HOW TO REDUCE POTABLE WATER DEMAND FOR A SPORTS PARK BY 100%

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ABSTRACT (500 WORDS MAXIMUM)

Councils around New Zealand have a duty to provide outdoor play spaces to a generation of children who are less connected to the outdoors. But can this social value driven goal be achieved while aligning sustainability goals and resource reduction targets? The answer is yes, even with the climate change challenges looming.

There is a perfect storm coming driven by a rapidly growing population and higher urban demand, coupled with climate change driven water scarcity. Auckland's projected climate change impacts include less rainfall overall, but more intense storms, which is changing the way we design infrastructure. There will be impacts on where we live, work, and play.

Recreation is a large part of 'kiwi culture' and Auckland is fortunate to have a large network of parks and open spaces. These contribute to the goal of making Auckland the world's most liveable city by providing high-quality community spaces. Planning and design of these spaces must respond to the needs of the community now, and in the future. It is crucial to consider value and longevity in design.

Sports parks as an asset can potentially use large amounts of water through irrigation of fields, amenity planting, and provision of ablutions and drinking water. This paper discusses the Scott Point Sustainable Sports Park in Hobsonville, Auckland, it's goal of reduced potable water reliance, and how this goal was achieved.

There were two key components to reducing reliance on potable water – the first was to reduce the amount of water needed *in total* by designing a water efficient sports park, and the second was to replace the remaining potable water demand with alternative supplies, where practical.

The Sports Park has reduced its overall forecast water demand by 36% through innovative design which will be covered in the full paper. At high level, this was achieved through specialist field design and use of valve-under-head-sprinklers.

To meet this lower demand with non-potable water sources, water sources were prioritised as:

1. Rainwater capture on site;
2. On site bore;
3. Town supply.

Rainfall demand and supply were modelled and design of a rainwater capture system was completed. This provided 23% of the lowered water demand (1.46

ML/year), with the remaining sourced from the use of an on-site bore (5.42ML/year, with a consent for 15.3ML/year).

This was a sustainable and innovative solution to remove the Park's reliance on mains supply. The rainwater capture system under the fields is also a New Zealand first for application of the proprietary Blue2Green system.

The goal of reduced water demand was met with the model predicting less water required (when compared to a base case design). This work was validated using the ISCA IS Rating tool v1.2 for credits Wat-1 and Wat-2, indicating that the design has been independently verified. The use of this Tool for New Zealand water projects is also discussed in this paper, which is particularly useful locally as a comparison to the Australian context that the tool was developed in.

KEYWORDS

Sports Park, Community, Rainfall Capture, Reduced Demand, Sustainability, Climate Change, Climate Resilience

PRESENTER PROFILE

Elizabeth Garner is a Civil Engineer who has worked on a variety of projects including motorway stormwater design in New Zealand and Australia, sustainability consulting, railway civil and drainage design, as well as small-site civil design. She has experience with the ISCA IS Rating Tool and GreenStar Communities.

1. INTRODUCTION

1.2 PROJECT BACKGROUND

It is projected that the Upper Harbour Local Board area will increase in population by 64% by 2033 (Upper Harbour Local Board, 2017). A large part of this growth is the Hobsonville area, which in the next few years will have over 20,000 new residents. As well as houses, roads, bus stops and shops, these new residents need somewhere for their children to play and grow. This is where Scott Point Sustainable Sports Park steps in, an Auckland Council initiative to build New Zealand's first fully sustainable sports park.

Scott Point Sustainable Sports Park (SPSSP, the park) is a 16.4 Ha area of semi-rural land in the northwest of Auckland that is about to be transformed into a public recreational park to meet the needs of the new community. It is a unique chance to take a completely greenfields site (except for a few horse fences and a plant nursery) and turn it into an asset for the community to enjoy for years to come. The park is required as part of Auckland Council's plan for a growing Auckland.

The demand for recreational space for formal and informal play is increasing with football and baseball being the fastest growing sports in the western area of Auckland. Auckland Council's own modelling showed that without SPSSP, there would be a shortfall of 58 playing hours per week by 2025 (Auckland Council, 2018). Provision of green space and parks aligns with several high-level development strategies for the Council, including the Auckland Plan, I Am Auckland: The Children and Young People's Strategic Action Plan, and the Upper

Harbour Local Board Plan. These strategies are key to Auckland Council delivering high quality of life to local residents.

At the heart of this development is the need to build sustainably, using less resources, giving back to the land and bringing people along the journey. To prove these broader outcomes, the Infrastructure Sustainability Council of Australia's rating tool – IS v1.2 – was chosen to be implemented on the design phase of the project. This was managed by Jacobs Auckland in partnership with Auckland Council, Isthmus Group and SportENG.

1.2 PROJECT SCOPE

This paper pertains to the detailed design phase of Stage 1 of the project. This work was completed from late 2018 throughout 2019. Subsequent stages of the park will include a multi-use hub building, netball courts, and an ecological restoration zone.

The scope of Stage 1 of the project was to deliver:

- Three full size football fields to FIFA standard with two baseball diamonds,
- Two half-size artificial training fields,
- Sports park lighting design,
- Changing room and ablution block,
- Carparking,
- Connecting roads (Joshua Carder Drive and Craigs Way),
- Cycle path, and
- Site wide stormwater.

The design life varied between 10 years for the fields depending on field type, 20 years for concrete kerb and channels and the cycleway, and 50 years for the carparking, road and lighting design.

