

BUILDING RESILIENCE INTO A RIGID FLOOD MANAGEMENT SYSTEM: LESSONS FROM THE RIVERLINK PROJECT

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ABSTRACT

Flood management strategies often conflict with environmental dynamics by taking them out of play using 'defensive' engineering solutions to resist the effects of severe flooding and erosion. In addition to the loss of ecological health and function, an unintended consequence of a defensive river system is disconnection with people and place. Defence mechanisms including stopbanks, monoculture edges, and manicured floodplains are static solutions to a dynamic problem. They create barriers for connectivity with the river and are a management approach focused on control of the natural environment. In this system the river loses its voice, riverside space becomes sterile and nature is unable to contribute to social health and wellbeing.

A multi-disciplinary team of designers, ecologists, and engineers are working to envision a diversified and more resilient future for the Hutt River/Te Awa Kairangi with the RiverLink project. Using a holistic approach that balances development and ecosystem services, design solutions aim to bring out the river voice through inclusion of ecological function in the landscape, creating a manifold of public spaces along the river without compromising the flood management framework. Site elements foster ecological and social benefits with the inclusion of riparian wetlands to treat urban runoff and improve flood capacity, native species revegetation to enhance biological and landscape diversity, and a range of recreational and passive spaces that improve visual and physical connections between the city edge and the river. In order to complete the full description of resilience by ensuring that solutions respond to community and tangata whenua values, a comprehensive engagement approach is being undertaken. Inclusive visioning for the space may become a model for an integrated approach to improve the health and resilience of communities through the enhancement of ecosystem services and giving a voice to the river

KEYWORDS

Hutt River, ecosystem services, river floodplain biodiversity, riparian wetlands, community engagement, linear park, promenade, mixed-use development, multi-functional public space, river access, WSUD

PRESENTER PROFILE

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Alistair Allan is an Engineering Team Leader with Greater Wellington Regional Council. Alistair has close to 10 years' experience of river and floodplain management in NZ. He has had an unusual career path coming from an engineering degree but having moved into working with start-up companies for the first half of his career before shifting to working with rivers and the natural environment after moving to NZ.

1 FLOOD MANAGEMENT

1.1 TRADITIONAL FLOOD MANAGEMENT – A MODIFIED HISTORY

Throughout history, humans have modified rivers in an attempt to tame these dynamic systems to suit society's needs. We have confined, impeded and altered the natural course and variability of many of our river systems, often to a degree that their original form and the way they once shaped the landscape are hardly discernible (Pinter, 2005). Specifically, traditional flood management strategies have used defensive engineering solutions such as stopbanks, dams, and bank stabilization measures to resist the effects of severe flooding and erosion (Susan Bolton and Jeff Shellberg, 2001). These strategies have significantly modified the timing and magnitude of river's physical processes, consequently altering the ecology of the river system.

The variability of a river's flow over time and space delineates its natural flow regime. This flow regime plays a fundamental role in regulating geomorphic and ecological processes that shape river channels and support aquatic life (Palmer et al., 2008). Water and sediment transport both within the river channel and between the channel and floodplain largely define riparian habitat. (Poff et al., 1997). Under natural conditions rivers and their floodplains are biodiversity hotspots, with a mosaic of productivity, diversity, and connectivity (Zevenbergen et al., 2008). The responsive and dynamic flow regime also allows the system to absorb disturbances and buffer an ecosystem and surrounding landscape from the impacts of flooding.

Traditional flood management practices often take these natural dynamics out of play by creating a more uniform flow regime and significantly reducing or eliminating floodplains and their wetland margins (Walsh, 2000). Consequently, the natural processes of sediment erosion, transport and deposition and structure of floodplain vegetation that support instream and terrestrial habitat are compromised. The removal of the natural filtration and attenuation processes that riparian wetland systems provide have also led to a decline in water quality, further advancing environmental degradation and loss of biodiversity (Allan and Flecker, 1993). Traditional practices have essentially replaced naturally biologically diverse areas with a simplified landscape.

