the mix of those conditions (e.g., choosing between wetlands scenarios with differing levels of flood protection and fishery yields).</p>
<i>Cost-based approaches</i>
<p><u>Replacement cost</u>: The loss of a natural system service is evaluated in terms of what it would cost to replace that service (e.g., tertiary treatment values of wetlands if the cost of replacement is less than the value society places on tertiary treatment).</p> <p><u>Avoidance cost</u>: A service is valued on the basis of costs avoided, or of the extent to which it allows the avoidance of costly averting behaviors, including mitigation (e.g., clean water reduces costly incidents of diarrhea).</p>
<i>Benefit transfer</i>
<p>The adaptation of existing ecosystem service information or data to new policy contexts that have little or no data (e.g., ecosystem service values obtained by tourists viewing wildlife in one park used to estimate that from viewing wildlife in a different park).</p>

Using cases like these, Brander, Brouwer and Wagtendonk (2013) undertook a meta-analysis of the economic valuation literature on ecosystem services provided by wetlands in agricultural landscapes with a focus on three specific regulatory services: flood control, water supply and nutrient recycling. The mean values were 6, 923 \$US/hectare/year<sup>15</sup> for flood control; 3, 389 \$USD/hectare/year for water supply, and 5, 788 \$US/hectare/year for nutrient recycling which, in total, comes to approximately NZ\$19,600.00 per hectare, per year. They report, however, that the values of these services varied greatly across different wetland sites due to species, size, scarcity of alternatives, etc. The authors then discuss the potential for using the value function estimated in the meta-regression analysis to transfer values to wetland sites for which there is no value information available, like the ARRRZ.

### *Valuing Biodiversity: Apiculture*

It has been proposed that part of the ARRRZ be devoted to apiculture. Honeybees are exposed to a number of different diseases and pests and, worldwide, the number of bees has been reduced by 20 per cent due to pesticide use, varroa, American Foul Brood and other diseases. Since its arrival in New Zealand, varroa has halved the number of working hives, and decimated the native bee population. Bee hives cost about \$500 each to establish and a further \$50.00 per year to maintain, but each produces about 30 to 45 kilograms of honey per year. Honeybees directly contribute \$80 million in exports (9,000 – 12,000 tonnes of honey) but they contribute another 4.5 billion of \$189 billion GDP indirectly through pollination services ensuring the viability of nitrogen fixing plants and our agricultural and horticultural industries. Honeybees indirectly help provide a third of our calories and three quarters of our food diversity.

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<sup>15</sup> The authors used data from 2007.

## *Valuing Active Recreation*

Many of the benefits of active leisure provision in a setting like the proposed recreation reserve option are well-documented in the literature. Sport and Recreation New Zealand (SPARC) recently commissioned an independent valuation of the benefits and costs of sport and recreation (Dalziel, 2011). The report notes that in New Zealand over 750, 000 volunteers spend more than 50 million hours engaged in sporting activities; 8/10 adults and 9/10 children participate in sport and recreation and spend over \$1.3 billion per year on sports goods and equipment. Using the value-added approach, the report calculates that sport and recreation accounts for approximately \$5.2 billion per year, or 2.8 per cent of New Zealand's GDP. The report also notes that active employees work 1.8 days more per year on average than their inactive counterparts and helps prevent 1,126 premature deaths per year. The report argues that gains in productivity and health benefits adds \$1.0 billion to this figure, while other personal benefits of participating in sport and recreation adds a further \$5 billion dollars, bringing the overall estimated value of the sector to \$12.2 billion.<sup>16</sup>

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<sup>16</sup> In their literature-based review of active modes of transport, the CDHB (2012) noted that economic benefit figures vary according to what was measured and how, but their findings reflect Dalziel's in identifying very similar types of benefits from increased use of active modes of transport.

## Methodology

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The methodology for this research sought to combine 'objective' values obtained from the literature with primary data gathered using both qualitative (in-depth interviews) and quantitative methods (choice experiment). In March, 2013, 14 one to two hour interviews were conducted with representatives of Christchurch-based community groups, research institutes, and retail/commercial interests in order to develop a 'rich picture' of the vision outlined for the ARRRZ. In this exploratory phase, contradictions, complementary activities, other studies, potential problems and benefits were discussed and the results analysed thematically. These themes then contributed to the development of a web-based pilot survey issued in May, 2013 that enabled the researchers to cross-validate and prioritise the different park proposals. This informed the subsequent choice modelling survey (a more detailed survey methodology is provided below) and enabled us to establish a dollar value for non-market goods.

## The Interviews

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The interviews with representatives of 14 different community groups or advocates of particular ideas were conducted in March 2013. The results, analysed thematically, included a broad spectrum of social, environmental, economic and cultural values.

Some of the main themes to emerge related to:

- Ecological services and functions including flood control, storm water management, water quality improvements and biodiversity/restoration
- Active recreation facilities and provisions for locals and tourists
- Opportunities for 'light' or 'boutique' commercial/retail activities
- Community gardens/allotments/food forests and urban food security
- Preserving iconic historic suburban houses, gardens and heritage/native trees
- Protecting future generations from sea level rise
- Rejuvenation of the eastern suburbs
- Indigenous and cultural values
- Education in a 'living laboratory'
- A 'living' earthquake memorial

### *Ecosystem services and functions*

A number of those interviewed for this research were promoting the value of various ecosystem services including flood mitigation, storm water management, water quality improvements and bio-diversity preservation and enhancement. Most highlighted the ways in which the inclusion of these ecosystem services in the ARRRZ was compatible with activities proposed by other interviewees and would, in most cases, add value by enhancing the overall setting.

Flood management has become a more critical issue post-quake as the typography of the eastern suburbs has changed as a result. Before emergency measures put in place, high tides caused flooding in areas along the lower Avon stretch and recent heavy downpours also caused major surface flooding and further damage to homes. One solution is to update residential floor levels (see Figure 5) but these developments have brought the threat of sea-level rise and flooding together for interviewees who see future residential development in the area as potentially dangerous (see Figure 6 which shows Christchurch City Council’s pre-quake flood management areas).



Figure 5: Updated residential floor levels for areas throughout Christchurch, CCC (2012)

Post-September 04<sup>th</sup> 2010, the number of properties vulnerable to a 50 year rainfall event had increased by 1, 268 due to ground settling and, as a result, the Christchurch City Council published updated residential floor levels for parts of Christchurch. Whilst some it was acknowledged that engineering solutions or building codes could help mitigate the threat of flooding (see Figure 6), the rate and consequences of sea-level rise were harder to predict. The Ministry for the Environment uses 0.5m by 2090-99 as a base, but notes assessments should ‘consider the consequences of... at least 0.8m’ (MoE, 2008). Given this uncertainty, some interviewees proposed using the ARRRZ to help protect surrounding suburbs from flooding whilst using the ARRRZ for non-residential purposes.



Figure 6: Pre-quake flood management area (CCC)

A number of interviewees described ways of combining flood management in the area with the development of an eco-sensitive recreation reserve, primarily through the incorporation of a) a man-made lake and b) wetlands. Interviewees described how a lake of 2.3 kilometres in length would meet international rowing event requirements, as well as serving the local water sports community at other times. Importantly, such a lake - combined with a series of smaller lakes, swales and wetlands - would also act as a repository for floodwaters from the Avon River, and mitigate flood damage in neighbouring suburbs. This method of flood management has been adopted successfully in, for example, in the Urrbrae Wetland to mitigate flooding from the Adelaide hills (Australia). The wetland covers an area of 6 hectares, 4 of which might be covered in water at any time, and storing up to 13.5 million litres of water from a catchment of approximately 380 hectares.

In addition to flood control, a combination of lakes, swales and wetlands has potential benefits in managing storm water from surrounding suburban areas. If appropriately placed and well-designed, these wet areas could augment or replace expensive mechanically pumped and piped storm water mechanisms, and allow water flows into the river to be released at a more manageable rate, and improve water quality (Figure 7).

