Foothills Water Proofing Project

Retain, Reuse, Reduce

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State of Play

Gnangara Mound ground water levels

Source: Department of Water website

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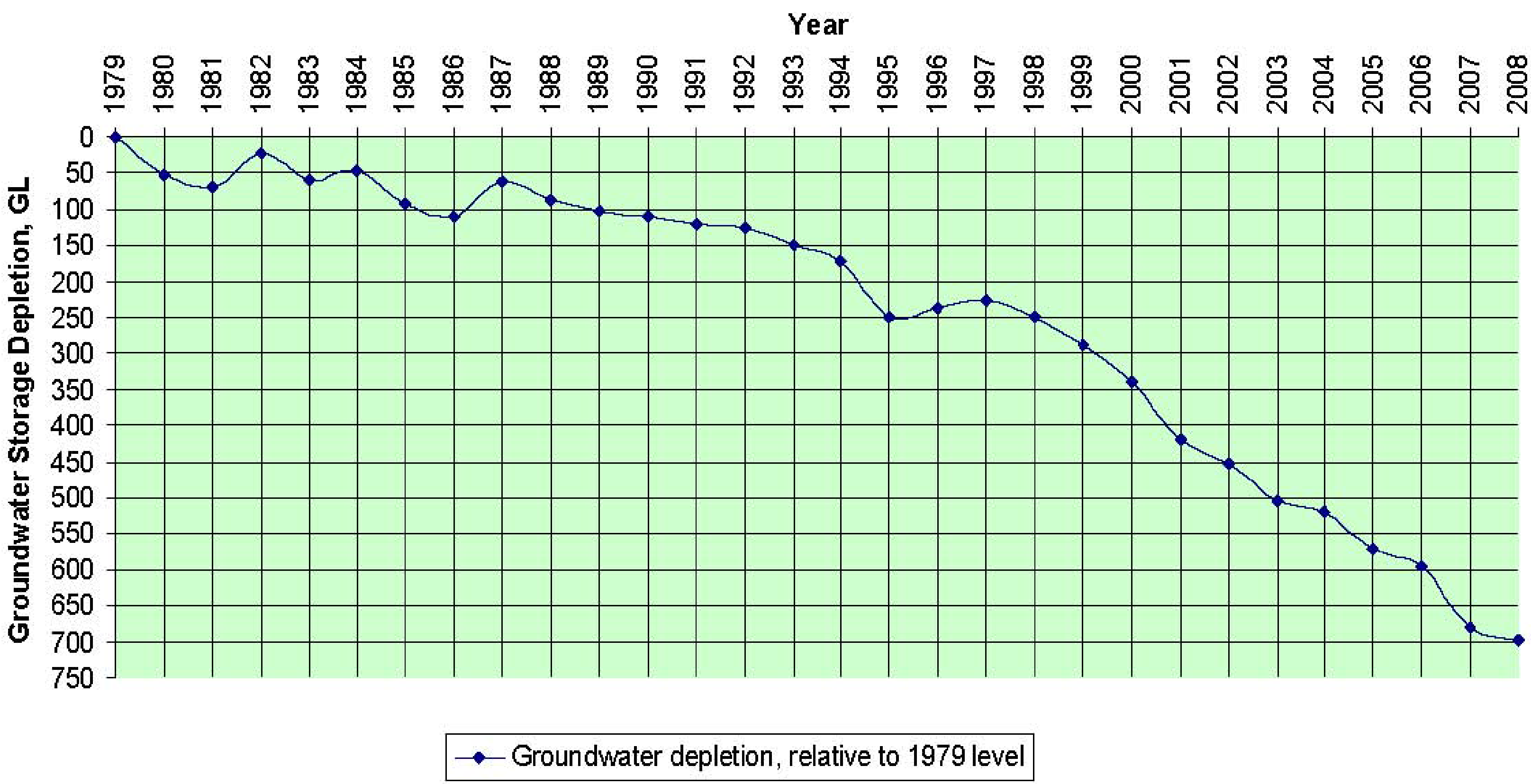
State of Play