In addition to the loss of ecological health and function, an unintended consequence of a defensive river system is the disconnection with people and place. The 'utilitarian' flood management components ultimately outweighed considerations of sociability and beauty. This single function approach focused on minimising risk by creating an environment to move large volumes of water quickly through the landscape with minimal obstructions such as permanent structures and vegetation, consequently transforming river systems into ignored backwater areas of cities (Prominski et al., 2012). Stopbanks, heavily armed edges, and monoculture landcover often impeded both physical and visual connections, severing areas along the river margins from the urban centre. The spatial configuration of a flood system essentially created marginal zones of leftover, 'in between areas' with limited amenities. Often lacking connections to place, people regularly moved through a floodway landscape in a similar rhythm to the river, linearly and swiftly.

1.2 FROM STATIC TO RESILIENT – THE PARADIGM SHIFT

Current trends in population growth and urbanisation, loss of native biodiversity, and increased disaster risk associated with climate change have highlighted the vulnerability of urban centres along waterways. These communities, which are on the frontline of the Anthropocene, are increasingly losing their capacity to deal with the unpredictability, increased frequency, and intensity of storms. Because risk and uncertainty are

inevitable, there is a need to be flexible and adaptive, shifting flood management strategies from the realm of static to resilient (Reed, 2015).

Resilience in this context is defined as the ability to adapt to a number of possible effects and to absorb those effects, while maintaining the majority of structures and functions (Reed and Lister, 2014). It is both ecological and societal, referring to the capacity for ecosystem services, individuals, communities, and businesses to survive fluctuating, often disruptive forces. An ecosystem service approach that addresses the link between ecosystems and human well-being is the focus of new management strategies in Europe and North America.

In many cases urban problems, including flooding, originate from disturbances to ecological systems and cascade into social and economic plights (McGregor, 2015). This complex and interconnected relationship has signalled a shift towards a more holistic flood management strategy. Modern approaches seek to re-establish hydrological dynamics and ecological values and functions that address biodiversity and water quality as well as flooding. Often this is achieved by reconnecting rivers and their floodplain and re-establishing wetland margins and native vegetation species.

Flood management strategies overseas have reached beyond solutions of landscape patterns and processes that support human well-being to include 'place-based', multi-purpose environments. These include layers of recreational, cultural, educational, and aesthetic experiences. Through design language, these spaces often become the means of transferring ecological literacy to human society. This holistic approach allows strategies to meet societal needs while incorporating ecosystem function.

Contemporary urban flood risk is a multifaceted, "wicked" problem with interconnected social, cultural, ecological and economic systems. Because of this complexity, solutions necessitate the following considerations: 1) they can no longer be static, but must be adaptive and responsive to the constantly changing socio-ecological domain, 2) they can no longer be solved in isolation, but require an integrated approach involving a multitude of disciplines, and 3) They must incorporate trade-offs because the values of these systems are often in conflict with one another. Like many other urban problems, flood management must consider hybrid ways to engage people, ecologies, and infrastructure in a collaborative manner.

2 HUTT RIVER/TE AWAKAIRANGI

2.1 LIFE GIVER AND TAKER

Te Awa Kairangi, the Hutt River, has been on a long journey. Its Maori name stems from its role as a giver of life and source of food. Its European name derives from Sir William Hutt, a non-resident chairman of the New Zealand Company in the 1840's.

The influence of the river on human settlement adjacent to it has evolved over time. Maori settlement existed in a situation where the river exerted a great influence over lives and livelihoods and a co-existence type relationship evolved. As populations grew, particularly after the arrival of European settlers this relationship changed. The new arrivals lack of understanding and experience with the river is best exhibited by the plans for the town of Britannia, which were soon abandoned and replaced with what the settlers thought to be a better plan for the settlement of Britannia, however this shortly led to loss of life and property. However, with the new arrivals came a different expectation, experience and their use of technology developed in Europe led to the settlers having a greater influence over the river, leading eventually to the formation of

one of New Zealand's most densely populated floodplains and the associated creation of a river and flooding control method learned from Europe that kept the river and flooding away from people.

2.2 A BREAK IN RELATIONSHIP

The approach to keeping the river away from people involved the creation of a system of flood banks to ever increasing heights, the dredging and channelising of the river, and the hardening of its edges with erosion protection structures. The river was troublesome, and as a result became an area of lesser value to communities and attracted waste disposal and industrial activities particularly along its lower reaches, in general the communities of the Hutt valley had turned their backs on the river and built their barriers to keep it away higher and stronger, although pockets had been retained for sport and recreation.

