A VALUES-BASED APPROACH TO SUSTAINABLY MANAGING CHRISTCHURCH'S WATERWAYS AND WETLANDS

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ABSTRACT

A 1996 amendment to New Zealand's Local Government Act 1974 required local authorities to complete asset management plans. This required the identification and locating of all assets owned and operated by local authorities, condition and performance assessments, and the definition of accurately costed levels of service for all service delivery activities. It became clear in Christchurch that commonly accepted infrastructural asset management approaches threatened to undervalue or ignore assets with natural or social values. Values change over time and vary from person to person. They become fluid when a variety of management viewpoints are adopted simultaneously. For example, our waterways need to retain capacity to drain land on one hand, but function as a natural ecosystem on the other. An approach to asset management was developed that involved an assessment of existing asset condition based on relevant values. The values identified was landscape, ecology, recreation, culture, heritage and drainage. The monetary cost of achieving the desired asset condition was determined from quantifying activities such as land purchase, planting and maintenance. By coupling clearly costed management activities with the achievement of social and natural values, sustainable management objectives become implementable.

KEYWORDS

Waterways; wetlands; asset management; land drainage; sustainability; social and natural values.

INTRODUCTION

In 1996 the Water Services Unit of the Christchurch City Council was required by an amendment to the Local Government Act 1974 to develop an asset management plan for the maintenance, operation and renewal of the city's land drainage system. The requirement coincided with a belief that the traditional approach to managing these assets required a significant re-think. The Water Services Unit quickly realised that their asset management plan needed to be, in reality, an asset management strategy, as it would require the adoption of a new holistic approach to drainage management. The asset management strategy had to identify and gain support for a whole new vision, as it would involve a whole range of cost implications.

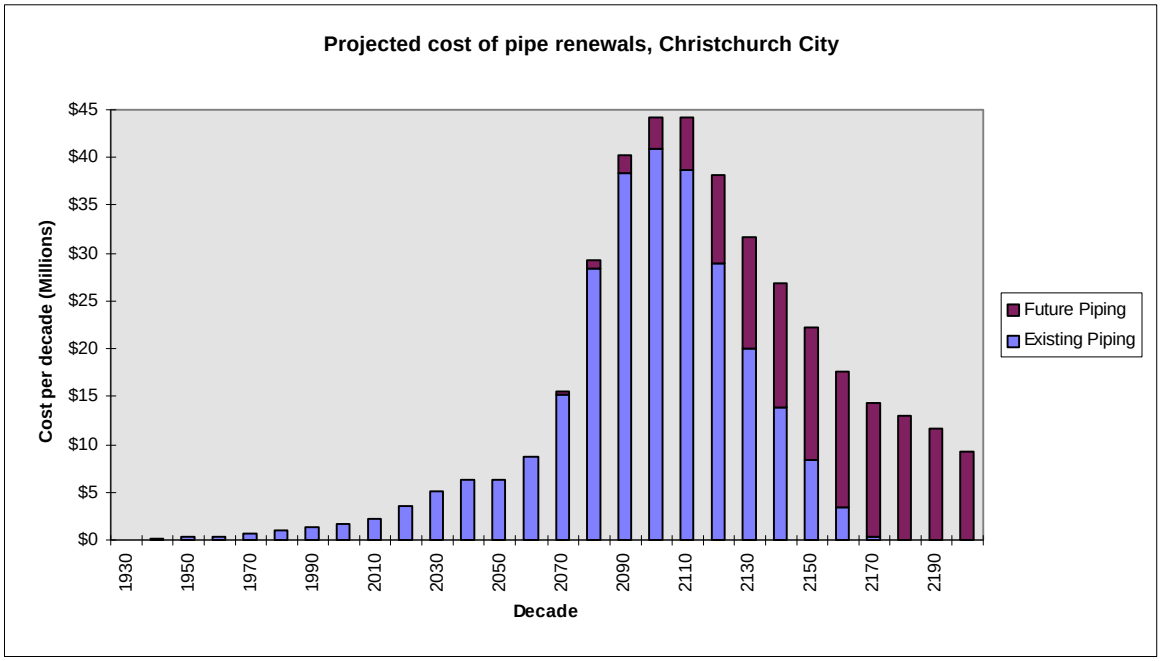
The background is a long story. Management philosophies for the city's wetlands and waterways have changed substantially over the past century, as has their appearance. The Christchurch Drainage Board, which managed the city's waterways and sewers from 1875 until 1989, had a very clearly defined focus for waterway management - to drain the city of surface waters. In the late 1800s Christchurch had the highest level of mortality of any New Zealand centre. Most deaths were due to the water-borne diseases typhoid, diphtheria and dysentery. With its flat topography, flooding became a regular problem for the growing city. The Drainage Board focused on the creation of fast draining water channels - straight and with few obstructions. The city's original cover of flax, raupo and fern quickly disappeared.