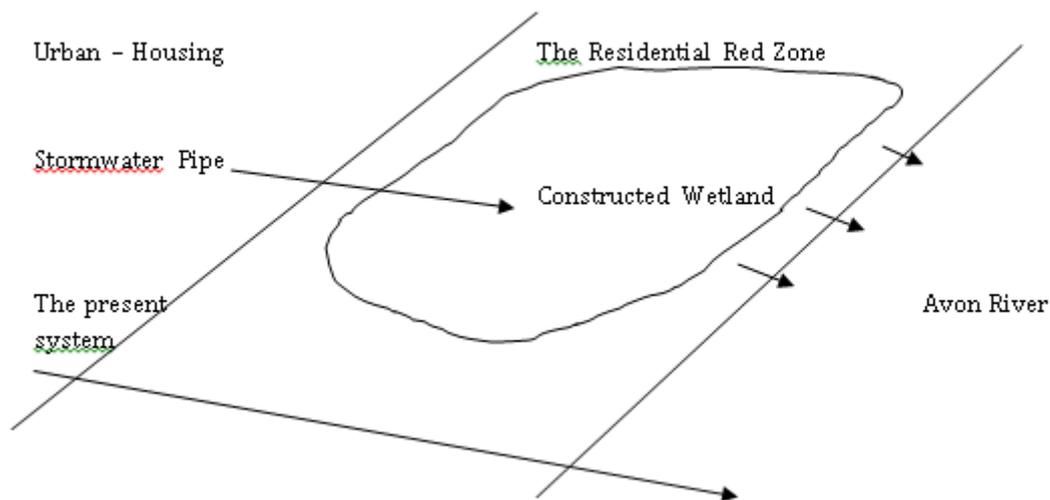


Figure 7: Passive stormwater management systems (source - Ann Kennedy)

#### *Biodiversity, wildlife and water quality*

A number of interviewees listed other benefits of wetlands in addition to storm water management and flood control, such as being aesthetically pleasing, fostering biodiversity, supporting wildlife and enhancing water quality in the Avon by filtering the storm water first. It was pointed out that only one third of the water flowing into the estuary from the Avon is able to sustain life, and that this is an opportunity to meet some of the goals outlined in numerous policy documents including the Canterbury Regional Policy Statement which calls on us to improve natural character values where they have been degraded to unacceptable levels.

It was also pointed out that New Zealand has a high proportion of threatened species, many of which are only found in this country. Though we have many national parks, these mainly cover mountainous areas, leaving low-lying, low-rainfall flora and fauna inadequately catered for. Distance and accessibility then become issues; as one interviewee noted

One of the biggest dangers facing our endangered species is the people, and it's not so much because they don't care, but it's because they don't know. Lowland areas [where most of us live] are very underrepresented in terms of ecosystems and species that occupy them. Then add the enormous pressure that introduced predators have had on the land, and it's very serious not only for nature but also New Zealanders' awareness, understanding, appreciation and identity. If you don't see it you don't know that it exists, let alone think it's precious.

With 86 per cent of our population living in towns and cities, urban sanctuaries – examples of which includes the Karori Wildlife Sanctuary in Wellington<sup>17</sup> - are a way of raising awareness and enhancing people's understanding and appreciation of our unique native flora and fauna whether they are wetland species or otherwise. Hosting eco-sanctuaries or restoring native habitats in urban locations is a way of facilitating visitor numbers and enabling sites to be more readily used for education purposes. The ARRRZ river park lends itself well to such uses, though there is debate over the extent to which this idea should be taken. Some advocate a fully predator-proof fenced area which, to be viable, would have to cover about 200 - 240 hectares and extend out to encompass Travis wetland. Others see problems with balancing predator proofing with, for example, people's movements in, out and across the area, and instead advocate for a more permeable forested park which still promotes ecological restoration and biodiversity, though to a lesser extent.

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<sup>17</sup> Karori wildlife sanctuary covers 250 hectares and was the world's first sanctuary completely protected by an exclusion fence targeting all pests. The fence is 8.6km long and cost \$240 million.

While this research did not investigate the value of increased *tourist* expenditure resultant from a wildlife reserve project, there is an indication that this value may be significant for the local economy. A recent study attempted to estimate the value of demand by international tourists for a 'NZ Wildlife Precinct' to be constructed in the ARRRZ<sup>18</sup>. As it was outlined, the precinct would contain various native nature attractions such as aviaries, eel feeding, a frog house, and several other attractions. Consistent with the work presented here, the study shared the overall framing of development of the ARRRZ into a reserve including native flora and fauna, to produce a unique New Zealand environmental experience. Knewstubb surveyed international tourists in the Christchurch Botanical Gardens and found that at least 52 per cent of respondents would visit such a precinct, and 30 per cent would spend an additional day in Christchurch to do so. This level of additional days spent in Christchurch combined with average daily expenditure of \$142.00<sup>19</sup> would generate at least \$40 million of expenditure each year. This would benefit local hospitality service suppliers and retailers. Tourists were also asked how much they would be willing to pay, in the way of an entry fee, to access the precinct. The average payment offered was \$39.00 and combined with visitor rates, results in an additional \$19 million injected into the economy. The main weakness of the study was the low number of survey participants but it does provide a framework that could be developed with a moderate level of funding that would allow surveying of more international tourists and additionally domestic tourists.

#### *Active recreation, eco-reserve for locals and tourists*

Within this broad category active recreation interviewees referred to a traffic-free, pedestrianized 'green corridor' stretching from Fitzgerald Avenue (bordering the CBD)

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<sup>18</sup> Knewstubb J. (2012). Tourism revenue from the proposed 'New Zealand Wildlife Precinct' within the Christchurch/Otautahi Red-zone.

<sup>19</sup> Ministry for Economic Development (2010). New Zealand regional tourism forecasts 2010 – 2016: Canterbury RTO. Wellington, New Zealand.

to the Avon Ihutai Estuary. Such a setting, following the river from city to coast, provides the ideal for a range of individual, collective and on-going activities, as well as special events. Furthermore, as a diverse range of active leisure and recreation pursuits can be co-located, positive synergies can be created around the provision and sharing of facilities. Co-location and subsequent exposure to a range of activities might also encourage patrons of one sport or recreation activity to try another, adding depth to the active leisure experience. There was general consensus among participants that a *continuous, traffic-free, pedestrian/cycle track along the river corridor* was central to the idea of the Avon River Park.

A second theme to emerge from the interviews centred on the idea that the corridor could be punctuated with *activity nodes* comprising toilet blocks, club rooms, river on/off ramps, and other recreational activities – dog parks, skating ramps, and children’s playgrounds. These nodes might also accommodate light retail –cafes – help connect park users with public transport provisions.

Along the corridor, interviewees supported the idea of man-made but ‘natural looking’ lakes for *water sports* and *sports fields*. Water sports advocates (kayaking, dragon boating, rowing, canoeing, waka) pointed out that the ARRRZ could, with some creative use of space, accommodate rowing lake suitable for hosting national and international events and other high performance sport facilities. A yacht club, located at the New Brighton end of the corridor, would restore the option of sailing in and around the estuary as well.

An issue that emerged from the interviews were the idea of *permeability and accessibility*. One interviewee who saw the green corridor’s potential to encourage active transport modes – cycling and walking to work/school - highlighted the need to maintain bridges and crossings within the park to facilitate this. Safety issues, especially at night, would have to be addressed as would the upkeep of certain paths to ensure they were adequate for those with prams, wheelchairs or walkers. If these conditions

were met, the health benefits – and benefits to the environment from reduced automobile emissions – could be secured.