1.3 PROJECT CLIMATE CHANGE RISK ASSESSMENT

In 2017 during the Master Plan phase of the project Auckland Council carried out a climate change risk workshop for the project. This covered the projections for Auckland's climate to 2100 and potential impacts to the asset.

These included:

- Sea level rise in the vicinity of the asset
- Mean temperature increase both annual and seasonal
- More frequent hot days (temp > 25 C)
- Decreased spring rainfall
- Increased autumn rainfall
- Increased dry days (daily rainfall < 1 mm)
- Increased extreme rainfall (daily rainfall > 40 mm)
- Increased evapotranspiration deficit
- Increased hydrological drought
- Increased wildfire risk

The majority of these risks are related to the supply and demand of water via climatic processes and have the potential to impact the operation of the asset.

1.4 WATER ISSUES AS A PROJECT CONSTRAINT – OR AN OPPORTUNITY?

The climate change risks had to be addressed in order for the asset to function for the duration of its design life. Addressing climate change risks early in the design phase is best practice for new projects.

It is expected that there will be heavier, more infrequent rainfall in Auckland in the future and that water will become scarcer overall. This has impacts on the design of the park from an operational perspective, namely the supply of water for irrigation and maintaining grass health as well as managing the risk of flooding on-site. These climate risks could affect the performance of the asset and its ability to deliver high-quality play hours to the community year-round.

Sports parks are large users of water due to the irrigation of the fields and amenity planting as well as ablutions and thus the risks to supply were an important issue for the Scott Point design to address.

A 'business as usual' approach would be to tap into the mains water supply and irrigate the fields with potable water. However, the project wanted to push back on this approach and used the ISCA IS v1.2 Rating Tool to do so. The Rating Tool credits for water use (Wat-1 and Wat-2) call for less water to be used overall on a project, and for any non-potable uses to be supplied by non-potable water, where suitable.

Utilising the IS Rating framework allows for innovative design changes to be measured and benefits realised during the design phase of a project, where the most impact can be achieved. It also allows for the design and sustainability initiatives to be peer reviewed and validated as truly sustainable.

1.5 ISCA IS V1.2 RATING

Auckland Council selected the Infrastructure Sustainability Council of Australia's (ISCA) Infrastructure Sustainability (IS) Rating Tool v1.2 to measure the sustainability benefits of the project in order to inform future sports park developments. The Tool was developed by the industry body ISCA in Australia for infrastructure projects of any asset type and scale. Common asset classes include roads, rail projects, ports, treatment plants, and the newly added social infrastructure class.

The Rating consists of 44 credits over six main themes:

1. Management and Governance,
2. Using Resources,
3. Emissions, Pollution and Waste
4. Ecology,
5. People and Place, and
6. Innovation.

Achievement in the credits generally ranges from Level 1 to 3. Work done to meet Level 1 is a reasonably standard business as usual approach but reaching Level 3 means going far beyond normal practice by employing sustainable initiatives and quantifying sustainability gains. Level achievement in the 44 credits correlates to up to 110 points. The Scott Point project targeted a Leading Rating which is the highest possible level for v1.2 and means achieving over 75 points.

The main credit focuses of SPSSP were water, urban design, ecology, health and climate change adaptation.

2. DESIGN APPROACH

2.1 DEMAND PROJECTION

In order to meaningfully reduce water demand of the project, the expected demand had to first be calculated. This was a crucial step of the IS Rating credit Wat-1 in which a 'base case' for the project had to be developed. This 'base case' is a calculation for water consumption for a sports park of the same size and scope as SPSSP built and operated with no sustainability or water reduction initiatives. The 'base case' and subsequent 'actual case' reductions are whole of life projections.

The SPSSP 'base case' was developed using the following inputs:

- Footprint / scope of Scott Point – such as play hours, field types, field size
- Conventional irrigation system water demands – sourced from SportENG
- Ablutions water use – sourced from Auckland Council's GD06 (Chen, Z. and Silyn Roberts, G., 2021)
- Construction water use data for dust suppression – sourced from Auckland Council's GD05 (Leersnyder, H. et al, 2016)