While the activities of the Canterbury Drainage Board have ensured that the frequency and effects of flooding in Christchurch are significantly reduced, it has created a large number of structures that require ongoing maintenance and, eventually, renewal or complete replacement. These structures include concrete and brick pipes and culverts, timber and concrete drains and a variety of bank works for river and streams. The cost of renewal of these assets will be borne by future generations.

These structures have also allowed us to place roads and buildings very close to waterways. Many waterways have become confined channels, supported by expensive engineering structures. When drainage was seen as the main function of waterways, this treatment served its purpose. However, it now means that the city risks

becoming trapped within a cycle of installing, repairing and replacing a very large number of structures and vast lengths of concrete and brick pipe. The chart below illustrates the likely costs of replacing just the pipe network. The cost is immense and it indicates that the city must develop means of exiting from the 'utility trap' - that is, minimising or eliminating the need to build more and more utility structures.

Figure 1. Long term costs of pipe renewals



By the time the functions of the Board became part of a new Christchurch City Council as a result of local government reform in 1989, most, if not all significant flood mitigation requirements for the city had been completed - the Woolston Cut on the Heathcote River being the last.

With these major works complete, and a more comprehensive resource management focus being adopted at a national level, the city's waterway management style began to evolve. The new Christchurch City Council, through its Water Services and Parks Units, adopted a more comprehensive resource management style. This was strongly supported by the inclusion of the following objectives in the Christchurch City Plan, prepared under the Resource Management Act 1991.

Table 1. Some Relevant Christchurch City Plan Policies

NATURAL ENVIRONMENT GOAL	Maintenance and enhancement of the quality of natural resources and their ability to meet the needs of present and future generations.
OBJECTIVE: WATER	2.2 Maintenance and enhancement of the quality and availability of the City's water resources, and of the natural values and public accessibility of waterways and their margins.
Policy: Wetlands	2.2.6 To conserve the remaining wetland areas within the City.
Policy: Aquatic Habitats	2.2.7 To enhance the City's waterways as habitats for fish and other aquatic species and plants.
Policy: Waterway Margins	2.2.8 To enhance the margins of waterways in terms of their natural, amenity and access values.
OBJECTIVE: NATURAL FEATURES AND HABITATS	2.4 The protection and enhancement of key elements and processes, comprising the City's natural environment.
Policy: Ecosystems and Habitats	2.4.4 To maintain and enhance the integrity and diversity of natural ecosystems and habitats within the City.
Policy: Extended Protection	2.4.5 To further extend and protect natural ecosystems and habitats (relates to creation of buffer areas).
OBJECTIVE: PORT HILLS	2.7 Maintenance and enhancement of the distinctive landscape and natural characteristics of the Port Hills.

This focus was exemplified by a number of projects on the city's waterway system, one key success including the Corsers Stream development. With drainage seen as only one component of the functions of a waterway system, the result of drainage works would never be the same.

Figure 2. Corsers Stream functions as a true environmental asset and an effective drainage system.

Figure 3. A waterway would have previously been piped or managed in a very utilitarian fashion.