As several interviewees pointed out, the ARRRZ area did accommodate a large number of active leisure options prior to the earthquakes, some of which have not been recreated elsewhere. As Fanning (2012) reports, these included golf courses, skate parks, dog parks, play grounds, sports fields and facilities (basketball, soccer and cricket), swimming pools and gymnasiums. As outlined in the Canterbury Earthquake Recovery Authority's *Recovery Strategy For Greater Christchurch* (2012) sport is considered a key element of cultural recovery which, in turn, contributes to a 'vital', 'functional' and 'liveable' city. The Recovery Strategy also identifies 'Opportunities and facilities for sporting, recreational and cultural activities' as a priority with a dedicated Sport and Recreation Programme. This seeks to '*recover the sport and recreation infrastructure* so that people can participate in them at least as much as they did before the earthquakes. It will also support and develop the volunteers and paid professionals who deliver sport and recreation activities'. The proposals put forward by the interviewees are therefore very much consistent with CERA's Recovery Strategy.

Besides specific and general ideas for particular park activities, several interviews were able to elaborate on the benefits of active leisure, including sport, undertaken in such a setting. Among the benefits listed were, first and foremost, health and wellbeing, and reduced costs to personal, community, workplace and public health systems. Some interviewees mentioned the role of sports and sporting events in raising New Zealand's profile overseas and restoring Christchurch's image as a great place to live, work, and play. Others referred to a number of other physical, but also social benefits and skills derived from playing team sports, such as team work, community development and social capital.

*Opportunities for 'light' or 'boutique' commercial/retail activities*

Various small-scale 'light' commercial and 'boutique' retail activities were proposed for the recreation reserve, including boat shed cafes along the river, artisan and craft market sites, hi-line wire/ropes courses, and so on. Arguably the most ambitious idea (but one that was not specifically described in the survey below) is that modelled on the 'covered biome' Eden project in Cornwall, UK (Figure 8). Advocates argue:

Christchurch has lost a number of major visitor attractions through the earthquakes and, currently, the city lacks attractions with the scale and appeal to influence visitor decision making when considering a visit here. We (a Christchurch-based group) have been working for some time on a major attraction that is based on the successful Eden Project in the UK. Subject to successfully securing funding it is planned that a feasibility study and business case will be completed over the next few months to determine the viability of the project.



Figure 8: The Eden Project ([www.edenproject.com](http://www.edenproject.com))

### *Community gardens and urban food security*

The interviews revealed strong support for devoting a portion of the ARRRZ to ‘light’ (i.e. not-for-profit) community-based urban agriculture and the preservation of key food producing heritage gardens along River Road and surrounding areas. These exemplify the gardening practices of old where maximum production is considered less important than hardiness, resistance to disease, good storage characteristics, and longevity of harvest which leads to year round food supplies. Advocates also highlight the benefits of community gardens, not just as a food source, but also in terms of the health benefits of active recreation, good nutrition and the building of social capital.<sup>20</sup>

Several of those interviewed saw the development of a recreation reserve as an excellent opportunity to improve water quality to levels that would support the return (or health) of native species of (edible) water-based wildlife, including whitebait.

### *Heritage trail - Preserving the Garden City*

The Avon River Residential Red Zone hosts a rich sample of early Maori and colonial heritage. Local Waitaha, Ngati Mamoe and Ngai Tahu used the river for mahinga kai and, currently, three Ngai Tahu pou stand on the sacred site of Tautahi at the eastern end of Salisbury Street. Some of the city’s first European settlers – such as former Mayor “Cabbage” Wilson – established homes and gardens in the area. During an interview with a keen advocate of a heritage trail, local tour guide Di Madgin pointed out that many of these homes exemplify not just a housing type, but a way of thinking. As one example, Englefield Lodge, on the corner of Avonside Drive and Fitzgerald Avenue, is thought to be the oldest house in Christchurch, built in 1852 by William Guise-Britten (First Four Ships). It was the first farm outside the Four Avenues in the

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<sup>20</sup> See, for example, Hosted’s (2013) dissertation on community gardens in Christchurch and the role social capital in resilience and recovery.

new Borough of Linwood and ‘espoused an upper-class colonial life: cricket, sailing on the river, and planting the first willows’. Nearby in Hanmer Street, are a number of workers’ cottages prefabricated in England and brought to Christchurch from 1865-80. Some of the other homes and gardens in the area, particularly along River Road, epitomise the kind of (radical at the time) ‘suburban’ development advocated by legendary urban planners like Ebenezer Howard (who wrote the Garden Cities of Tomorrow) and Truby King (founder of Plunket) who were both concerned about the crowded and unsanitary conditions of industrialised cities in the UK. In Di Madgin’s view, the ARRRZ ‘tells a powerful story’ that should be preserved, for its own sake, but also for its potential in terms of education, landscape and culture. There are also potential benefits from tourism with some participants pointing to Ferrymead Historic Park as an example.

### *Rejuvenation of the eastern suburbs*

The interviews showed a high level of concern for the people who remain in the Eastern suburbs whose livelihoods have, in some way, been affected by the earthquakes. Pre-quake, areas like New Brighton were suffering economic decline with several interviewees explaining:

We used to have the only Saturday shopping mall in Christchurch and that was a real asset. It brought people here. Now that QEII park [a multi-use stadium with a capacity of 25,000 people] has closed because of the earthquakes, it’s even worse. The people here are really suffering the lack of facilities... [but also] lack of through traffic that QEII brought this way.



Figure 9: QEII Park post Feb 22<sup>nd</sup> ([www.TVNZ.co.nz](http://www.TVNZ.co.nz))

The establishment of a 'city to sea' green/pedestrian corridor and recreation reserve was seen as a way of restoring the economic viability and general attractiveness of the remaining Eastern suburbs. It was believed that such a corridor would help serve to make New Brighton and surrounding areas a 'destination' for locals and tourists. It would facilitate the recovery of local business, and enable them to serve the needs of the local community once more.

#### *Education: A Living Laboratory*

Several of those interviewed highlighted the educational value of having a recreational reserve 'right on our doorstep'. While some were referring to the opportunity for local schools to use the area for education purposes, others described the benefits to the general public in terms of exposure to many of the ideas outlined above: ecological services, green corridors and other areas supporting flora and fauna, gardening and heritage. Ideas like these have already been formalized in documents like the Christchurch City Council's *Learning Through Action* (2013) which refers to conservation of water, freshwater and estuarine ecosystems, sustainability of resources, organic waste cycle and working with worms, biodiversity, impact of pests, geology, outdoor survival, waste management, and native trees and plants.

### *A 'living' earthquake memorial*

The cathartic and healing attributes of memorials featured strongly in the interviews, and there was strong consensus that a recreation reserve would be a fitting tribute to those who have suffered through the 13, 000 or so earthquakes and aftershocks, some of whom lost their lives or loved ones, many of whom lost their homes, their schools, their businesses, or their communities.

Some interviewees framed the idea of memorial in terms of a 'living reminder' but this was more contentious. While some did not want to be reminded, others were keen to use the notion of memorial as a warning to future generations to consider the location of residential development more carefully and save future generations from experiencing a similar disaster. For some, a reminder was all the more necessary given the possibility of sea level rise which would make any development in the ARRRZ vulnerable to storm surges and/or eventual inundation.



Figure 10. An impression of a memorial sculpture

Overall, despite some disagreement over this aspect, the tone of the interviews

regarding the proposed recreation reserve was very positive. Most highlighted the importance of having an area of the city that ‘ticks so many boxes in terms of ecosystems, heritage, recreation, and it could be a really exciting place...’ Rather than seeing the ARRRZ as a ‘problem’ created by a series of devastating earthquakes, the interviews are perhaps best summarized by the interviewee who said ‘the vision I have is restorative, it is healing. It tells me that, as a people, we can turn disaster into opportunity’.

# Choice Modelling Survey

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## *Introduction*

This section of the report discusses the analytical results from the choice modelling survey. Results are in two main parts: first are the economic values of benefits to Christchurch residents of various park development options; second are estimates of savings to public health costs, from increased recreational activity if park development occurs. The section follows a standard structure for presenting the results of the survey: methodology, results, discussion and conclusion.