2.1.1 Sports Field Design

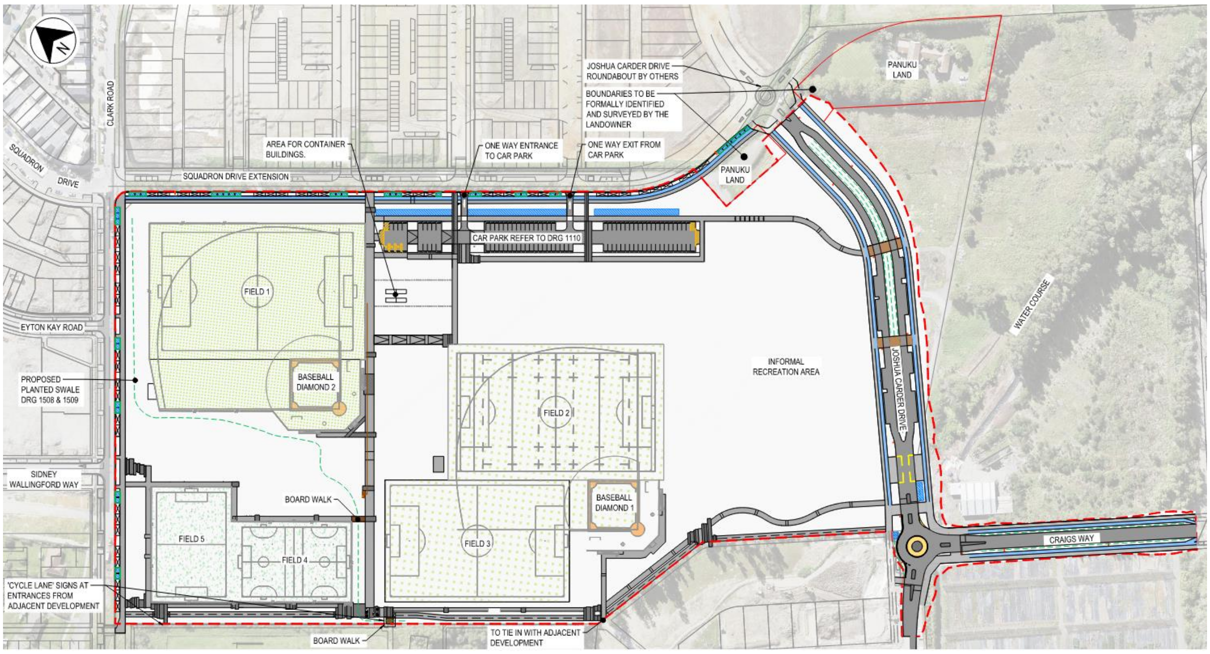
The project footprint included five fields; one 'main field' designed for football and baseball (Field 1), two sand carpet fields sharing a border also designed for football and baseball (Fields 2 and 3), and then two smaller artificial fields designed for training (Fields 4 and 5). The site layout can be seen in Figure 1.

Fields 4 and 5 have zero water demand as they are artificial fields and thus the 'blades of grass' consist of plastic weave matted down. In the 'base case' Fields 1, 2 and 3 were modelled as sand carpet fields, with 100 mm of sand root zone provided for couch grass. This species of grass is most commonly used in Auckland Council parks due to being drought tolerant and hardy, thus it was selected for both the 'base case' design and 'actual case' detailed design.

The water demand for the sand carpet fields could be determined with reasonable accuracy due to Auckland Council having operational water use data available for existing parks, and due to SportENG's experience designing fields and irrigation systems. A traditional irrigation system was used for the 'base case' demand as this is business as usual for sports parks. Such a system is turned on manually and delivers water uniformly over an entire field from mains water supply. The annual irrigation rate for these sand carpet fields with conventional irrigation was 2,226 m^3/Ha.

The total irrigation demand for these three fields was 6.7 ML per year, multiplied by 50 for the Park design life.

Figure 1: Proposed site plan showing the five proposed fields in relation to carpark and connector roads



2.1.2 Construction Water Use

Construction water use demand was estimated through consultation with construction firms and Auckland Council's Guidance Document GD05 for erosion and sediment control. The main use of water during the construction phase of a land development project such as SPSSP is dust suppression during bulk earthworks. The 'base case' rate of water applied per 5 L/m^2/day was taken from GD05 which is a relatively conservative figure and was applied over an assumed construction period of two earthworks seasons from September to May. The area for bulk earthworks was 98,612 m^2.

2.1.3 Ablutions and Drinking Water

Operational water use also includes ablutions as well as the irrigation of the fields. For SPSSP, part of the scope included delivering changing rooms, showers, toilets and drinking water. These demands were estimated from the expected visitor numbers (play hours) applied to Auckland Council's GD06 on-site wastewater management document. This water use was estimated to be 38.7 ML which is 7% of the entire water use over the 50 year lifetime of the park.

A summary of the expected 'base case' water demands can be seen below in Table 1.

Some minor water uses were calculated and then removed from the scope as they were less than 5% of contributing total. These included ablutions for site workers and wheel wash facilities over the construction period, and cleaning of the changing rooms during park operation.

Table 1: 'Base case' water demands for SPSSP

Use		Base Case	
		Demand (ML)	Percentage of Total
Construction	Dust Suppression	159.8	29%
Operational	Ablutions & Drinking Water	38.7	7%
	Sports Field Irrigation	335.1	60%
Total		**533.6**	

2.2 DEMAND REDUCTION THROUGH DESIGN

Once the 'base case' demand had been quantified then design initiatives could be implemented to reduce it.

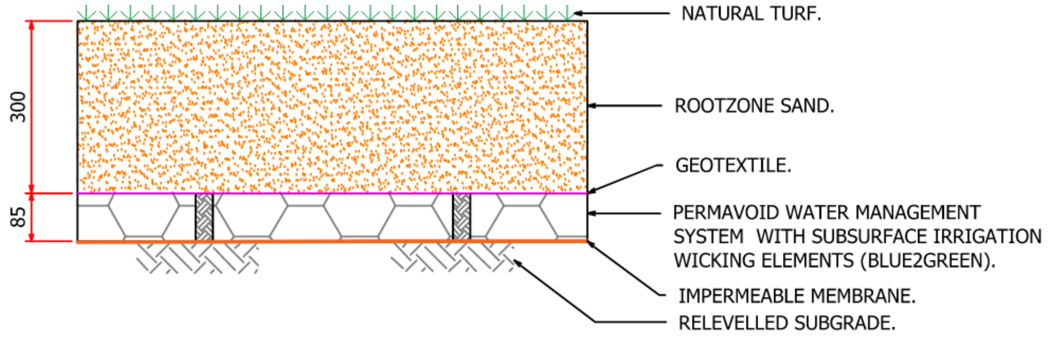
2.2.1 Sports Field Design

Specialist field design was implemented to reduce the water demand of the Park as the fields were the largest user of water over the lifetime of the asset. Thus the biggest wins for water reduction could be made here.