THE VALUES-BASED APPROACH

The Water Services Unit sought an asset condition assessment procedure that satisfied the diverse needs of an holistic management view. It also required a targeted and accountable resource management system that allowed asset condition and level of service issues to be readily understood (a separate asset management plan for utility waterways was completed in parallel to the waterways and wetlands plan using standard infrastructural asset management techniques, although both plans were conjointly managed).

The term 'condition' was considered in two ways: First, condition in terms of the distance between the status quo and some ideal state (the benchmark); and second, in terms of the current physical condition of the asset

The benchmark process was achieved via a structured workshop with council officers and a range of knowledgeable individuals from the city, including landscape architects, iwi representatives, ecologists, engineers, parks planners and so on. The Unit systematically identified just what the waterway and wetland system should deliver in its ideal state.

From this emerged a number of 'values' that the resources are managed for. These values generally cost money to achieve (such as planting trees for landscape, recreation and ecological values), and yet it is difficult to identify how much they are ultimately worth. Intuitively we know that a high quality landscape is of greater worth than a low quality one, but we cannot accurately say by how much. As a result it is difficult, and often misleading, to affix a dollar value to the benefit gained as a result of an improvement to a natural

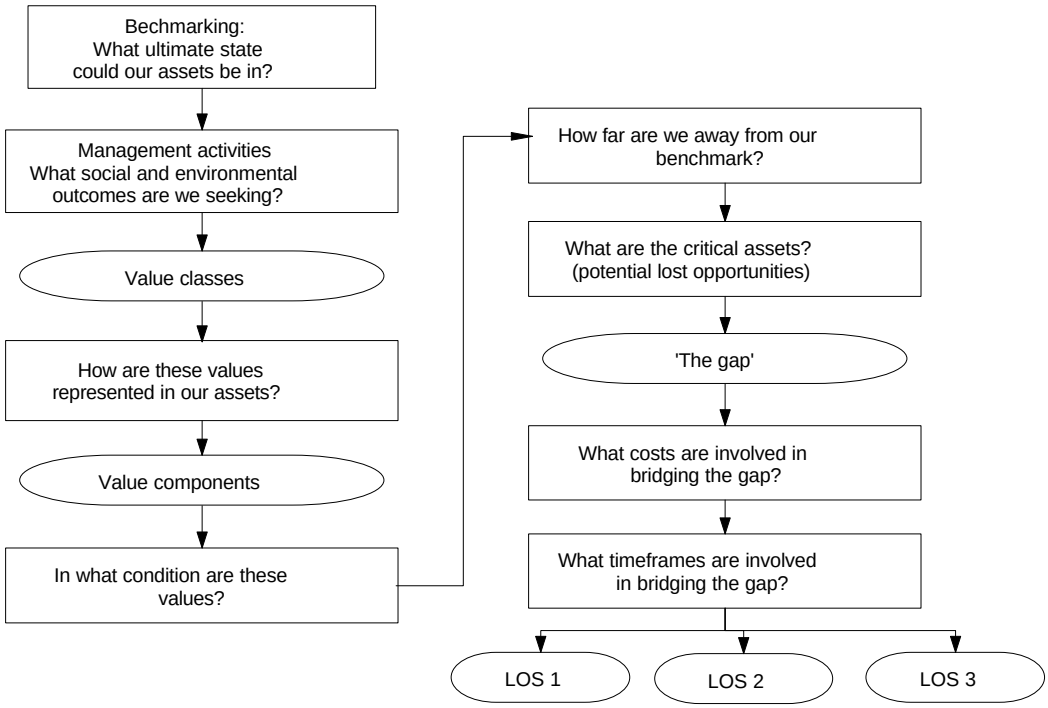
asset. This is the crux of a natural asset management plan: we might know how much activities cost, but not how much they are worth.

