

Waterway Health Improvement Program

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Abstract

The institutional arrangements around stormwater and waterway management in Sydney are complex, involving multiple stakeholders with unclear roles and responsibilities and inconsistent management practices. Similarly, there is no one piece of legislation that governs waterways and waterway health. In addition, the community has limited understanding of the stormwater system and its governance in Sydney and expect government as a whole to properly manage the city's waterways and support initiatives that will improve waterway health.

In recent years, the expectations and frustrations of the community around the management of stormwater have become apparent with increasing complaints. In response, Sydney Water has developed a Waterway Health Improvement Program (WHIP), that would supplement current investment by local councils in order to help improve the ecological and social values of Sydney waterways.

The \$20M program consists of several water sensitive urban design (WSUD) projects, developed in collaboration with Councils across three major catchments.

To demonstrate the success and learnings of the program, Sydney Water has developed a Monitoring and Evaluation (M&E) framework and is undertaking a choice modelling study to assist with the justification of a long-term investment of this program.

Sydney Water's Waterway Health Improvement Program (WHIP) funds water sensitive urban design projects within its area of operation. The WHIP was approved by the Independent Pricing and Regulatory Tribunal (IPART) in the recent pricing review as a new part of Sydney Water's Stormwater Capital Investment Portfolio. Funds have been allocated for the 2016/17 to 2020/21 price period. Sydney Water intends to maintain the WHIP as an ongoing capital program that complements assets renewals, flood mitigation and growth programs. The M&E framework and the choice modelling study will enable Sydney Water to quantify the benefits and impacts of the program, in the absence of a clear regulatory driver and inform the development of a broader approach to Sydney Water's stormwater management role particularly around waterway health outcomes.

The implementation of the program is composed of several different workstreams:

- 1. Design development, stakeholder engagement and construction*
- 2. Development and implementation of a Monitoring and Evaluation Framework - Provide performance information (both qualitative and quantitative) to enable decision making and the planning for future phases of the waterway health improvement program.*
- 3. Willingness to pay study/choice modelling – An economic assessment of the program will identify a dollar value for the outcomes that the program will achieve now or in the future and enable the economic justification of the WHIP*

The following long-term outcomes are expected from the program:

- **Ecological values of waterways are improved** - by removing sediment and nutrient flows, reduction in the volume and intensity of stormwater flows from contributing catchments and creation of habitat
- **Social values of waterways are improved** - Improve the visual appearance of the waterways by reducing litter/ gross pollutants loads, improving social amenity and usability of project sites and through micro climate cooling.
- **Catchment management practices are improved** – collaboration on the projects leverages co-investment, builds capability and improves reputation. This is to be led by the Splash Network via training and peer to peer learning.

The type of data we will collect to monitor the outcomes and the choice modelling study could be applied to a number of other programs in regard to waterway health improvement.

This program is the first significant stormwater quality improvement capital investment Sydney Water has embarked on since the early 2000's. The WHIP goes beyond just managing drainage and flooding to also managing water quality and amenity. In line with customer and stakeholder expectations, it is anticipated that the current program will become an ongoing part of Sydney Water's Stormwater Investment Portfolio. The current projects will act as benchmarks for Sydney Water to demonstrate leadership and play a co-ordinating role in a complex institutional environment.

1. INTRODUCTION

The institutional arrangements around stormwater and waterway management in Sydney are complex, involving multiple stakeholders with unclear roles and responsibilities and inconsistent management practices. Similarly, there is no one piece of legislation that governs waterways and waterway health. In addition, the community has limited understanding of the stormwater system and its' governance in Sydney and expect government as a whole to properly manage the city's waterways and support initiatives that will improve waterway health.

In recent years, the expectations and frustrations of the growing community around the management of stormwater have become apparent with increasing complaints. In response, Sydney Water has developed a Waterway Health Improvement Program (WHIP), that would supplement current investment by local councils in order to help improve the ecological and social values of Sydney waterways.

The program originally consisted of 17 water sensitive urban design (WSUD) projects (including 6 litter booms), developed in collaboration with Councils across three major urban catchments. These projects will add to Sydney Water's existing 68 Stormwater Quality Improvement Devices already operating across its declared Stormwater catchments.