The first initiative was to irrigate the grass from the rootzone upwards via drainage cells beneath the main field (Field 1). Irrigation in this manner improves the health and resiliency of the grass when compared with irrigating top down through only sprinklers. When the grass is more resilient, it can withstand more damage from play, and requires less water and treatments to be applied to its surface. This changes the field design as the sand root zone has to be deeper than a standard sand carpet design and build atop drainage cells.

Drainage cells were investigated for their ability to hold water, allow the rootzone to draw water up, their proven use overseas, and their embodied carbon for material impacts to the project. The product selected was the Blue2Green cell which has been used in sports parks in the UK and Europe and is made from 91% recycled plastic. It allows for storage under the field and provides wicking so that the grass can draw the water up through the sand layer, as shown in Figure 2.

Figure 2: Natural sand carpet turf profile of Field 1 with Blue2Green subsurface irrigation and storage (source: SportENG)



The second initiative was to look into a specialised sprinkler system that can deliver targeted relief to damaged sections of grass, rather than treating the entire field at once. Such as system is known as a 'value-under-head' sprinkler system. These systems use less water than conventional sprinkler systems (1,913 m^3/Ha compared to 2,226 m^3/Ha) because individual sprinkler heads can be turned on or off manually to deliver water to specific small areas that may need maintenance, such as around the goal posts of a football field. Delivering water in such a targeted way results in less water use over the lifetime of the asset as only areas in need of irrigation or treatment receive water.

2.2.2 Construction Water Use

Construction water use was projected to decrease from 5 L/m^2/day to 0.8 L/m^2/day due to less earthworks from base case to actual case design, changes to construction methodology for each field type, and consultation with the ECI contractor on their historical water application for dust suppression. These initiatives are not covered in detail in this paper as they were made for material and energy savings rather than water savings.

2.2.3 Ablutions and Drinking Water

Ablution and drinking water demand were taken to be the same from 'base case' to the actual design due to the park needing to provide showering, toilet and drinking water facilities to a specified number of people in order to meet the scope of the project. These numbers could not be reduced meaningfully in design as 'low flow' showers and toilets are essentially business as usual for community assets and are minor water users over the lifetime of the asset.

Thus, the total water demand of the sports park for its design life of 50 years was reduced from 533.6 ML to 343.8 ML, a reduction of 36%, as per Table 2.

For one year, the irrigation demands of the fields was reduced from 6.7 ML to 5.82 ML which is a reduction of 13.2%.

Table 2: 'Base case' water demands compared to 'actual case' design demands

Use		Base Case		Design	
		Demand (ML)	Percentage of Total	Demand (ML)	Percentage of Total
Construction	Dust Suppression	159.8	29%	25.6	7%
Operational	Ablutions & Drinking Water	38.7	7%	38.7	11%
	Sports Field Irrigation	335.1	60%	279.5	76%
Total		**533.6**		**343.8**	

3. WATER BALANCE & RESERVOIR MODELLING

3.1 BASIS OF MODEL

Once water demand is reduced as much as practical, a suitable water balance can be determined. The project chose to supply only the operational irrigation water demand with non-potable sources as it would be cost-prohibitive to treat rain or bore water to drinking water standard for the ablutions supply. Thus the water balance focusses only on meeting irrigation demand.

The priority of water supply to SPSSP was firstly rainwater, then bore, then mains water supply. Thus, the water balance was modelled based off purely rainwater falling on the site which could be supplemented with the bore if required.

The water balance is in constant flux between changing supply (rainfall) and demand and is constrained by the physical space available to collect water as well as the climatic conditions. Optimising the water balance meant increasing potential supply and rationalising storage on the site. The proposed storage for this project was an in-ground tank that supplemented the storage within the drainage cells underneath Fields 1, 4 and 5.

3.2 SUPPLY INCREASE

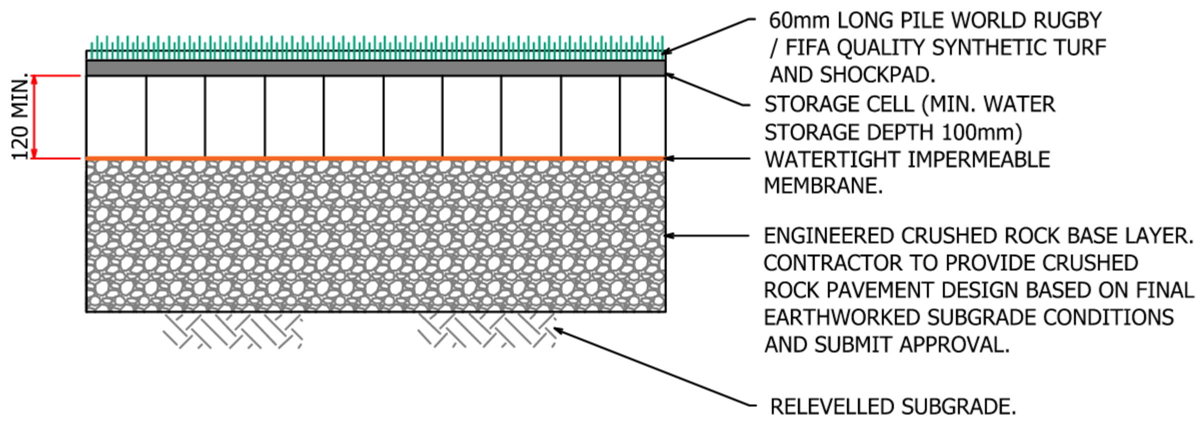
At Scott Point the supply of rainwater was increased by maximising collection area. Instead of only collecting from the fields that required irrigation (1, 2 and 3), the system was expanded to include the artificial fields (4 and 5) and carpark area.