The values were grouped into the following categories:

Landscape, includes; character, aesthetic quality (including sight, sound and smell).
Heritage, includes; historical sites (structures or remains).
Ecology, includes; the processes and inter-relationships that affect native and exotic vegetation, fish, water quality, birdlife, invertebrates, etc.
Recreation, includes; active and passive recreation, play, and the structures for pedestrians and staff.
Culture, includes: awareness and appreciation of the resources, a spiritual dimension, and educational activities.
Drainage, includes; providing for storm and groundwater flows.

These are what 'give value' to the assets that the Water Services Unit manage. The values can be improved, maintained or protected by carrying out development and maintenance programmes. The benchmarking process saw each asset group assessed for how far each component value was from reaching its benchmark. This was described as 'the gap', and was measured as a percent. The activities required to bridge the gap were identified and costed. The schematic below illustrates how the benchmarking process led to a costed development programme (an LOS is a 'level of service').

Figure 4. Benchmarking programme



Each asset group was assessed for the degree to which it is managed for each values. This was referred to as the 'value component'. A resource may be managed, for example, for 80% ecological values and 20% recreation. This process made the management objectives for any asset explicit, and was necessary for the condition assessment process. The physical condition of the asset was assessed via a 'desktop' exercise, relying on the accumulated experience of Water Services Unit staff and that of contractors and consultants (a more detailed analysis is currently being considered). Waterways were assessed according to divisions that had first been used in the Christchurch City Plan, namely: Hillside waterways; Rivers upstream; Rivers downstream; Environmental assets and Wetlands. Two division are represented below. By using a statement of relative value for each of the management values, a statement of 'average condition' for each waterway was achieved (that is, if a management value contributed only a small percentage to the total makeup of the

waterway, its condition assessment was weighted accordingly). The condition assessment was necessary to illustrate the current state of the waterway network, to allow comparisons over time, and to pinpoint high priority work areas.

Table 2. Example of condition assessment for each values and the average for each waterway

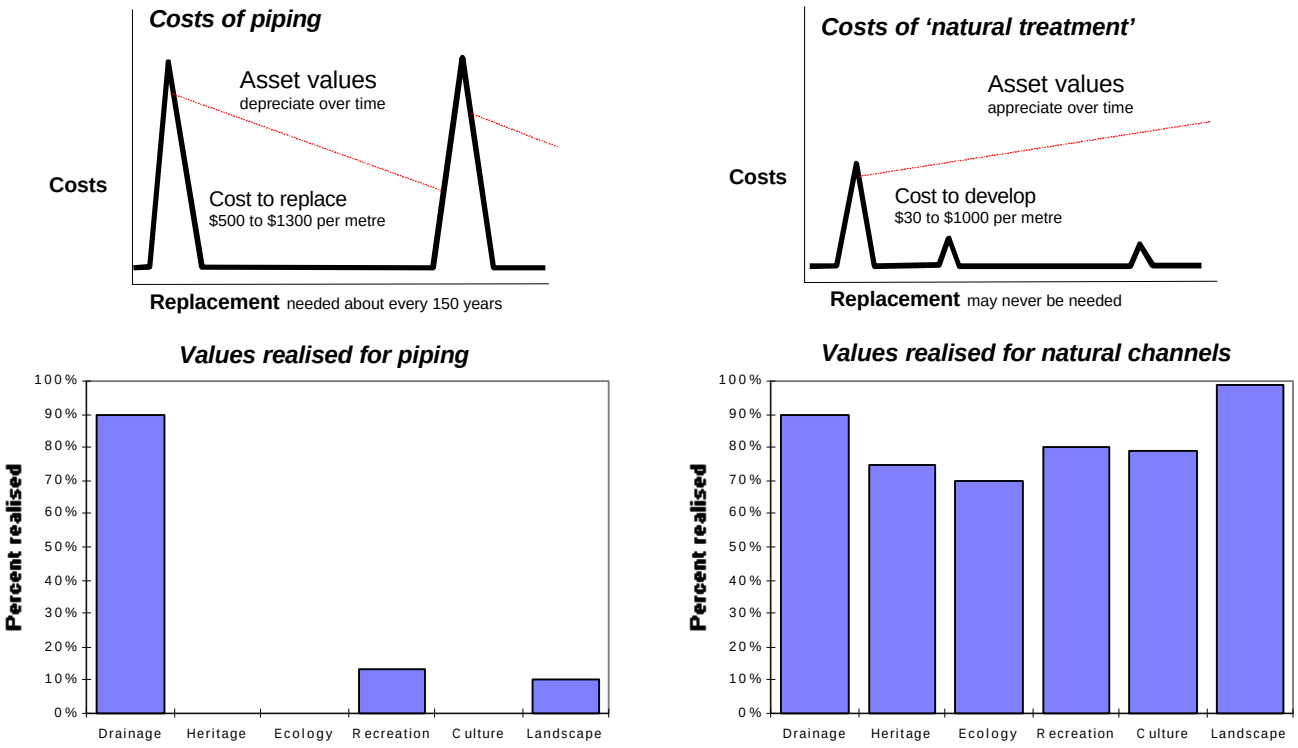
	Landscape			Heritage			Ecology			Recreation			Culture			Total components	Average condition (%)
	Components	Condition (%)	Relative value	Components	Condition (%)	Relative value	Components	Condition (%)	Relative value	Components	Condition (%)	Relative value	Components	Condition (%)	Relative value		
Hillside waterway	35	30	4	5	?	1	35	5	6	15	40	5	10	15	4	100	18
Rivers downstream	30	85	10	30	75	16	10	60	2	20	75	7	10	25	8	100	64