## *Method*

The survey used the choice modelling approach to understand the economic value of park development options. Choice modelling is an economic valuation technique that is used to value goods and services that don't have observable market prices; it is referred to as a 'non-market valuation' method. This approach is appropriate because we don't have prices to indicate how much residents are willing to pay for the types of features that could make up a park, such as playgrounds or sports fields. This approach has been applied in other countries to value park amenities and associated environmental aspects (Bullock, 2008; Koo et al. 2013; Arnberger and Eder, 2011).

Choice modelling surveys present respondents with a series of *choice tasks*. For each choice task, respondents choose between at least two options. In this study, the options represent alternative recreation reserve developments. Each option is described by a number of characteristics or *attributes*, which could make up a recreation reserve, e.g. playground, sports fields. In each choice task the combinations of characteristics are systematically varied to denote different types of recreation

reserves. We assume that the options chosen by respondents, are what they think are best for them.

Statistical information derived from these choice tasks is modelled to reveal the relative importance of each recreation reserve characteristic. By including a monetary attribute in choice tasks, the monetary value of other attributes can be calculated. Economists calculate this as *willingness to pay*, e.g. how much I am willing to pay to have a recreation reserve with a playground. This value is therefore the monetary estimate of the benefit of this park attribute.

Choice modelling is well established in economics with over four decades of application and an extensive literature focusing on improvements in research design, application and analysis. The method is flexible to many different situations and has been employed to estimate values for transport, cultural heritage, environmental quality, food and health care.

### *Survey Design*

Development of the set of attributes that could describe the recreation reserve development started with in-depth discussion with members of the extended AvON network. This qualitative phase continued with semi-structured interviews with representatives of key community organisations advocating for a particular element of the proposed recreation reserve (outlined above). The organisations interviewed were selected to represent a wide breath of interests in redevelopment of the red-zone. The lessons from this stage were then used in a quantitative scoping study of 704 Christchurch residents in April and March 2013. The final set of attributes and levels are presented in Table 4. The survey instrument including covering letter and survey questions can be found in Appendix 3.

Table 4: Attributes and levels

Attributes		Levels
Recreational Spaces	Cycle/walking/jogging paths	Yes / No
	Sports fields	Yes / No
	Water based opportunities	Yes / No
	Children’s playground	Yes / No
	Open grassed areas	Yes / No
Environmental Enhancement	Improved river water and habitat quality	Yes / No
	Mostly native plants and habitat	Yes / No
	Restoration of wetlands	Yes / No
Heritage Protection	Preservation of heritage gardens including flowers and fruit	Yes / No
	Preservation of important Māori food gathering sites	Yes / No
Connection with Eastern Suburbs	Paths connecting CBD to Brighton	Yes / No
	Paths connecting CBD to Brighton and beyond to South Shore, Bottle Lake	Yes / No
Commercial Activities	Tourist focused businesses	Yes / No
	Cafes	Yes / No
Percentage of Red Zone used for Park	60 per cent in Park	Yes / No
	80 per cent in Park	Yes / No
	100 per cent in Park	Yes / No
Enhanced Community Engagement	Regular festivals and markets	Yes / No
	Community food gardens	Yes / No
	Community meeting places	Yes / No
Annual Rates Cost to Christchurch Households		\$20, \$30, \$40, \$60, \$80

Source: AERU

### Survey Sample

The sample of Christchurch residents to be surveyed came from the Electoral Roll. This roll contains all citizens registered to vote in public elections. As registration is mandatory for everyone aged 18 and over, this roll represents a high quality sampling frame. The sample was drawn to reflect the distributions of age and geographical location of the wider Christchurch population. The final sample consisted of 2,000 names and postal addresses.

## *Survey Administration*

The survey was administered using a mixed-mode design. This consisted of posting a paper survey to all 1500 members of the sample that included a link to an on-line version of the survey. This meant that respondents could fill out and mail back the paper version of the survey in the free-post reply envelope provided, or they could use the link to complete the survey on-line.

## *Survey Results*

The surveying process yielded an effective response rate of 20 per cent<sup>21</sup> with 291 usable responses. A typical mail-out-mail-back self-administered survey (the type used here) response rate is less than 25 per cent in NZ. The greater level of cognitive burden that is required in choice modelling surveys means that these surveys tend to have response rates around 20 per cent. Other forms of survey administration, such as in-person (face-to-face) surveying tend to have a much higher response rate but incur considerably higher expenses. The sample demographics are presented in Table 5. Comparing the survey sample distributions with the Christchurch population show that, overall, we have achieved a reasonable level of representativeness. However the sample contains proportionally more high income earners and higher educated residents than the overall Christchurch population. This is a common finding in surveying of the general public and is addressed by weighting the data prior to analysis.

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<sup>21</sup> 291 usable replies /1462 (38 Gone-No-Addresses)

Table 5: Survey respondents description

Demographic Variable		Sample Distribution	ChCh Population <sup>22</sup>
Age	60 +	29%	18%
	30 – 59	62%	63%
	20 – 29	8%	19%
Gender	Female	55%	51%
Education	High school	25%	65%
	Trade/technical qualification or similar	20%	22%
	Undergraduate diploma/certificate/degree	31%	9%
	Postgraduate degree	21%	4%
Location	Christchurch South-East	20%	18%
	Christchurch North-East	30%	26%
	Christchurch South-West	22%	24%
	Christchurch North-West	28%	32%
Employment Status	Unemployed	1%	2%
	Paid employment	69%	66%
	Not in labour force	30%	32%
Household Income	Less than \$20,000	6%	20%
	\$20,001 to \$70,000	37%	57%
	More than \$70,000	57%	23%
Household Size	One	16%	24%
	Two	57%	34%
	More than two	27%	42%

Source: AERU

Information in Table 5 details the percentage of respondents located in each part of Christchurch and the actual spatial distribution of survey respondents is shown in Figure 11. Both these sets of information indicate good spatial representativeness in the survey data.

<sup>22</sup> Statistics New Zealand data.

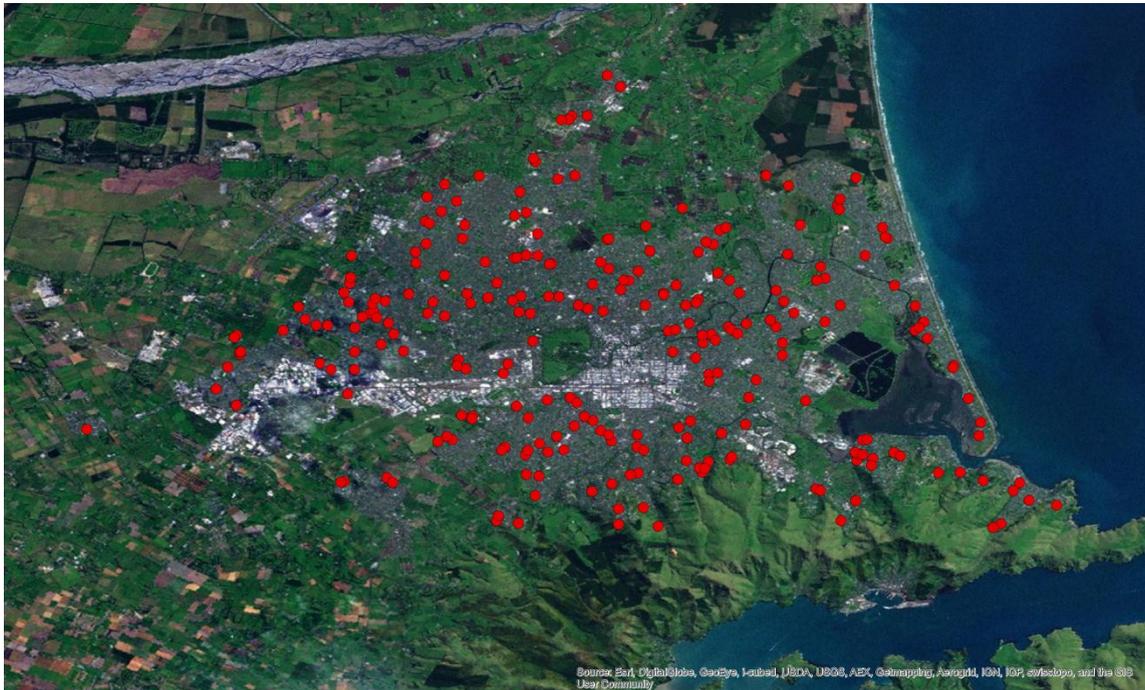


Figure 11. Spatial distribution of survey respondents

### *Choice Modelling Results*

The statistical modelling of survey respondents choices resulted in the model presented in Table 6. For the modelling procedure the data are weighted to reflect the Christchurch population distribution of household income. By conventional econometric standards the model performs well.