The on-field capture system is made up of drainage cells beneath Fields 1, 4 and 5. The Blue2Green wicking system is used under Field 1 and a storage cell system is under Fields 4 and 5.

Due to the Blue2Green system Field 1 is both a supplier of water as well as a user of water. This results in it having a reduced irrigation demand compared to Fields 2 and 3. These systems have been used overseas for water collection and rootzone irrigation under sports fields however this a first for New Zealand sports parks.

Rainwater falling on the artificial fields 4 and 5 percolates through the FIFA standard 'pile' and shockpad layer to storage cells (Figure 3). These cells act as storage within the system that when overtopped flows to the storage tank.

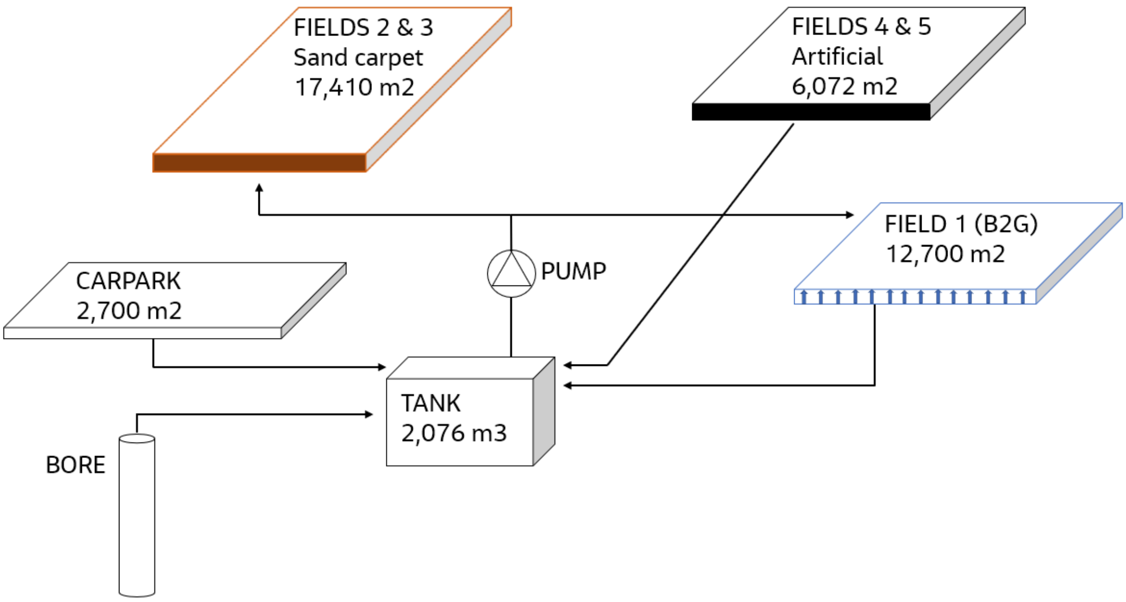
Figure 3: Detailed design cross-section for artificial Fields 4 and 5 with drainage cells (source: SportENG)



The carpark capture system involves basic stormwater management of directing the rainwater into a stormwater collection system. Treatment of the carpark area water was required to remove suspended solids and heavy metals, however the treatment option had to allow for maximum capture and flow into the system. This was achieved by specially designing rain gardens that had a shallow media depth of 500 mm with no retention or detention. The majority of water treatment occurs in the top 50 mm of filter media (Auckland Regional Council, 2003) and so this specialist raingarden allows for suitable treatment and minimises water losses.

These collection areas flowed to a reservoir tank under the carpark to allow for storage over the year (Figure 4). This tank was sized using a reservoir model to optimise between storage required, frequency of overtopping, and practicality of reservoir size.