Different levels of service were developed based on the costs and timeframes to achieve the social and environmental outcomes required.

Level of service and cost options

Level of service options involved both treatment options for new waterways (whether to pipe them, at one extreme, or to treat them as 'natural assets' on the other), and for the gradual restoration of existing waterways to achieve the previously identified benchmark conditions. For the treatment of existing and new waterways, a range of cost options were presented. These summed up the desired holistic approach, with reference to the management values sought. The two most extreme options are illustrated in Figure 7.

Figure 6. Level of service options: Piping and natural treatment.



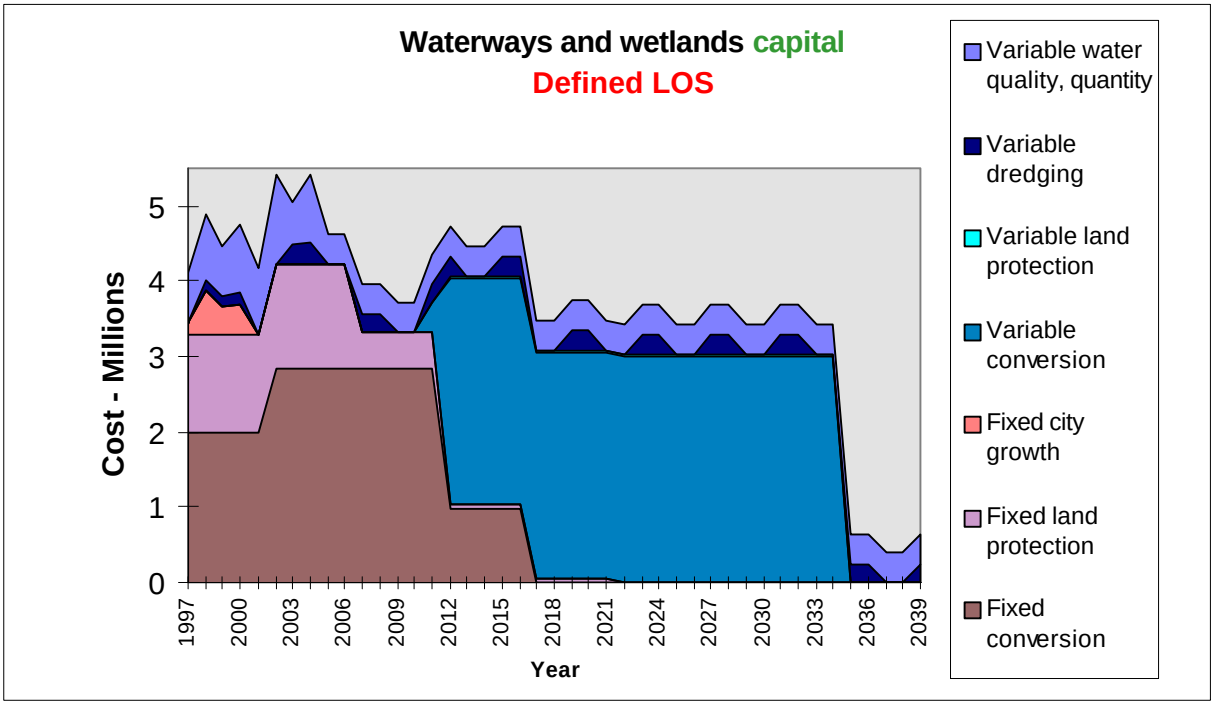
Although 'natural treatments' are not appropriate in all circumstances, the costs and benefits of that option were made clear. The examples entrenched Council's desire to adopt the 'holistic approach' as a desired level of service.