The following outcomes and benefits were listed in the business case as expected from the program:

- To enhance the ecological and social values of Sydney's waterways
- To improve the knowledge and capability of various stakeholders in waterway management
- To create a positive stakeholder and customer response in areas where waterway health works are delivered.
- To better coordinate urban water management in Sydney

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2. MONITORING AND EVALUATION FRAMEWORK

To demonstrate the success and learnings of the program, Sydney Water developed a Monitoring and Evaluation (M&E) framework in collaboration with multiple internal stakeholders. The M&E Framework is designed to guide the development and implementation of the WHIP. The scope and timeframe of the M&E framework is likely to expand into other areas both within and beyond stormwater related investment. This process will inform the development of a broader approach to Sydney Water's stormwater management role particularly around waterway health outcomes. It will also provide a foundation of knowledge to support the incorporation of integrated water management solutions into Sydney Water's planning. It is essential for Sydney Water to quantify the benefits and impacts of the program, in the absence of a clear regulatory driver, especially in the context of future price determinations.

An M&E framework is an overarching conceptual framework to evaluate the program, with an emphasis on demonstrating causation and the unique contribution made by investment. Implementation of the program will allow benefits to be tracked and will ensure that future business cases and investment decisions are more robust.

The M&E framework was developed in collaboration with multiple stakeholders within Sydney Water, primarily through a series of three participatory workshops. The purposes of the Monitoring and Evaluation framework is to:

1. Provide performance information (both qualitative and quantitative) to enable decision making and the planning for future phases of the waterway health improvement program.
2. Be accountable to stakeholders and justify the benefit of current and ongoing investment in waterway health in the absence of a clear regulatory mandate.
3. To learn from what is or isn't working and understand why. This is a new program and as such involves an element of learning by doing. This includes being reflective of our work so that we can understand, add value and continually improve on our work including looking for alternative ways of doing things.
4. To be transparent with our partners and others doing similar work so that there is sharing of information and lessons learnt and minimisation of duplication.

The M&E framework was developed through a number of key activities, including the development of: **The program logic model for the WHIP**, which forms the basis for the M&E Framework. It captures how the WHIP expects to achieve its desired outcomes: improving waterway health and improving customer and stakeholder experiences. This supports choices about what to measure to assess how well the WHIP is achieving its expected outcomes and having the intended impact.

The key evaluation questions, which are carefully crafted and focused questions that assist at several levels to:

- help stakeholders stay focused on M&E information of primary importance
- provide a framework to ensure the necessary data (both qualitative and quantitative) is collected and synthesized
- provide structure for reporting
- guide the M&E for a mid-term review or end of program evaluation

Mapping of the monitoring questions to the outcomes in the program logic and developing the monitoring methods, data custodians, and timeframe for the different phases of implementation (data collection, analysis and syntheses, evaluation reporting and improvement processes).

3. PROGRAM LOGIC

Program logic is the rationale behind a program or project, the cause-and-effect relationships between program activities, outputs, intermediate outcomes, and ultimate outcomes. Represented as a diagram or matrix, program logic shows a series of expected consequences, not just a sequence of events. The purpose of the program logic model is to provide a framework to monitor and evaluate the performance of the WHIP. The program logic has also proved valuable in explaining and justifying the program.

The program logic for the WHIP (Figure 1) shows three different pathways of change that articulate how these long-term outcomes will be achieved. Ultimately all pathways are working towards contributing to the overarching vision of healthy and valued waterways that enhance the liveability and sustainability of Sydney. It is expected that there will be many interventions (programs and projects), in addition to the WHIP that will help to achieve this vision and long-term outcomes. As such, the long-term outcomes are beyond reach of the current WHIP timeframe (2020) but the program logic model has been developed to accommodate an expanding scope and longer term timeframe. Therefore, it provides the focus for the program as it is now, and the rationale for an ongoing program. The contribution that the WHIP will make to the vision, as described in the three long term (20 to 40 year) outcome statements, are:

1. The ecological values of the waterways are improved
2. The social values of the waterways are improved
3. Catchment management practices are improved