The first important finding is the attribute ‘percentage of Red Zone used for a park’ is positive and significant. This means that respondents are willing to pay for a recreation reserve in the red zone, and are willing to pay more for a larger recreation reserve.

Most of the recreation reserve attributes are statistically significant, meaning that they

are important factors in respondent's choice of recreation reserve. There were several attributes that respondents considered to be unimportant. This means that they do not derive any benefit from their presence in the recreation reserve and are therefore not willing to pay for them. These attributes are:

- Sports fields
- Children's playground
- Open grassed areas
- Paths connecting CBD to Brighton
- Tourist focused businesses
- Community meeting places
- Maori food gathering sites<sup>23</sup>

The model parameters are used to estimate the monetary benefit from each recreation reserve attribute. This is calculated as household willingness to pay per annum. These values are presented in in the third column of Table 6.

The most highly valued recreation reserve attribute is the multi-use paths for cycling/walking/jogging; closely followed by preservation of heritage gardens, and native plant and habitat.

The least valued recreation reserve attributes are: preservation of Māori food gathering sites; followed by cafes, and food gardens.

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<sup>23</sup> Qualitative data suggests that at this time, people may not see the ARRRZ and the Avon River as potential food gathering/mahinga kai sites, because of the 'bad press' around sewerage discharge and contamination.

Table 6: Christchurch households WTP for recreation reserve attributes

Attributes of Red Zone Redevelopment		Model Parameters	Annual Willingness to Pay <sup>24</sup>
Recreational Spaces	Cycle/walking/jogging paths	0.639***	\$34.2 [12-56]
	Sports fields	0.082	-
	Water based opportunities	0.289**	\$15.4[5-26]
	Children's playground	0.075	-
	Open grassed areas	-0.131	-
Environmental Enhancement	Improved river water and habitat quality	0.374***	\$20.1 [6-36]
	Mostly native plants and habitat	0.587***	\$31.4[9-48]
	Restoration of wetlands	0.278**	\$14.9 [2-25]
Heritage Protection	Preservation of heritage gardens including flowers and fruit	0.611***	\$32.7 [12-57]
	Preservation of important Māori food gathering sites	-0.222*	-\$11.9 [-36- -6]
Connection with Eastern Suburbs	Paths connecting CBD to Brighton	0.241	-
	Paths connecting CBD to Brighton and beyond to South Shore, Bottle Lake	0.354**	\$18.9 [4-31]
Commercial Activities	Tourist focused businesses	0.094	-
	Cafes	0.226**	\$12.1 [1-21]
Percentage of Red Zone used for Park	80 per cent in Park	0.204***	\$10.9 [-1-18]
	100 per cent in Park	0.395***	\$21.1 [11-33]
Enhanced Community Engagement	Regular festivals and markets	0.456***	\$24.4 [12-36]
	Community food gardens	0.233**	\$12.5 [1-19]
	Community meeting places	0.127	-
Annual Rates Cost to Christchurch Households		-0.019***	
Number of choice observations		2037	
McFadden Pseudo R <sup>2</sup>		0.23	

Source: AERU

Notes: \*\*\*, \*\*, \* denote statistical significance at the 1%, 5% and 10% level respectively.

WTP estimates are in 2013 NZ dollars per annum per household. 95% Confidence Intervals in brackets.

<sup>24</sup> Willingness to pay can be calculated as the ratio of an attribute to the money metric used in the survey. In this model the money metric is the annual rates cost to Christchurch residents. The ratio captures the idea of a trade-off: how much money would I trade (pay) to get more of the other attribute? The calculation is: – (attribute parameter/price parameter).

## Public Health Cost Savings

Physical activity is linked to improvements in a wide range of health conditions including heart disease, mental health and diabetes. The health benefits of walking and cycling have been linked to positive financial outcomes as participants generate savings to the public health system through avoided treatment costs. The savings are estimated as \$1.30/km for walking and \$0.65/km for cycling (NZTA, 2010). To investigate whether development of cycling/walking/jogging paths in a recreation reserve would generate public health cost savings, we included a series of questions in the survey. We asked respondents which activities that would participate in, their level of activity, and how this level of activity relates to what they would have otherwise done in the absence of these new paths. Table 7 shows over 90 per cent of respondents said they would use the paths for at least one activity.

Table 7: Recreation reserve recreational use

Usage Description		Sample Distribution		
		Cycling	Walking	Jogging
Frequency of use	Daily	4%	8%	1%
	2-3 times a week	11%	17%	9%
	Weekly	17%	21%	7%
	Monthly	30%	42%	12%
	Never	38%	13%	71%
Amount of use	Half an hour (Cycle:9km;Walk:3km;Jog:5km)	33%	31%	49%
	One hour (Cycle:18km;Walk:5km;Jog:12km)	51%	56%	50%
	Two hours (Cycle:36km;Walk:10km;Jog:20km)	15%	14%	1%
	Active for more than two hours	1%	0%	0%
Amount of activity above usual level	No more than usual	21%	43%	37%
	10 per cent more	7%	7%	6%
	25 per cent more	11%	9%	13%
	50 per cent more	11%	13%	19%
	100 per cent more	18%	14%	9%
	No previous level of activity	32%	14%	16%

Source: AERU

Combining the information in Table 7 with the savings rates per km, we estimate annual average health savings per individual user as:

- \$587 for Cycling
- \$398 for Walking
- \$192 for Jogging<sup>25</sup>

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<sup>25</sup> We assume the same rate of public health cost savings as for walking, \$1.30/km

### *Christchurch Aggregate Benefits*

This section estimates the level of total benefits to Christchurch from attributes of a recreation reserve in the ARRRZ. In order to aggregate the marginal household level values given in Table 7 up to the population level, assumptions have to be made about the non-respondents who did not return the survey<sup>26</sup>. For illustrative purposes, we apply a common approach to account for the values held by non-respondents (Mitchell and Carson, 1989). In Table 8 we have estimated aggregate values for Christchurch<sup>27</sup>. If 0 is used as a multiplier, we assume that non-respondents are not willing to pay anything; this would imply that they get no benefits from a reserve or any associated amenities. If the multiplier is 0.5, we assume that each non-respondents' WTP is half of the WTP of a sample respondent. The third assumption is that non-respondents have the same average WTP as respondents and the multiplier is 1.

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<sup>26</sup>This is a common issue for all sample surveying. When individuals selected in the sample do not complete the survey there is a potential for bias to result from this non-response. Non-response bias occurs when the estimated value differs from the population value due to differences between respondents and non-respondents.

<sup>27</sup> Assuming 150,000 households.