Figure 4: Schematic of water storage and supply system at SPSSP

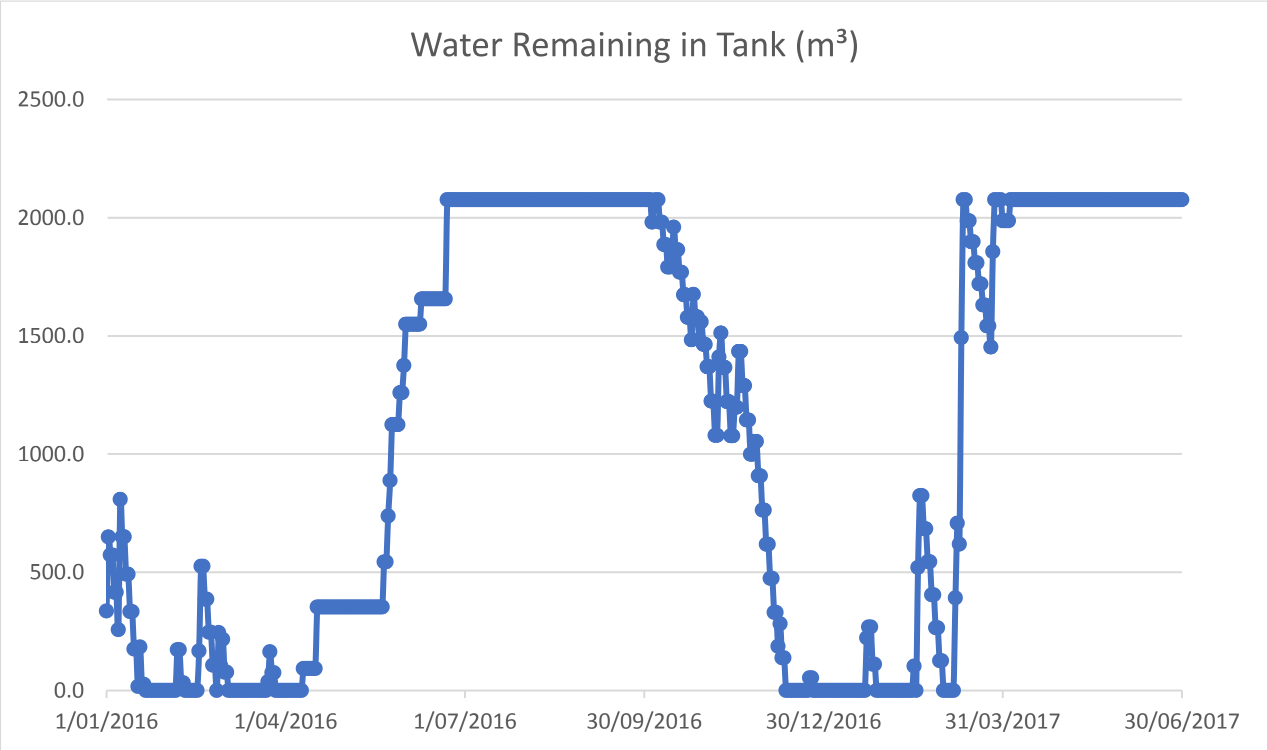


3.2 RESERVOIR MODEL

The reservoir model was designed in Excel by matching monthly demand with monthly supply and optimising for tank size. The water remaining in the tank over 18 months can be seen in Figure 5.

Supply was determined using daily rainfall data from 2016 and 2017 due to that being a dry summer season. Thus worst case for the summer demand on the tank. Demand was based on the irrigation demands of sand carpet Fields 2 and 3 and the reduced irrigation demand of Field 1 (modelled as 60% of sand carpet demand) due to the use of Blue2Green making it partially self-irrigating.

Figure 5: Graph of water remaining in 2,076m³ tank over 18 months



Based on the impervious areas and the rainfall modelling completed over the 2016-2017 period, an annual volume of 1,461 m³ (1.46 ML a year) could be captured and supplied to the fields. When balancing this with the demands over the year which vary with temperature and growing season, the tank is predicted to overflow 56 days of the year (as per the flat line at the top of the graph) and be empty for 123 days. When it is empty the bore shall be relied on to meet demand.

The onsite storage also has flood-prevention benefits as water is retained on site from the impervious surfaces. The capture system also reduces peak flows from exiting the site thus reducing the risk of future flood events. It was determined that in the 1% AEP event the peak flow in the post-development scenario was 19% lower than the pre-development peak flow (2.29 m³/s compared to 2.81 m³/s). This was validated through IS Rating credit Lan-4 Flooding.

3.3 BORE AVAILABILITY

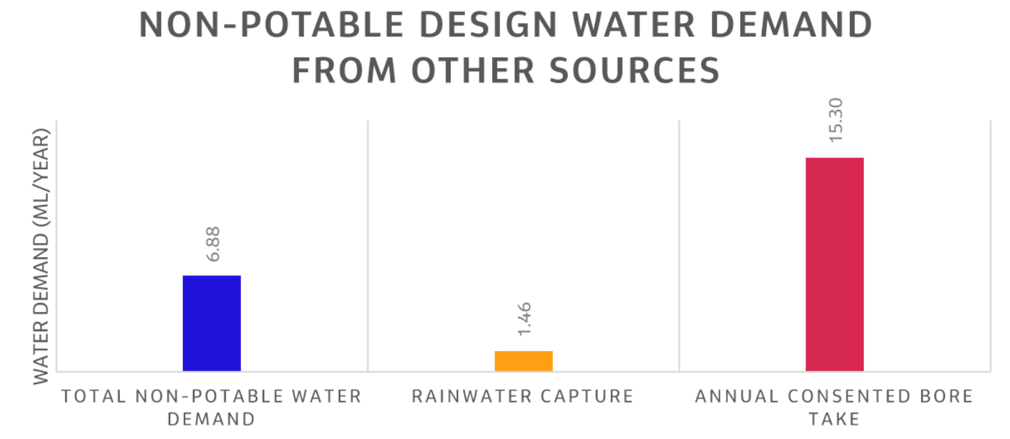
The option to utilise the on-site bore to supplement water supply instead of potable mains water was not without its own complications. The bore (bore 588) draws from the Kumeu-Waitemata Aquifer that is classed as a High Use Aquifer Management Area according to the Auckland Unitary Plan aquifer management overlay, accessed via Auckland Council GIS. It was previously consented to irrigate the plant nursery on the SPSSP site which indicates the water would be of suitable quality for irrigating the sports fields. However, the aquifer has many consented users and most recent assessments from 2018 indicate that the aquifer has 105,070 m³/year remaining unconsented out of a total supply of 1,559,000 m³/year (Diack, 2019).