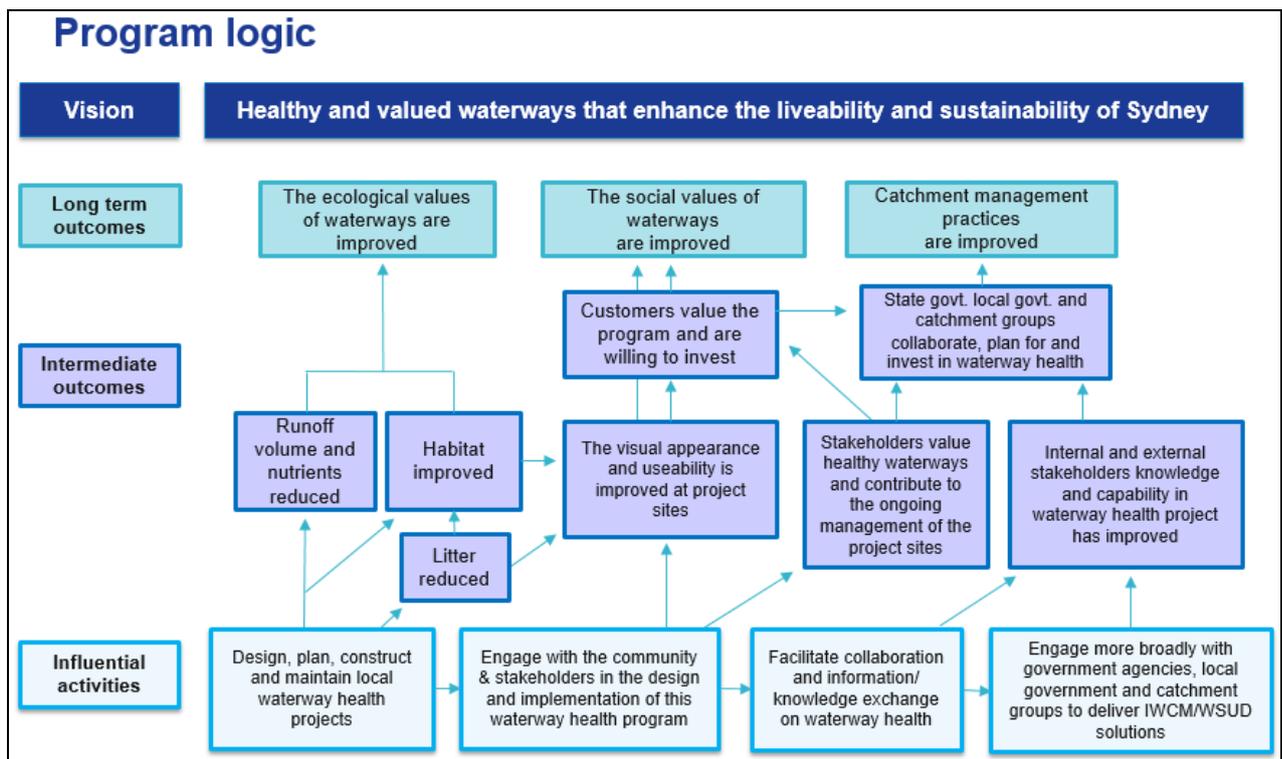


Figure 1. Program Logic developed for the Waterway Health Improvement Program

4. PERFORMANCE EXPECTATIONS

Through the development of the M&E Framework, initial benefits were reviewed and revised, and ultimately expanded to reflect the broader range of outcomes in the Program logic model. This included the identification of intermediate and long-term benefits that provide a measurable indicator from early activities and changes, such as reducing visible pollution in waterways, to the long-term outcomes of improving overall waterway health.

Table 1 summarises the intermediate and long-term benefits of the WHIP and their relationship to the program outcomes. For each outcome, the data collection and reporting method have been confirmed. Some of the methods and the specific targets will be further investigated and refined over the next year while projects are designed.

Table 1. Outcomes and Benefits of the Waterway Health Improvement Program

LONG TERM OUTCOME	LONG TERM BENEFIT	INTERMEDIATE OUTCOME	INTERMEDIATE BENEFIT
ECOLOGICAL VALUES OF THE WATERWAYS ARE IMPROVED	Water quality in the Upper Cooks estuary has improved from 'X' to 'Y'	The volume of litter has reduced	m ³ and/or tonnes of gross pollutants removed (program target = X m ³ / annum gross pollutants removed)
		The volume of sediments has reduced	kg of sediment removed (program target = X kg/ annum sediment removed)
	Water quality in the Georges River has improved from 'X' to 'Y'	The volume of nutrients has reduced	kg of nutrients removed (program target = X kg of nitrogen and X kg phosphorus removed/ annum)
	The number of safe swimming sites in the Parramatta River has increased from '4' to 'X'	The volume of runoff has reduced	ML of runoff retained program target = X ML/year
	The habitat and ecological values of the waterways has improved from 'X' to 'Y'.	Habitat has improved	Achieve net gain in area of native vegetation restored
	Increase in number, density and diversity of flora and fauna species from 'X1, X2, X3' and to 'Y1, Y2, Y3' (diversity & abundance)		
LONG TERM OUTCOME	LONG TERM BENEFIT	INTERMEDIATE OUTCOME	INTERMEDIATE BENEFIT
SOCIAL VALUES OF THE WATERWAYS ARE IMPROVED	The social values of the waterways has improved from 'X' to 'Y'. (benchmark against current state) Enjoyment, use and appreciation of project sites improves – social value	Social amenity/useability of the site has improved	Microclimate cooling benefit achieved through the design - ambient temperature reduced by X°C on days over 35°C
			Amenity/accessibility at the sites is improved Length of pathways increased from 'X' to 'Y'.