Table 8: Christchurch aggregate reserve benefits

Attribute	Values in \$Million per annum		
	Non-respondent Multiplier		
	0	0.5	1
Cycle/walking/jogging paths	\$0.7	\$2.9	\$5.1
Water based opportunities	\$0.3	\$1.3	\$2.3
Improved river water and habitat quality	\$0.4	\$1.7	\$3
Mostly native plants and habitat	\$0.6	\$2.7	\$5.7
Restoration of wetlands	\$0.3	\$1.2	\$2.2
Preservation of heritage gardens including flowers and fruit	\$0.7	\$2.8	\$4.9
Paths connecting CBD to Brighton and beyond to South Shore, Bottle Lake	\$0.4	\$1.6	\$2.8
Cafes	\$0.2	\$1	\$1.8
80 per cent in Park	\$0.2	\$0.9	\$1.6
100 per cent in Park	\$0.4	\$1.8	\$3.1
Regular festivals and markets	\$0.5	\$2.1	\$3.6
Community food gardens	\$0.2	\$1	\$1.8
Total	\$4.7	\$20.1	\$36.3

Source: AERU.

To form an estimate of public health cost savings at the Christchurch population level requires an estimate of the total number of recreationalists that would use the reserve, and how much additional activity they would undertake. We consider the total pool of possible recreationalists as those residents aged between 18 and 74 years old<sup>28</sup> who currently cycle, walk or jog. The SPARC NZ 2007/08 Active New Zealand survey<sup>29</sup> estimates that 23 per cent, 66 per cent and 17 per cent of the general adult population participate in cycling, walking and jogging respectively. We then assume that the proportion of these recreationalists that would use the reserve is the same as that found in the survey. These steps provide an estimate of the total number of reserve users.

<sup>28</sup> In the survey, 83 per cent of respondents participating in at least one activity were aged between 18 and 74 yrs. old. This finding was consistent across activities.

<sup>29</sup> Published online at [www.activenzsurvey.org.nz](http://www.activenzsurvey.org.nz)

To estimate the number of these users that would undergo activity additional to their usual levels we adopt the rates of additional use found in the survey. Multiplying this total number of users by the individual average savings, yields total annual savings generated of:

- \$16.1 million from cycling
- \$32.7 million from walking
- \$1.5 million from jogging<sup>30</sup>

These estimates appear reasonable when compared against the current public health budget for Christchurch over the current financial year of \$1.2 billion, or about \$3,500 per person.

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<sup>30</sup> The margin of error for these estimates is 5.7%. This means that there is a 95% probability that the true value lies in the range  $\pm 5.7\%$  of the average value reported here.

## Conclusions

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This research has demonstrated significant public desire and support for the development of a recreation reserve in the Avon River Residential Red Zone. Support is strongest for a unique natural environment with native fauna and flora, healthy wetlands and rivers, and recreational opportunities that align with this vision, such as walking, cycling and water-based sporting and leisure activities. The research also showed support for a reserve that promotes and enables community interaction and wellbeing, and is evident in respondents' desires for community gardens, regular festivals and markets, and the physical linking of the CBD with eastern suburbs through a green corridor. There is less support for children's playgrounds, sports fields or open grassed areas, all of which could be considered as more typical of an urban park development.

- Benefits (willing to pay) to Christchurch residents (excluding tourists) of a recreation reserve could be as high as **\$35 million** each year.
- Savings to public health costs could be as high as **\$50.3 million** each year.
- The incorporation or restoration of various ecosystems services, including water quality improvements, flood mitigation and storm water management could yield a further **\$8.8 million** (\$19, 600) per hectare/year at 450 ha).

Combined annual benefits of a recreational reserve in the ARRRZ are approximately **\$94.1 million per annum** but this figure does *not* include potentially significant benefits from, for example, tourism, property equity gains in areas adjacent to the reserve, or the effects of economic rejuvenation in the East.

Although we were not able to provide costing estimates for park attributes, this study does make available the value of benefits, which can be used as a guide to the scope of expenditure on development of each park attribute.

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# Appendix 1: The Avon-Otakaro Network (AvON) Charter

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## CHARTER

*This Charter represents the current Vision, Aim and Objectives of the Avon-Ōtākaro Network, it is a living document that will evolve over time.*

### **Vision**

To promote the future use of the Ōtākaro/Avon River and the surrounding red zone lands as an ecological and recreational reserve for the community.

### **Aim**

We wish to establish a community-driven, science-informed living memorial to rejuvenate and nurture the long-term environmental, economic, community and spiritual wellbeing of the eastern suburbs and greater Christchurch.

We aim to create a place of hope and inspiration for the people of Christchurch by restoring health and vitality to our river and its lands.

### **Membership**

Avon-Ōtākaro Network (AvON) is a network of individuals and organisations, founded in 2011 by:

- Avon River Park Facebook Group
- River of Life
- Campaign for a Memorial Reserve Covenant

## **Background**

In June 2011 the Government announced that more than 5000 homes would have to be abandoned within a ribbon of residential “red zone” that tracks east from the CBD along the banks of the Ōtākaro/Avon River and some of its tributaries (from now referred to as the Ōtākaro/Avon River Red Zone). This left many residents devastated and their communities decimated. The reason for abandoning red-zoned land was that it is too damaged to be economically remediated for residential redevelopment at present.

Since the announcement, Canterbury Earthquake Recovery Minister Gerry Brownlee has indicated that the land is to be cleared, fenced and grassed, pending a decision on its long-term future. This leaves the possibility that some of the land may be remediated and redeveloped for residential use in the long term.

Public feedback via the Share an Idea campaign identified very high levels of support for:

- community input into the future of the city;
- a greening of the city;
- continuous parklands along the banks of the Ōtākaro/Avon River from source to sea; and
- extensive cycle and walkways along the river.

The ideas listed above are featured prominently in the Central City Plan, particularly in relation to the Papawai Ōtākaro/Avon River Park project and green frame, however the objectives of the network are also consistent with a range of other popular initiatives including Greening the Rubble, Gap Filler, Building Resilient Communities, the Avon-Heathcote Estuary Ihutai Trust and Sustainable Otautahi Christchurch. As well, more than 95% of those responding to a Facebook question indicated the Ōtākaro/Avon River Red Zone land should become a park/reserve and more than 18,000 people signed a petition to Parliament to this effect.

Te Ngāi Tūāhuriri Rūnanga and Te Rūnanga o Ngāi Tahu support the proposed Papawai Ōtākaro project within the Central City Plan and have also submitted to CERA about the need for specific recovery planning for the natural environment, including a focus on the potential restoration of the Ōtākaro as it relates to the residential red zone.

## **Objectives of the Avon-Ōtākaro Network**

1. To advocate for the Ōtākaro/Avon River and the surrounding red zone lands to become a publicly owned ecological and recreational reserve, running from the proposed Papawai Ōtākaro/Avon River Park in the CBD, through to the coast.

2. To work with Te Ngāi Tūāhuriri Rūnanga and Te Rūnanga o Ngāi Tahu on their vision for the Ōtākaro and ensure the incorporation of cultural heritage and values are included within the development of an Ōtākaro/Avon River Park.
3. To promote the establishment of a broad, continuous, natural corridor of indigenous habitat as appropriate to the historic ecology of the Ōtākaro/Avon River and its catchment, including Te Ihutai/Estuary, with specific regard to enhancing water quality and indigenous biodiversity.
4. To advocate for definitive and timely decisions regarding the long-term future use of the Ōtākaro/Avon River and residential red zone lands, to provide certainty and confidence for those having to abandon the lands, those living in adjoining communities and greater Christchurch.
5. To quantify and disseminate findings about the economic value of this initiative in terms of wetland management, biodiversity, water quality, carbon economics, cultural, recreational and community assets, health, tourism, education, employment and small business.
6. To promote a widely supported, multi-purpose amenity by incorporating, where appropriate, other desires raised by the people of Christchurch for the future use of this red zone land, including (but not limited to):
  - a) A continuous network of pedestrian paths and cycle ways from CBD to coast as both a recreational and tourism asset, able to interconnect with similar networks in the north, south and west;
  - b) Land and water-based recreational facilities and amenities for the health, wellbeing and further development of the community;
  - c) Some exotic parkland (possibly retaining existing trees and other plants from the abandoned gardens of Red Zone residents);
  - d) Entertainment, recreational, and commemorative events, such as the Spring River Festival, Christchurch Marathon and River of Flowers;
  - e) Food resilience and sustainability with provision for communal gardens and allotments;
  - f) A living memorial to those who lost their lives and homes in the earthquakes;
  - g) Art, craft and cultural amenities that reflect our diverse heritage;
  - h) Promotion of learning and research opportunities in social and environmental studies and community resilience, for all levels of education.
7. To promote these initiatives as a seamless extension of complementary initiatives in the CBD and elsewhere along the river, estuary and coastal systems of the region.
8. To integrate the multipurpose objectives into a coherent spatial plan for the Ōtākaro/Avon River and the surrounding red zone lands incorporating the above.