Changes in flood risk management and environmental management practices in the 1990's altered this approach, and as a result of these changes Greater Wellington Regional Council now aims to keep people and development away from flood waters, rather than keeping floodwaters away from people. In the Hutt Valley the river and community are now neighbours sharing a stopbank fence, now looking for opportunities to reduce the impact of that barrier, and see what each can offer the other for mutual benefit.

2.3 A WAY FORWARD

This approach started to influence the Hutt River in a strategic way from 1995, with the commencement of development of the Hutt River Floodplain Management Plan. While the core of this plan looks to address the modernisation, improvement, and strengthening of the stopbanks and physical protection methods employed to keep flood waters away from people, it brought into play tools to bring land adjacent to the river into public ownership, recommendation of controls on development in flood prone areas, recognition of environmental, social and cultural values of the river and the importance of using both 'soft' and 'hard' edge type protections.

This recognition of river values, support of the Resource Management Act and an approach that balanced 'soft' and 'hard' edge types has meant that the river has slowly changed from a neglected state to a popular green space adjacent to the city, which is widely used for a whole range of recreation activities.

Twenty years has passed since these changes started to take shape and both the value awareness of the river and the nature of the managed hazard has shifted. Concepts around water quality and a public demand to see improvements in these that form part of national debate have an opportunity to take shape through large scale capital investment projects such as RiverLink, and development of methods to tackle the impacts of climate change are an outcome expected of the design teams. This improving cycle of change makes us and the river better neighbours. The efforts made to work with natural process to improve water quality, to respond to climate change and to strengthen broad scale river value leads to greater human and natural system resilience.

3 RIVERLINK PROJECT

3.1 PROJECT OVERVIEW

RiverLink is a flood protection project that strives to achieve a more resilient future for the Hutt River/Te Awa Kairangi. The project is located along a 3km stretch of the Hutt River between Kennedy Good Bridge and Ewen Bridge near the Hutt City Central Business District (CBD).

The design team is a multi-disciplinary group of consultants led by Boffa Miskell. This group, coupled with the guidance and expertise within GWRC, HCC, and respective communities, have embraced and contributed to a shift in thinking towards a more integrated river landscape with a focus on value and resilience. Using a holistic approach, design solutions aim to reveal the river “voice” through the inclusion of ecological function within the development of public spaces and social amenities, while providing a stronger connection between the river and Hutt City.

3.2 PHILOSOPHICAL APPROACH

The design of the RiverLink Project is grounded by a philosophical approach that strives to balance flood control, land development, and enhancement of ecosystem services to improve the health and resilience of communities and reconnect people to the river through ‘place-making’. Through the reintroduction and enhancement of ecosystem services into the urban fabric, the environment may become better equip to withstand and absorb effects associated with unpredictable change of a dynamic river ecology. Landscapes that can absorb internal fluxes rather than resist them will allow the community to adapt to change, ultimately improving their resiliency.

In order to complete the full description of resilience, design solutions need to respond to social and cultural ecosystem services through recognition of community values. Shaping the public realm to maximize shared value is achieved through a participatory decision-making community engagement process (James S. Gruber, 2010). This inclusive method often reveals landscape and cultural assets, strengths and resources, while helping to build a place-based design language. It is through this language that landscape patterns and processes are understood and embraced by society. Ultimately, this process helps build social acceptance and ownership, influencing the human propensity to effect landscape change and improve resilience (Paul H. Gobster et al., 2007).

3.3 GOALS AND OBJECTIVES

RiverLink follows previous scoping exercises which looked at the opportunities for flood control, transport, ecological and public amenity improvements based on the objectives set out in the Hutt Valley Flood Management Plan 2001 [HVFMP] and Making Places 2009 documents. This earlier work formed the basis for the Preliminary Concept Design brief and initial vision for RiverLink and contained the following key objectives:

- 1:440 year return flood protection. Equating to 90+ years protection (incl. climate change)
- New Pedestrian/cycle bridge connecting potential changes to rail facilities and Lower Hutt City
- Development of river linear park with ecological and social amenity improvements
- Development of a promenade/ urban landscape alongside the Lower Hutt City edge to the river to provide an improved interface between the city and the river.