			Increase in patronage at the site + 10% more users post construction at each site
		Visual appearance has improved	20% reduction in number of complaints related to waterway pollution

LONG TERM OUTCOME	LONG TERM BENEFIT	INTERMEDIATE OUTCOME	INTERMEDIATE BENEFIT
CATCHMENT MANAGEMENT PRACTICES ARE IMPROVED	Sydney Water and external stakeholders collaborate, plan and invest in waterway health projects Increase in collaborative programs from x to y	Stakeholders value the projects and contribute to the ongoing management of the project sites	Contribution of Councils towards projects (both in-kind and financial): + \$X M in-kind and/or cash contributions and collaborative maintenance arrangements at all sites
		Internal stakeholders' knowledge and capability in waterway health project has improved	Sydney Water and Splash develop training program to identify knowledge gaps and build capability. + 10% of staff identify increased capability & knowledge SPAS & ISP have capability in 2 of 5 needs areas/topics.
		External stakeholders' knowledge and capability in waterway health project has improved	Sydney Water and Splash engage with external stakeholders to build awareness, knowledge and skills for better catchment management + X surveys/capability assessment/education activities
		Sydney Water is a valued partner in waterway health	Trust and reputation has improved from 'X' to 'Y'.

5. PROJECT SELECTION AND DESIGN APPROACH

Investment in WSUD projects under the WHIP for the 2016-2020 price period concentrated on the Cooks, Georges and Parramatta River catchments. This was due to these areas being within Sydney Water's declared Stormwater catchments but also they are waterways with know pollution issues as well as articulated visions for improvement that align to city strategy. Early stages of the program involved liaison with local councils and catchment groups to identify potential project sites. A long list of potential sites was developed for further analysis. Potential sites were a mix of those previously

identified by councils under other plans as well as new sites identified by council and Sydney Water. Long listed sites were then assessed using a multicriteria analysis including criteria such as risk and feasibility, pollution removal potential, opportunity for stormwater harvesting, council support and potential for amenity improvements.

Short listed projects were then packaged for design development. Six litter booms were fast tracked for design and installation due to their simplicity. These booms were installed in 2017/18 and are performing above expected litter removal expectations. Other projects consisted of mainly wetland and bioretention systems, all with GPT's and some including Stormwater harvesting.



Figure 2. Kogarah Bay Creek litter boom. One of six booms installed as early parts of the program

All projects are located in areas of open space in urban Sydney. With current and projected infill growth the existing high pressure on open space is set to increase further. Because of this Sydney Water was very cognizant of ensuring its WHIP projects would balance and enhance the use of open space at each site. In an effort to do this an initial master planning phase was introduced into the design process which resulted in the following design process:

1. Masterplanning phase (to gain general agreement in open space use)
2. Preliminary concept design (to agree asset type, footprint and general arrangement)
3. Detailed concept design (including design drawings, specification and REF for construction tender)
4. Design development and construction contract (for delivery and maintenance through establishment period)

The aim of the masterplan phase was to ensure the project would fit logically into its site in a way that would align and enhance the adjacent open space and other land uses. The masterplan phase was also seen a way of understanding council and community values and hopefully garnering support for the project. Interestingly the masterplan approach has produced mixed results. Only one council (Parramatta) fully supported the approach and utilised the process to formally adopt a council masterplan for a project site (see Figure 3). Some councils found the process useful to understand how a WSUD asset would fit into their open space but chose not to formalise the results through council endorsement. Some councils were not happy with the approach and preferred Sydney Water to simply design the WSUD element and allow council to develop and complete the adjacent open space planning.