## **Statement of Support**

The focus of AvON is the future use of the Ōtākaro/Avon River Red Zone. However, we acknowledge the plight and pain of those of us who have had to abandon red zone homes, and the financial difficulties many faced in doing so. We hope that by working to ensure the land becomes a place of beauty and pride, we can give some comfort and peace to those directly affected. We offer our support to those individuals and groups focused on negotiating and advocating for the best possible housing outcomes for all.

## **Contact**

Email: [AvonOtakaro@gmail.com](mailto:AvonOtakaro@gmail.com)

Website: [www.avon.org.nz](http://www.avon.org.nz)



## Appendix 3: Choice modelling survey

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Agribusiness and Economics Research Unit  
PO Box 85084  
Lincoln University  
Lincoln 7647  
Canterbury

### **Welcome to a survey on the potential uses of the Avon River Residential Red Zone**

Dear Sir/Madam

Following the residential red zone decisions, there has been a great deal of discussion around the choices and opportunities we face about the future use of the land along the Avon river, from Barbadoes St in the Central Business District to eastern suburbs such as New Brighton and Southshore (as shown in the map in the accompanying survey booklet).

This survey will help us to understand what residents view as important in the redevelopment of this area.

It takes about 10-15 minutes to complete and we will be grateful for your contribution. A free-post envelope to return completed surveys is provided. You do not have to participate, and you have the right to decline to answer any question.

This survey is being conducted by Lincoln University in New Zealand. Data will be held on a secure server on the University campus. The survey is anonymous and confidential, it does not collect identifying information and your responses cannot be linked to you. It has been approved by the Lincoln University Human Ethics Committee.

The researchers are Dr Suzanne Vallance and Dr Peter Tait. If you have any questions or concerns about the research, please contact them at:

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Completion of the survey will be taken as your consent to participate in this research. Thank you for your participation.

If you would prefer to answer this survey online you can use this survey link:

Following the devastating earthquakes of September 2010 and February 2011, a large area along the Avon River has been designated as a red-zone and cleared of buildings. This area is shown as the red shaded area in the map on the cover page of this survey booklet.

You are invited to participate in a survey assessing Christchurch residents' preferences for different redevelopment options for the residential red-zone along the Avon River. We want to know your views on different redevelopment options. This will help to manage this resource the way residents want.

Please complete this questionnaire, even if you think you don't know much about red-zone development. We need answers from all types of people to ensure we are representing the views of most residents. There are no wrong or right answers.

**1**

**What do you think are the most important aspects of the redevelopment of the residential red-zone along the Avon River?**

To indicate which aspects are important to you, write a number next to the relevant aspects below. Place a '1' next to the aspect you think is most important, and a '2' next to the second most important aspect etc. Place numbers next to as many aspects as you want.

- Attracting tourists
- Improving river water and habitat quality
- Having a 'living' earthquake memorial
- Rejuvenating and connecting with the eastern suburbs
- Establishing community gardens/allotments
- Preserving cultural and heritage values
- Protection from flooding and storm surge
- Encouraging commercial enterprises
- Rebuilding residential houses
- Providing recreational opportunities
- Restoring wetlands
- Providing community meeting places and events
- Creating a nature reserve

## 2

### Comparing Options

The next set of questions asks you to make choices between two possible options. Each option describes how the Avon River red-zone could be redeveloped.

Each option is described in terms of eight redevelopment outcomes:

- The percentage of red-zone land used as a park versus for residential housing
- Recreational activities
- Enhanced community engagement
- Environmental enhancement
- Heritage preservation
- Connection with eastern suburbs
- Commercial activities
- The annual financial contribution that each household would make either via rates or rent to achieve redevelopment options preferred by the community

**For each question please select the option you prefer the most.**

Whilst you may not want either option, selecting one is important because, when your answers are placed alongside others, it will help us to build a picture of the value that the community places on alternative redevelopment options.

There are no trick questions or correct/incorrect answers – we are just trying to understand the value to the community of various options.

Choice Task 1 of 7

<b>Which Option Would You Choose?</b>	<b>Option A</b>	<b>Option B</b>
<b>Distribution between Park usage and Residential housing</b>	60% Park usage / 40% Residential housing	100% Park usage
<b>Recreational Activities</b>	Cycle/walking/jogging paths	Sports fields Water based opportunities Children’s playground Open grassed areas
<b>Enhanced Community Engagement</b>	Regular festivals and markets	Community food gardens Community meeting places
<b>Environmental Enhancement</b>	Mostly native plants and habitat	Restoration of wetlands
<b>Heritage Preservation</b>	Heritage gardens including flowers and fruit	Important Māori food gathering sites
<b>Connection with eastern suburbs</b>	Paths connecting CBD to Brighton	Paths connecting CBD to Brighton
<b>Commercial Activities</b>	Tourist focused businesses	Cafes
<b>Annual rates cost to your household</b>	\$60	\$60
<b>Your Choice</b>	<input type="checkbox"/>	<input type="checkbox"/>

Choice Task 2 of 7

<b>Which Option Would You Choose?</b>	<b>Option A</b>	<b>Option B</b>
<b>Distribution between Park usage and Residential housing</b>	100% Park usage	60% Park usage / 40% Residential housing
<b>Recreational Activities</b>	Sports fields Water based opportunities Open grassed areas	Cycle/walking/jogging paths Children's playground
<b>Enhanced Community Engagement</b>	Regular festivals and markets Community food gardens Community meeting places	No enhancement
<b>Environmental Enhancement</b>	Improved river water and habitat quality Mostly native plants and habitat Restoration of wetlands	No environmental enhancement
<b>Heritage Preservation</b>	Heritage gardens including flowers and fruit	Important Māori food gathering sites
<b>Connection with eastern suburbs</b>	Paths connecting CBD to Brighton and beyond to Southshore, Bottle Lake	No connection
<b>Commercial Activities</b>	Cafes	Tourist focused businesses
<b>Annual rates cost to your household</b>	\$80	\$60
<b>Your Choice</b>	<input type="checkbox"/>	<input type="checkbox"/>

**Choice Task 3 of 7**

<b>Which Option Would You Choose?</b>	<b>Option A</b>	<b>Option B</b>
<b>Distribution between Park usage and Residential housing</b>	80% Park usage / 20% Residential housing	80% Park usage / 20% Residential housing
<b>Recreational Activities</b>	Cycle/walking/jogging paths Children’s playground	Water based opportunities Open grassed areas
<b>Enhanced Community Engagement</b>	Regular festivals and markets Community food gardens Community meeting places	No enhancement
<b>Environmental Enhancement</b>	Restoration of wetlands	Improved river water and habitat quality Mostly native plants and habitat
<b>Heritage Preservation</b>	Important Māori food gathering sites	Heritage gardens including flowers and fruit
<b>Connection with eastern suburbs</b>	Paths connecting CBD to Brighton and beyond to Southshore, Bottle Lake	Paths connecting CBD to Brighton
<b>Commercial Activities</b>	Tourist focused businesses Cafes	Tourist focused businesses Cafes
<b>Annual rates cost to your household</b>	\$40	\$40
<b>Your Choice</b>	<input type="checkbox"/>	<input type="checkbox"/>