Guided by these high end objectives and river model flood management framework, a team of landscape architects and ecologists at Boffa Miskell interjected ecological, landscape, and social patterns and processes to create public space. The following subset of objectives and methods were outlined for the areas between the river's edge and stop-bank:

Objective: Attenuate and treat urban stormwater

Method: Incorporation of wetlands at stormwater outlets along the river margin and bioretention areas within parking areas.

Objective: Enhance biological diversity and habit

Method: Establish the natural transect of native floodplain vegetation from aquatic to terrestrial to support habitat.

Objective: Re-establish visual and physical connections to the river

Method: Initiate lateral movement towards the river by opening and accentuating viewsheds, establishing pathway connections from the city centre, and creating spaces that people can actively and passively engage with the river along its margin.

Objective: Create a diversity of spaces and activities between the stopbanks

Method: Create a network of pathways linking active and passive spaces between social gathering hotspots.

Objective: Celebrate the history and spirit of place

Method: Ensure that historic and cultural patterns and places are intertwined with a spaces that capture the essence of contemporary Hutt City.

Collectively these objectives help to re-establish and enhance a diversity of ecosystem services that were lost in the single function flood control system. Supporting and provisioning ecosystem services, such as nutrient cycling and water, are generally inherent in river systems that include wetlands and diverse native vegetation. These elements also strengthen regulating ecosystem services namely climate, water quality and air quality, while maintaining flood protection. Lastly, non-material benefits, or cultural services, such as recreation, education, and aesthetics are realised in diversified landscapes. When ecology seamless merges with human occupied areas, the health and resilience of the holistic system are strengthened.

3.4 DESIGN PROCESS

The Preliminary Concept Design process for RiverLink is unique in its integrated nature that strives to reach solutions outside of the historical boundaries of flood management and are based on a deeper understanding of the holistic system. Boffa Miskell alongside GWRC and HCC developed an approach that created multiple opportunities for inter-disciplinary collaboration between the RiverLink team and meaningful community collaboration with the RiverLink team.

3.4.1 RIVERLINK TEAM AND DESIGN PROCESS

The RiverLink team has a diverse group of professionals supported by GWRC, HCC and NZTA officers. The organisations and project team have embraced the integrated nature of the project and have collaborated accordingly to ensure the numerous design challenges across the project are addressed, and a collective outcome is sought. The success of this multi-disciplinary/ integrated approach is due open dialogue, regular workshops and honest face to face meetings where disciplines of involved parties are

present and able to raise their issues concerns and contribute towards aligned solutions. Throughout the project, whole of team workshops have been held at significant milestones points to ascertain the progress made but to also allow for regular team wide collaboration, sharing of ideas and growth of relationships in between the specialist subject meetings.

Boffa Miskell as a lead consultant to the project has been in the fortunate position to instil a landscape and ecology led focus to the project. This has enabled us to act as advocates for this integrated approach to ensure RiverLink is designed with people and communities in mind. We have been able to push for international best practices in Water Sensitive Urban Design, stormwater treatment and people focused space. Too often these methods are subject to value management and are seen to be difficult to implement or maintain. The retention of these elements of design has been supported by GWRC, HCC and NZTA.

3.4.2 COMMUNITY ENGAGEMENT

Community engagement has been an integral part of the Riverlink design process. The integrity and value, collaborating with the community brings to the Riverlink project cannot be understated. Since the inception community engagement has been an ever growing work stream that started from a base of:

- Online media including regular written and animated video updates
- Community-led design workshops and collaborative consultation events
- Digital and analogue surveys of communities and river users
- Place making interventions to demonstrate possibilities offered by the project.

Having a diverse set of engagement methods staggered throughout the design process has helped engage a wider audience of community members and stakeholders, excited and stimulated the imaginations across generations and provided opportunities for their continued involvement for the duration of the project to date and into the future. More importantly, this has empowered the community to take ownership of the future of their 'place', a key element to achieving resilience. Through knowledge gained from the community, the Riverlink team has been able to build a picture of the issues, experiences, opinions and ideas helping to inform the design. This has been particularly useful in understanding how important water quality and general environmental issues were to the community.