Figure 3. Draft Milson Park Masterplan (now formally adopted by council)

The masterplan and preliminary stages involved site investigations and meetings as well as design workshops. Through this process it was decided to drop or defer projects at some sites. Reasons for this included:

- Inadequate space available to achieve a suitable water treatment outcome
- Deferral of projects in order to link them with larger future capital works
- Projects unsupported by councils

6. COMMUNITY AND STAKEHOLDER ENGAGEMENT

Designing and undertaking a meaningful stakeholder and community engagement plan was seen as key to the successful delivery of the WHIP. As the projects are being delivered in partnership with Councils across Sydney, building and maintaining the relationship with Council has been essential. For all projects, Councils were engaged early at the project inception stage with key staff within different departments of Council being identified. Throughout all design stages Sydney Water have worked closely with Council's project teams, this has included numerous site visits and face to face meetings.

The community around project sites was seen as the other key stakeholder group. During the development of any project it is vital to engage with the community, so their views and requirements can inform the design. For this project there were four key focus areas during engagement:

1. informing the community about stormwater and water sensitive urban design (WSUD), and the link to waterway health
2. understanding how the community currently uses the open space where the treatment systems are proposed, and how they would like to use it in future
3. hearing views from the community on the initial concept plans and ensuring they are considered during the concept design phase
4. share the final concept designs with the community, clearly demonstrating where their feedback has been incorporated in the design and where it has not, explaining why

Figure 4 shows the engagement approach during the design development phase. Insights gained during this phase will inform the approach to community engagement during the construction phase.