A desktop groundwater impact assessment was carried out by Jacobs to consider:

- remaining water availability of the aquifer,
- potential drawdown effects to neighbouring sites,
- saline intrusion into the bore, and
- any groundwater / surface water interactions.

It was determined that a conservative calculation of required take for sports field irrigation of 5,420 m^3/year (simply non-potable demand minus rainfall capture volume as per Figure 6) was considerably less than what was historically being drawn to irrigate the nursery (15,260 m^3/year) and the available consented take (15,300 m^3/year). Thus, there would be a reduction in the amount of water extracted in this land parcel once the land use changed from plant nursery to sports park. The maximum two-day demand on the bore would be 145m^3 during January.

Figure 6: Graph of non-potable demand and supply over one year



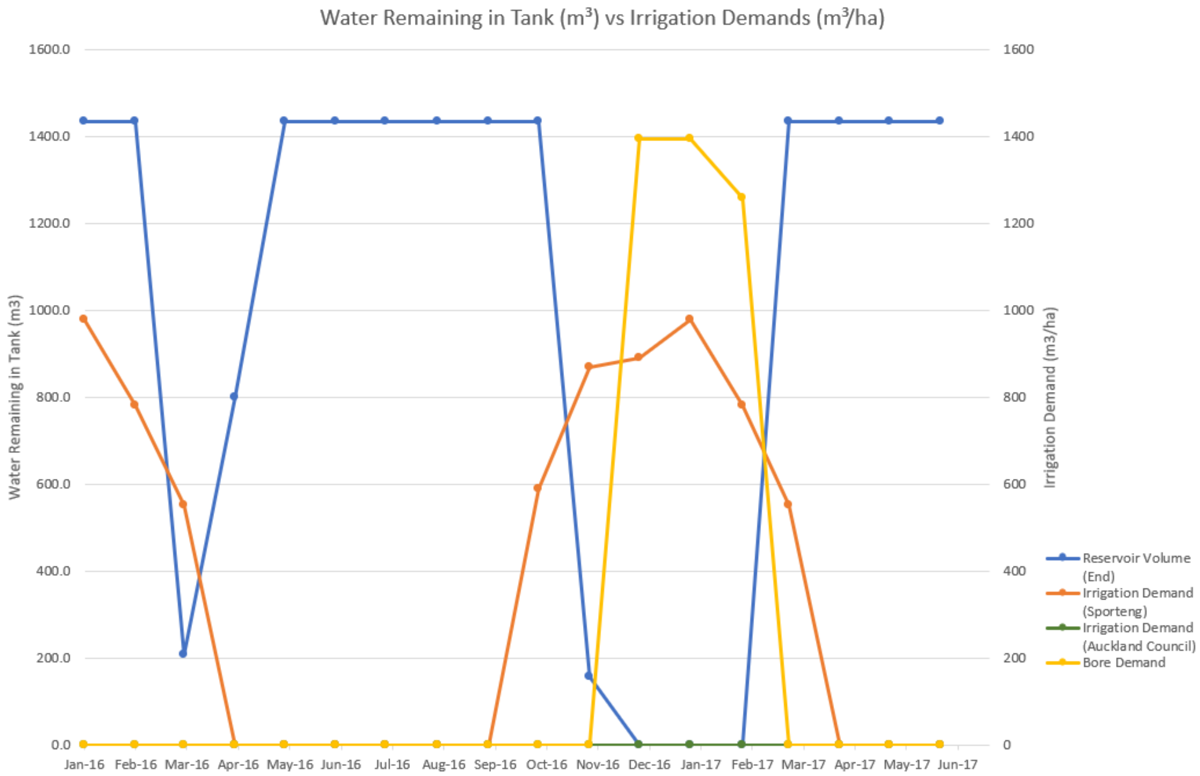
It was also found that the pumping activity is unlikely to have any impact on the water quality of the aquifer and surface water bodies in close proximity. The proposed rate of pumping would not noticeably influence the current neighbouring consent holders, or encourage salt water intrusion from Nimrod Inlet which is adjacent to the site (Diack, 2019).

The exact volume drawn from the bore would vary throughout the year and over the years of operation due to climatic variations. The reservoir model for a 2016-2017 year calculated the bore draw at 3,200 m^3/year for SPSSP.

The below Figure 7 graph illustrates that bore supply increases during summer when the reservoir empties because of less rainfall coupled with increased demand due to the the grass growing season and high field use. This water source is preferred to mains supply as a fallback option due to prioritising non-potable sources.

As the entire years' irrigation demand can comfortably be met from a combination of rainfall collection and bore supply the project has reduced its potable water demand by 100%, when compared with a 'base case' design supplied fully by a mains water connection.