**Choice Task 4 of 7**

<b>Which Option Would You Choose?</b>	<b>Option A</b>	<b>Option B</b>
<b>Distribution between Park usage and Residential housing</b>	100% Park usage	60% Park usage / 40% Residential housing
<b>Recreational Activities</b>	Cycle/walking/jogging paths Sports fields Water based opportunities Children’s playground Open grassed areas	Open grassed areas
<b>Enhanced Community Engagement</b>	No enhancement	Regular festivals and markets Community food gardens Community meeting places
<b>Environmental Enhancement</b>	Improved river water and habitat quality	Mostly native plants and habitat
<b>Heritage Preservation</b>	No heritage protection	Heritage gardens including flowers and fruit Important Māori food gathering sites
<b>Connection with eastern suburbs</b>	Paths connecting CBD to Brighton	No connection
<b>Commercial Activities</b>	Tourist focused businesses	Cafes
<b>Annual rates cost to your household</b>	\$20	\$40
<b>Your Choice</b>	<input type="checkbox"/>	<input type="checkbox"/>

**Choice Task 5 of 7**

<b>Which Option Would You Choose?</b>	<b>Option A</b>	<b>Option B</b>
<b>Distribution between Park usage and Residential housing</b>	80% Park usage / 20% Residential housing	80% Park usage / 20% Residential housing
<b>Recreational Activities</b>	Water based opportunities Children's playground	Cycle/walking/jogging paths Sports fields Open grassed areas
<b>Enhanced Community Engagement</b>	Community food gardens Community meeting places	Regular festivals and markets
<b>Environmental Enhancement</b>	No environmental enhancement	Improved river water and habitat quality Mostly native plants and habitat Restoration of wetlands
<b>Heritage Preservation</b>	No heritage protection	Important Māori food gathering sites
<b>Connection with eastern suburbs</b>	Paths connecting CBD to Brighton	Paths connecting CBD to Brighton
<b>Commercial Activities</b>	No commercial activities	Tourist focused businesses Cafes
<b>Annual rates cost to your household</b>	\$60	\$80
<b>Your Choice</b>	<input type="checkbox"/>	<input type="checkbox"/>

Choice Task 6 of 7

Which Option Would You Choose?	Option A	Option B
<b>Distribution between Park usage and Residential housing</b>	80% Park usage / 20% Residential housing	80% Park usage / 20% Residential housing
<b>Recreational Activities</b>	Children’s playground Open grassed areas	Cycle/walking/jogging paths Sports fields Water based opportunities
<b>Enhanced Community Engagement</b>	No enhancement	Regular festivals and markets Community food gardens Community meeting places
<b>Environmental Enhancement</b>	Improved river water and habitat quality Restoration of wetlands	Mostly native plants and habitat
<b>Heritage Preservation</b>	Heritage gardens including flowers and fruit Important Māori food gathering sites	No heritage protection
<b>Connection with eastern suburbs</b>	Paths connecting CBD to Brighton and beyond to Southshore, Bottle Lake	Paths connecting CBD to Brighton and beyond to Southshore, Bottle Lake
<b>Commercial Activities</b>	No commercial activities	Tourist focused businesses
<b>Annual rates cost to your household</b>	\$20	\$40
<b>Your Choice</b>	<input type="checkbox"/>	<input type="checkbox"/>

**Choice Task 7 of 7**

<b>Which Option Would You Choose?</b>	<b>Option A</b>	<b>Option B</b>
<b>Distribution between Park usage and Residential housing</b>	100% Park usage	60% Park usage / 40% Residential housing
<b>Recreational Activities</b>	Sports fields	Cycle/walking/jogging paths Water based opportunities Children's playground Open grassed areas
<b>Enhanced Community Engagement</b>	Community food gardens	Regular festivals and markets Community meeting places
<b>Environmental Enhancement</b>	Improved river water and habitat quality Mostly native plants and habitat	No environmental enhancement
<b>Heritage Preservation</b>	Important Māori food gathering sites	Heritage gardens including flowers and fruit
<b>Connection with eastern suburbs</b>	No connection	Paths connecting CBD to Brighton and beyond to Southshore, Bottle Lake
<b>Commercial Activities</b>	Cafes	No commercial activities
<b>Annual rates cost to your household</b>	\$80	\$80
<b>Your Choice</b>	<input type="checkbox"/>	<input type="checkbox"/>

3

In the previous Choice Tasks, were there any redevelopment outcomes that you ignored when making your choices? Select as many as applicable.

- Distribution between Park usage and Residential housing
- Recreational Activities
- Environmental Enhancement
- Heritage Preservation
- Connection with eastern suburbs
- Commercial Activities
- Annual rates cost to your household
- Enhanced Community Engagement

4

If the red-zone redevelopment had the type of cycling paths described in this survey, how often would you cycle on them?

- Daily
- 2-3 times a week
- Weekly
- Monthly
- Never (*skip to question 7*)

5

What amount of cycling would you do on each occasion?

- Cycle for about half an hour (approx. 8 - 10km)
- Cycle for about an hour (approx. 16 - 20km)
- Cycle for about two hours (approx. 32 - 40km)

6

How does this level of cycling compare to what you would have done in the absence of these new paths?

- The same amount
- About 10% more
- About 25% more
- About 50% more
- Twice as much
- I wouldn't have cycled otherwise

7

If the red-zone redevelopment had the type of walking paths described in this survey, how often would you walk on them?

- Daily
- 2-3 times a week
- Weekly
- Monthly
- Never (*skip to question 10*)

8

What amount of walking would you do on each occasion?

- Walk for about half an hour (approx. 2 - 3km)
- Walk for about an hour (approx. 5km)
- Walk for about two hours (approx. 9 - 13km)
- Other, please state \_\_\_\_\_

9

How does this level of walking compare to what you would have done in the absence of these new paths?

- The same amount
- About 10% more
- About 25% more
- About 50% more
- Twice as much
- I wouldn't have walked otherwise

10

If the red-zone redevelopment had the type of jogging paths described in this survey, how often would you jog on them?

- Daily
- 2-3 times a week
- Weekly
- Monthly
- Never (*skip to question 13*)

11

What amount of jogging would you do on each occasion?

- Jog for about half an hour (approx. 4 - 6km)
- Jog for about an hour (approx. 8 - 12km)
- Jog for about two hours (approx. 16 - 24km)
- Other, please state \_\_\_\_\_

12

How does this level of jogging compare to what you would have done in the absence of these new paths?

- The same amount
- About 10% more
- About 25% more
- About 50% more
- Twice as much
- I wouldn't have jogged otherwise

To finish up we would like to ask a few questions about you. These questions allow us to check that we have a representative sample of people. **Remember your responses are confidential and anonymous.**

13

Are you Female  Male

14

What is your year of birth? \_\_\_\_\_

15

What country were you born in? \_\_\_\_\_

16

What ethnic group(s) do you identify with? \_\_\_\_\_

17

How many adults (18 and over) \_\_\_\_\_ and children \_\_\_\_\_ live in your household?

**18**

Please select the highest level of formal education you have completed (or the equivalent outside of New Zealand).

- High school
- Trade/technical qualification or similar
- Undergraduate diploma/certificate/degree
- Postgraduate degree

**19**

Please select the option that best describes your current situation.

- Unemployed
- Retired
- Unpaid voluntary work
- Student
- Paid employment
- Home duties
- Self-employed
- None of the above

**20**

Please indicate your household yearly income from all sources before tax.

- Loss
- \$0 to \$20,000
- \$20,001 to \$40,000
- \$40,001 to \$50,000
- \$50,001 to \$70,000
- \$70,001 to \$100,000
- \$100,001 or more

**Thank you very much for your cooperation and contribution to this project. If you have any questions or comments please feel free to contact the author or write them below.**

**Please return this survey by placing it in the freepost envelope provided as soon as possible.**

**You can contact the researchers at:**

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**The survey can also be completed online at:**

**<http://tinyurl.com/RedZoneSurvey>**