Early in the project a webpage was established to issue the project had an online presence. <http://haveyoursay.gw.govt.nz/riverlink> shared with the community background information on the project, updates, related articles, project timeframes and insights into the emerging design. An animated video was produced and updated regular to highlight how the design was progressing.

RiverLink



The RiverLink project will deliver better flood protection, better lifestyle and improved transport links for the people of central Lower Hutt.

You can use this site to read the latest news from the project team and to gain more information about the project and how it affects you.

Greater Wellington Regional Council, Hutt City Council and the NZ Transport Agency are combining their skills and working together on the project, which will bring big benefits to the local and regional Hutt Valley community.

NEWS Q & A NEWSLETTER YOUR FEEDBACK

Earthquake strengthening for stopbanks

4 days ago



The stopbanks did not suffer any damage in the earthquake on 15 November 2016 but we are mindful of the primary fault rupture zone and the new stopbanks will be applying techniques to further enhance their resilience. It's a prudent approach given that much of the land along Pharazyn St and at Melling are astride the Wellington fault and within its "primary fault rupture zone" where there is potential for ground deformation during a rupture of the Wellington fault.

We're taking the opportunity during the preliminary design phase to build in extra strengthening. In the design of stopbanks and associated...

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- Public consultation on flood protection options for the section of flood protection between Kennedy Good and Ewen bridges
- Flood protection Option A agreed with community
- Design Stage 1
- Preliminary design
- Construction begins

Learn more about the Riverlink Project



More about the Riverlink project in Te Reo



Figure 1: RiverLink webpage

Community-led design participation has been mutually invaluable. Not only have these events encouraged the community to contribute ideas and gather knowledge about the project but it has enabled the project to steer the design in the direction of most interest to the community. For example, understanding where the most popular areas for recreations such as fishing, swimming, walking and being able to develop designs in a way that enhances these activities and manages out conflicts between them.

The first collaboration event held shortly after the project began in 2016 was a community-led design workshop. The Riverlink team went to the community with a blank map with the base river extent superimposed and asked the community to draw and place ideas on either a collective or individual maps. The event inspired freeform thinking and built upon the framework envisaged by the project team. At the end of the workshop we had sketches, stickers, imaginings and ideas from nearly 400 minds aged 6 to 60+. The results spoke for themselves and a small selection of the workshop outputs can be seen below:



Figure 2: Collective map showing various ideas placed by the community



Please let us know your answers to the following questions (there's room on the page over to add any other comments too): **PUT YOUR MAP IN THE BOX WHEN YOU ARE DONE**

How important is the revitalisation of the city centre? On a scale of 1 (not important) to 5 (very important). 5

How important is it to connect the city centre to the river? Or a scale of 1 (not important) to 5 (very important). Can you think of any examples where this has been done well? 5

To make it a more vibrant place how important is it to have people living in the city centre? On a scale of 1 (not important) to 5 (very important).

Who do you think could be living in the future city centre if it is vibrant, river-connected with new living options? Do you know of people like this? Young families

What would you like to see in the future city centre? Can you think of any cities that have these qualities? Outdoor recreational spaces

What sort of role should Council have in making a vibrant, river-connected, walkable city centre? Creating public space - good urban dev will follow RIVER SURFING

0 100 200m

Figure 3: Example of individual map showing various ideas placed by the community

During the workshop the community were also asked to vote on images drawn from rivers around NZ and the world. We asked people which were their favourite ideas to inspire the Riverlink design team. The top three images can be seen below:



Figure 4: Top 3 images which received the highest votes

Place making interventions, or trials, have also been planned as another way to engage with the community and to physically demonstrate the ideas and concepts which are emerging from the preliminary concept design process. Ideas which are popular are demonstration of proposed pavement surfaces, river berm plantings for edge formation and recreation, and experimentation with wetlands. The first of these interventions took advantage of the summer, and formed access to the river through a dense willow fringe. This became known as a pop-up beach which created a pleasant lunch spot, but also a venue for summertime activities, council led information and education programmes and featured as a stop on a Hutt Valley art festival.