To identify the costs of achieving the desired benchmark, the required management activities were identified and described. The term ‘restoration’ was used to describe the activity of moving from an existing condition towards a preferred condition. This involved focusing on the management of the ‘values’ previously identified: landscape, recreation, ecology, heritage and culture. Restoration may involve planting, regrading, bank shaping, joint management programmes with iwi and residents, interpretation displays and so on. To achieve restoration (and the values identified), the protection of land resources is also often necessary, through purchase, covenant, reserve acquisition, etc. Other minor cost activities were also identified (dredging and managing water quality and quantity, for example).

A series of broad level of service options were developed to represent the outcomes of different rates of expenditure on both restoration and land protection. Two options were adopted for these activities in each resource grouping: the activity was either ‘fixed’ where an opportunity would be lost if the activity was not undertaken before a certain time (such as the start of a subdivision), or ‘variable’ for activities with no significant time constraints. The level of service options then related only to what period should the variable activities be carried out.

Council reviewed the level of service options as a timeframe issue, choosing an objective that would see the entire waterway network restored ‘within our lifetime’. This translated to a 40 year horizon, requiring an additional vote of $500,000 to the restoration budget. Although Council was reticent about increasing costs, this increase was approved, based on the budget shown below (this was later ‘smoothed’).

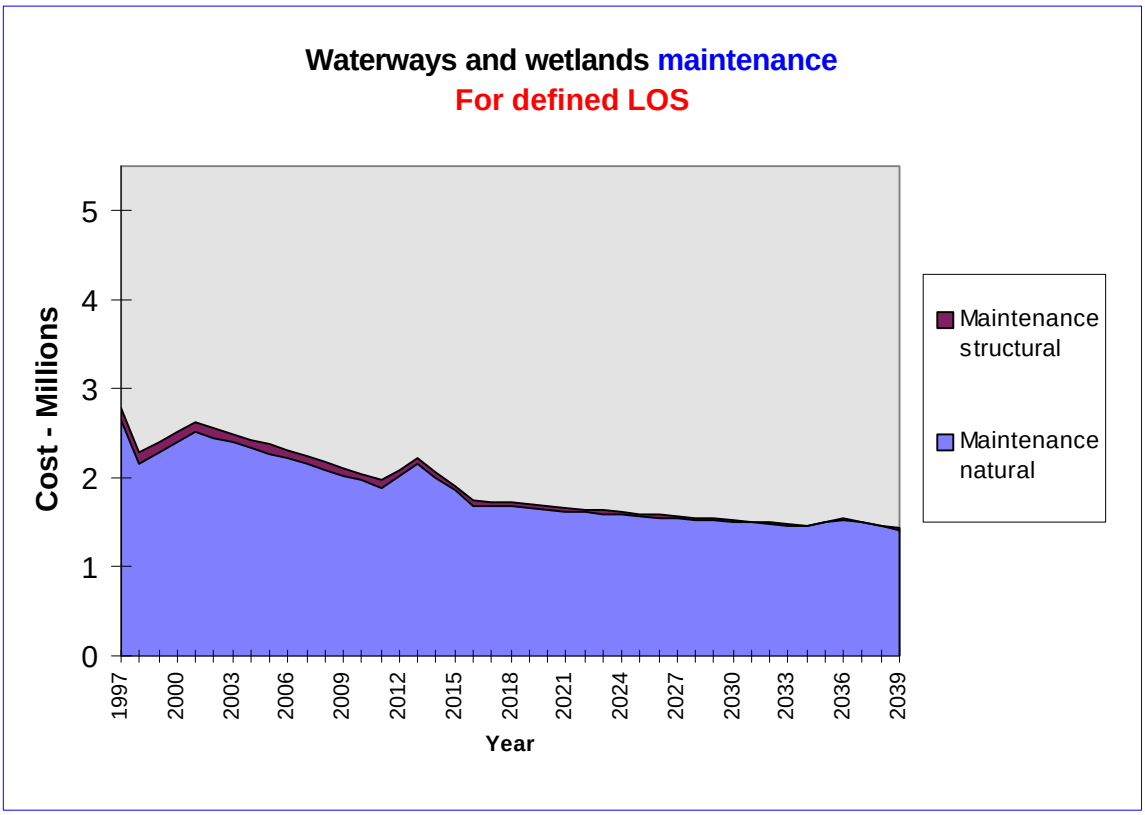
Figure 7: Waterway and wetlands restoration budget, with variable and fixed components



Sustainability

The concept of sustainability in management of ‘natural assets’ was taken to mean that the cost areas of renewal, operations and maintenance should be showing a reducing cost over time. If the unit was seen to be carrying out management activities that increased renewal and maintenance costs, then the management options would clearly be at fault. A spreadsheet was developed to calculate the impact ‘bridging the gap’ would have on these cost areas. Costs were extrapolated from past experience. The following example illustrates in dollars what sustainability means (maintenance costs reduce over time). The chart is based on the preferred level of service (restoring the system ‘within our lifetime’).