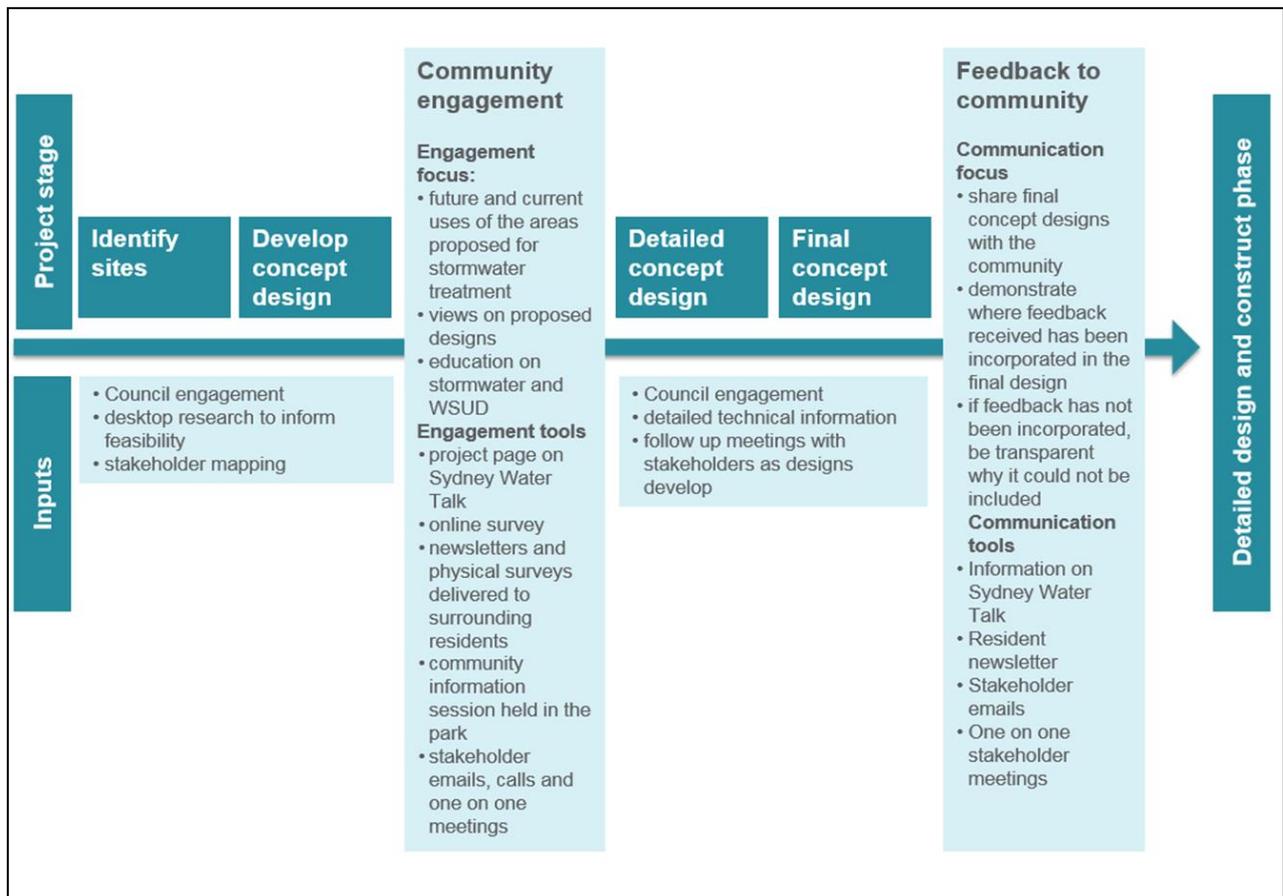


Figure 4. Engagement approach during the design development phase

The program is currently in the detailed concept design stage, prior to the feedback loop when the final designs are shared with the community. It is during this stage that a proper evaluation of the engagement process can be undertaken; did we hear the community correctly and reflect their views accurately in the designs.

7. WILLINGNESS TO PAY

Improved stormwater management across Sydney Water and Council managed stormwater catchments can have a range of costs and benefits to the community. There is a range of reasons why households may value the outcomes of improved stormwater management, however, estimations of the economic values of these potential benefits are limited. Economic benefits of a good or services are defined in terms of people's willingness to pay for them. Identifying a dollar value for the outcomes that this program will achieve now and in the future is of strategic importance to Sydney Water as it will form part of an evidence based justification for future funding both internally and externally through its financial regulator (IPART). Sydney Water has therefore initiated a choice modelling study as part of the WHIP to provide evidence of customer willingness to pay for WSUD type projects.

The choice modelling study is focused on the potential outcomes from the WHIP projects that the community may value including:

- improvements in waterway health
- reduced litter
- additional vegetation and wetlands
- provision of additional recreation facilities.

A questionnaire was designed via an iterative process within Sydney Water and then tested on focus

groups. A 30 year time frame was used because a program of extra investment would take a number of years to implement and environmental outcomes from this investment would take time to eventuate. The focus of the study was broadened to encompass actions across the entire urban catchments of the three river systems (Georges, Cooks and Parramatta Rivers) and includes investment made by Sydney Water as well as councils (to reflect current governance arrangements).

The frame for the questionnaire was that new stormwater management actions to reduce the impacts of stormwater runoff on the Parramatta, Cooks and Georges Rivers, would cost money in excess of the stormwater rates paid by existing and future households in the catchments. The cost of any new stormwater management actions would be paid for by an increase in Sydney Water's or the respondent's local council's stormwater management charges, depending on who manages stormwater in their area. For respondents who rent, it was stated that increased stormwater management charges would be passed onto them by their landlord. The time frame for the payment vehicle was annually for 10 years.

Survey results were not yet available at the time of publishing but it is hoped that data from the willingness to pay study will help support future investment in waterway health improvement and water sensitive urban design for both Sydney Water and local councils.

8. LESSONS LEARNT

The following are some of the lessons learnt in implementing the WHIP up to the detailed concept design stage:

- Invest in adequate preliminary site investigations for project identification. This should be done by experienced staff that understand the site requirements for a potential project and understand the local council and community. Particularly important is adequate grade to allow a gravity system and adequate space to allow a sufficient system and land uses that will not conflict with a treatment system. Even if sites are identified in previous plans it is worth double checking them.
- In a highly urbanised area the opportunity for large project sites in open space where a gravity system is possible is very limited. This results in either pumped systems or smaller more decentralised systems as alternatives.
- Designs are relatively flexible. This presents opportunities in future projects to take a co-design approach, involving the community more intensely in the initial stages of the program and/or projects. However, this program involves multiple stakeholders and has technical constraints, so any co-design would require more time and resources built in to all stages of the project.
- A 'one size fits all' approach to stakeholder communications across all sites was not optimal. Taking an approach from the outset that was designed around each community, space and project constraints could have produced improved outcomes.
- In general co-design and a more tailored approach to engagement at each site, would be helped by focusing initial engagement on values, rather than uses of open space. A focus on gathering community values would uncover uses of the parks but also understand what the community value and the priority they place on these values.
- As the program matures it may be possibly to consider alternate models for implementation with shared funding and implementation across agencies.