The Riverlink pop-up beach was positioned near a natural river beach formation close to the Lower Hutt CBD. Willow trees, planted for erosion protection purposes, were removed to improve the visual and physical connection to the river and a retrofitted shipping container, casual seating and project information displays were incorporated into the space. The space was reinforced as a venue by engaging a local artist to illustrate the exterior of the container, and the use of a programme of events, entertainment and food that activated the area and made it a focal point along the river trail adjacent to the CBD. Since being implemented the community have been able to view information about the project and the ideas for that location and experience what changes in the area may create.

A video of the artist creating the mural can be seen here:

<https://www.facebook.com/chimpartist/videos/1619993784685148>



Figure 6: RiverLink pop-up beach

Riverlink continues to strive to find new ways to engage with the community to ensure that all sectors of the community have a chance to not only comment but shape the design of the project.

3.5 MASTERPLAN/KEY ELEMENTS

The elements of the RiverLink project fit within a newly modified river system bound by stop-banks delineating the edge of the floodway. The river channel cross-section was modified to include long sections that form a two tier berm system. Not only will this create an opportunity for a diversity of environments for flora, fauna, and people, but will also provide an extra layer of protection for spaces located in the upper berm section of the floodplain. The masterplan for the RiverLink project incorporates many design components that aim to enhance ecological and social connectivity. Some key elements are discussed below.

3.5.1 WETLANDS

Multi-purpose wetlands are planned to firstly treat urban stormwater in five areas throughout the project, as well as replicate natural wetland communities to increase local biodiversity. The location of the wetlands was determined by the size of the catchment, invert elevation, available space, and incorporation with other project features. Initially, over twenty were considered but five, given the experimental nature of the approach, have been chosen to “test” the concepts in the context of the river system.

Low flow diversions will direct the first flush flows into wetland spaces, while larger flows continue through the primary outlet into the river. Key plant species in the wetland systems include sedge species (*Carex spp.*, *Machaerina spp.*, *Schoenoplectus spp.*), rush species (*Juncus spp.*), Raupō (*Typha orientalis*) and edge species such as Mingimingi (*Coprosma propinqua*), Toe Toe (*Austroderia fulvida*), and Swamp flax (*Phormium tenax*). These species are typical of lower terrace native wetlands and are well evolved to sustain communities through periodic flooding from the river while trapping and treating stormwater flows from urbanised catchments. A focus on the choice and design is on species and communities that will not require frequent maintenance, can compete with exotic invasive semi-wetland species common in the landscape, and are large enough in their own right to be of ecological value to the wider landscape. The wetland plant palette is repeated along the lower berm of the floodplain to continue the design language and habitat connection throughout the linear corridor.

It is important that the wetlands become more than simply a designated area for stormwater treatment, but rather seamlessly merge with the surrounding landscape and other designed elements, ‘making place’. Each wetland is designed to exhibit an individual identity and functional purpose, realised through design language and programming elements. Wetlands planned near the city centre incorporate urban form, while those in less developed areas merge with the topography of the designed river channel to further enhance natural character. While all of the wetlands offer learning opportunities through the exhibition of natural processes, one wetland near a local school is specifically planned as an outdoor education area. Here children can learn about water quality, habitat, and flora and fauna within the river floodplain.

Since the development of these wetlands are located at the ‘end of pipe’ of the stormwater system, it is understood that the ability of realising major water quality gains will be challenging and their contribution to the overall water quality of the greater river system will be negligible. However, they are an important first step to a more comprehensive approach to the enhancement of ecosystem services within the river floodplain. Their presence within the system and development as cared for spaces is also an important component of the narrative with the community about value of the environment and the need for greater stewardship toward the land and water.



Figure 7: Visualisation showing wetland and riverside pathway

3.5.2 TERRESTRIAL HABITAT

The terrestrial component of improving biodiversity and ecosystem system services will manifest through large areas of indigenous species revegetation. Each terrestrial revegetation patch contains a minimum one-hectare core habitat area, an area (while minimum in ecological terms) necessary for habitat development and persistence without constant maintenance. Spatially these areas respond to the existing indigenous patterns from the nearby hillside, bringing these species to the river corridor. In addition to the species list being diverse and indigenous, it is the intention to achieve the full forest structure and composition over time. The forest structure consists of a ground cover, understorey, subcanopy, canopy, and emergent layers. Species are targeted to represent the native riparian forest condition, but the initial establishment phase this will not include final canopy species in proportional abundances expected of a pristine system.