Figure 8. Declining maintenance budget



CONCLUSION

The key result of the asset management process has been the identification of what the Water Services Unit is managing its assets for: creating sustainable asset conditions that realise social and environmental values (including drainage), at a declining annual cost in the longer term.

The Water Services Unit now knows what values it is managing for and is able to systematically collect data that will enable it to make clear management decisions in terms of where it undertakes work, what activity it involves, what outcomes are expected, and what priority level the work is at.

Most importantly, the Unit has a mandate to perform a multi-dimensional role. This has required an examination of its basic organisational structure so that its members' skills are directed towards achieving the wide range of necessary outcomes. The Unit's basic design manuals must now be revisited so they target the management of 'values', as these are now its measurable outcomes.

A considerable benefit is that Unit now has the political backing to achieve this transformation. The strategy process encouraged the Unit to re-think its direction, with the benefit of a captive political audience, and a loose structure around which it could develop an appropriate waterway and wetland management system.

However, it is clear that the Water Services Unit does not have complete authority to act on achieving all values. To be successful, there is a clear need to operate in accord with key stakeholders and development partners. For example, much restoration work will take place on private land. It is intended for the progress of the asset management strategy to be monitored by a group of stakeholders who have agreed to lend their expertise.

Critical success factors to the success of the strategy to date included:

- All concepts were timely and in accord with the objectives and policies of key guiding documents.
- A wide inter-disciplinary team was involved.
- Successful pilot projects pre-existed the strategy.
- Data representations were very visual and easily understood. The concepts were very simple.
- A forum for assessing the strategy existed in the form of the asset management programme being undertaken by Council.
- Team leaders had a firm belief in the vision.
- Implementers were part of the team. In fact, they led the project.

Acknowledgements

The consent of the City Manager for this paper to be presented is gratefully acknowledged.

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