Figure 7: Graph of water levels in tank vs demand of irrigation vs bore demand



4. SUSTAINABILITY RATING APPLICATION

4.1 PROJECT ACHIEVEMENTS

This project is the first in New Zealand to apply the Infrastructure Sustainable Council of Australia (ISCA) Infrastructure Sustainable (IS) Rating tool v1.2 to a sports park or community asset. The Design Rating was submitted in December 2020 and is likely to be certified in mid to late 2021 with a Leading Rating (over 75 points). This includes maximum points of Level 3 achieved for the two water credits, Wat-1 and Wat-2.

Wat-1 was achieved by modelling the base case water usage and reducing projected water usage through design by over 20%. This has been explained in previous Sections 2.1 and 2.2, with a 36% reduction achieved.

Wat-2 was achieved by replacing projected potable water usage with non-potable sources for 100% of the water demand, where it made economic and environmental sense, as per Section 3.

The evidence submitted for these credits included an explanatory memorandum, water demand calculation spreadsheet, evidence of consultation with designers and expert consultants, NIWA CliFlo data, and detailed design drawings from Jacobs and SportENG.

The 'economic and environmental sense' guidance was an important feature of this projects' success with replacing potable water demand. Through a cost-benefit decision making process it was determined that potable water demand for drinking water is best sourced from mains supply, as for a project limited to $20mil capital cost it would be cost-prohibitive to treat collected rainwater on site to drinking water standard. This would be energy intensive and result in further energy use emissions that would impact the projected operational energy use of the site. This analysis process was formalised and validated through the IS Rating credit Man-7 Decision Making.

The Rating framework in general was comprehensive and truly covered environmental, social and governance aspects of sustainability. It is valuable for a project or asset to be benchmarked and have it verified by independent experts. The initiatives and processes from this Rating will inform future Auckland Council projects.

The project also achieved Level 3 for the climate change credits Cli-1 and Cli-2 due to the early workshopping done by Auckland Council and adaptation measures implemented by the design team during the detailed design phase. The use of the Blue2Green system as a New Zealand first also gained the project 5 innovation points.

4.2 APPLICABILITY TO THE NEW ZEALAND MARKET

The Infrastructure Sustainability v1.2 Rating was developed in the Australian market and can be applied to New Zealand projects. While the tool is helpful in baselining sustainable initiatives and considering all facets of sustainability over the entire lifecycle of projects, it does have some limitations in the New Zealand market.

Firstly, the tool is suited to large infrastructure projects with higher capital budgets than most New Zealand projects. Rail and road infrastructure projects in Australia are commonly in the billions of Australian dollars, whereas a 'large' project in New Zealand is comparatively a few hundred million NZD. From experience using the Rating, while the scale of project can vary, the scope of the Rating remains the same and it is challenging to justify the work on smaller projects. The Rating Tool outlines 'Small Project guidance' for projects under $20mil AUD which the SPSSP project employed, however it is not a full scale down of the tool and only applies to specific credits. This is a limitation of v1.2 which has since been superseded by v2 and a new small project specific tool which is currently undergoing testing within the Australian market.

Another difference between the Australian market and New Zealand market is the value of water. Here, water is viewed as taonga by Maori and thus its use is more carefully considered. This social value is not reflected in the IS Rating Tool v1.2 and so the 'sustainability' considerations are limited to purely reducing consumption. The importance of water to the local iwi (Nga Maunga Whakahii O Kaipara and Te Kawerau a Maki) was explained in the Rating submission in the ecology, urban design, heritage and stakeholder credits, however this is a uniquely New Zealand focus and not easily applied to the Rating Tool as it currently stands. The Tool itself does not reward the protection and enhancement of water in a way that is relative to the real-life importance for New Zealand projects.

CONCLUSIONS

In order to meaningfully reduce water consumption, or make any resource reductions, it is key for a design team to understand the available data and use this to base line a projects' demand. This baseline or base case can then be used to inform decisions throughout the design phase where the most impact can be made. The IS v1.2 Rating Tool provides a useful framework for this which can be applied to many assets at different scales.

For Scott Point Sustainable Sports Park, the 'base case' water demand over its 50 year design life for construction and operation was 533.6 ML. It was found that the majority of water use came from irrigating the sports fields during operation, followed by construction water use. This demand was reduced by 36% to 343.8 ML by changing the field design, sprinkler design, and reducing overall construction activities. By quantifying a base case first, the team can determine where the biggest wins can be made and focus on reducing the largest water use activities.

The key changes were in sports field design by allowing for bottom-up rootzone irrigation via drainage cells under main Field 1, and innovative sprinkler system use on Fields 2 and 3. This reduced operational demand could be fully supplied by non-potable sources by collecting and storing rainwater on site and supplementing with an on-site bore. This bore was suitable for use due to the existing water quality and the suitable characteristics of the aquifer. This ultimately meant that the demand on mains supply for non-drinking water was reduced by 100%.

Reducing potable water demand by collecting and storing on site also had benefits from a climate change resilience and flooding point of view. The overall downstream flooding impact was reduced when compared to pre-development peak flows, and potential climate change risks of insecure water supply and changes in climatic condition were mitigated.

The sustainability initiatives of this project were independently verified by ISCA and can be applied to future sports park developments by Auckland Council. SPSSP achieved the highest possible IS Design Rating v1.2 level of a Leading Rating for the design phase of the project. Key credits for the project were the water, climate change, ecology, and innovation credits, as well as health and stakeholder.

The project is ongoing with construction beginning in 2021.

ACKNOWLEDGEMENTS

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