Due to safety concerns and spatial constraints, the incorporation of these vegetation patches is limited to three areas beyond more programmed spaces. When determining the location and shape of the vegetation patches the following were considered, proximity to other patches and to wetlands, the edge effect on core habitat, the fluvial sediment transport of the river, and lines of sight to improve visibility.

Proximity to other vegetation patches improves landscape ecology connections by creating a habitat corridor effect, where species move freely between patches as well as resources for native fauna. Where possible, vegetation patches are located upstream or upland from the proposed wetlands to serve as a buffer from high fluvial sediment river flows or subsurface runoff. Further responding to the river's fluvial sediment flows, the vegetation patches are placed along the transitions between the lower and upper berms. This not only helps to stabilise the bank between the berms, but leaves sufficient area within the upper berm for flows to pass freely over open lawn areas.

From a park user perspective, each area maintains clear sight lines from three directions and is located near a higher use activity such as a parking lot or dog running area. This reduces the perception of isolation or exposure to danger. A five-metre wide mowed

edge separates vegetation from the pathway, providing both a maintenance 'que to care' and generous distance from the edge to further reduce the perception of danger.

In a similar fashion to the repetition of the wetland planting palette throughout the river corridor, species used for terrestrial habitat development are incorporated into higher activity urban sections and willow river edge. Native species are mixed with exotics in sparser, sometimes more formal, planted areas. Although these areas do not contain the structure and size to develop 'habitat', their presence in urban systems plays an important role for the restoration of ecosystem services and social acceptance of native vegetation in highly developed areas.

3.5.3 LINEAR PARK

The design for RiverLink looks to transition the existing flood corridor into a linear park providing a greater level of amenity and diverse experiences for users. It proposes to achieve this through establishing an informal, environmentally-focused landscape north of Melling Bridge to a more formal, active, dynamic, urban landscape near the Lower Hutt CBD. Hence wetlands, large areas of native planting and generous open spaces have been incorporated into the northern section while in the south an urban edge promenade has been integrated into the stop bank with terraced edges leading people down to the river's edge. Throughout the park multiple path typologies have been applied to diversify the experience people can choose as well as improving accessibility. The paths importantly connect people with a string of interventions designed to increase engagement of people with the landscape and therefore their connections with place. These interventions include interpretive signage, launching points for water sports, jump platforms, seating terraces/ steps to beaches, boardwalks through wetlands, a stepping stone crossing and pedestrian bridge crossing.

Limited graphics are available to illustrate the design but below are some graphics which highlight some of the ideas which are being explored as part of RiverLink.



Figure 8: Visualisations showing places for people to connect with the river landscape

4 CONCLUSIONS

RiverLink pulls together three levels of government and their teams of urban designers, civil and natural environment engineers, architects, ecologists and the community. This complex structure throws up challenges for the disciplines involved and shifts thinking and approach striving to reach a balance in outcome that leaves the river and spaces owned by the community in a better condition than they were before the project.

A battleground still in progress for RiverLink design is the improvement of ecological landscape function with delivery of other aspects of design. The challenge of balancing flood protection, amenity and recreation, natural spaces, water quality, habitat, affordability, sustainability to create a resilient outcome.

The goal posts have certainly moved from where they were in 1995 when a need to change was identified, where they were in 2001 when the community recorded what change they wanted, and where they were in 2012 when the RiverLink project commenced. Where this will land is yet to be determined and will become a matter of local debate, discussion and local resolution.

One win that can already be taken away is the acceptance of need for change. This is firmly embedded within both the community and its local government agencies. A positive change in all aspects of design will be achieved as part of this project, the degree of that change to be achieved remains to be seen. This degree of change will not be just a technical or numbers game, but will also come down to matters of how much change is socially acceptable, how different generations view that change and what degrees of change communities and their service providers who must enact that change can trust.



Photograph 1: Hutt River from the Hills above Petone, 1847



Photograph 2: Hutt River from the Hills above Petone, 1920



Photograph 3: Hutt River and Hutt City Centre aerial view, 2007

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