Source: Draft Perth-Peel Regional water plan 2010-2030 Department of Water

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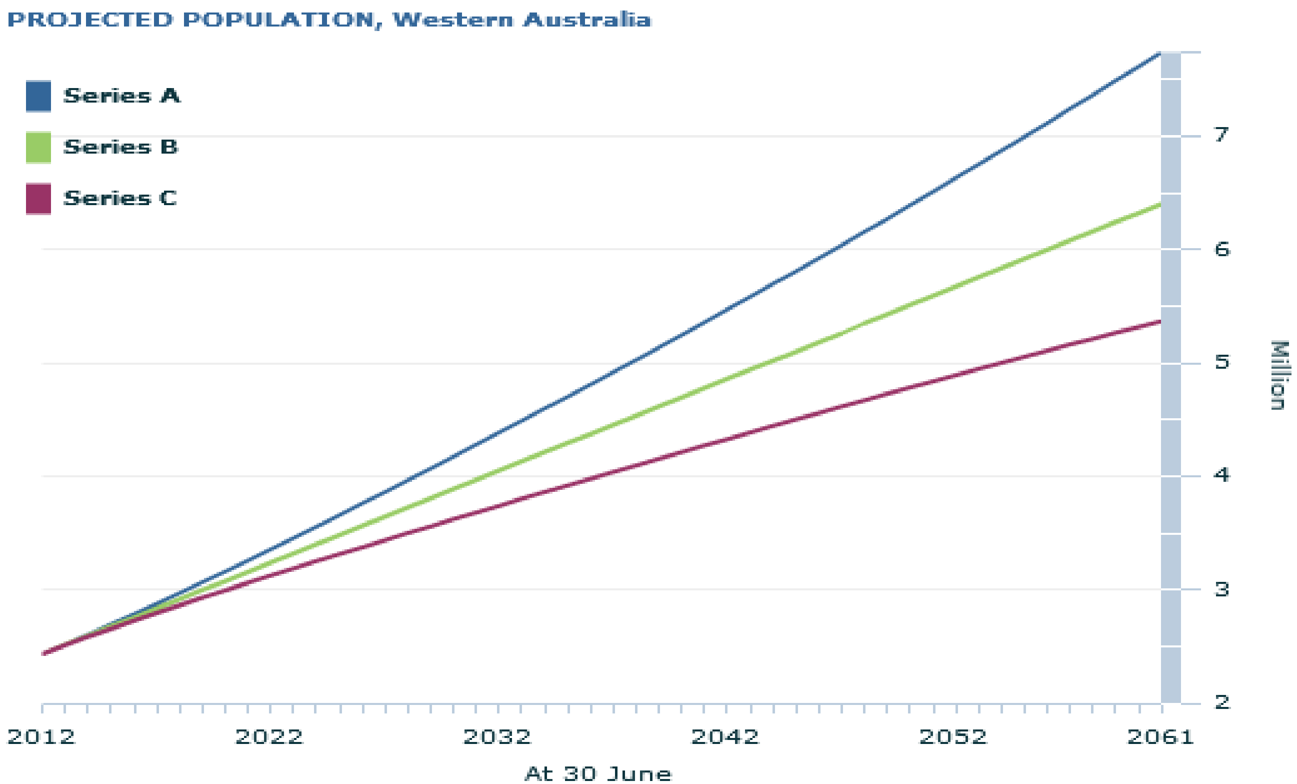
Population Growth



Australian Bureau of Statistics

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Future

Demand management

Possible demand management mechanisms include:

- Temporary or permanent water restrictions.
- Water pricing.
- Improved water system efficiency.
- Water trading.
- Increased end use efficiency (for example, housing codes, appliance performance standards).
- Use of alternative sources of supply for fit-for-purpose use.
- Consumer information on real costs and options.
- Reductions in water allocation limits.

Source: Draft Perth-Peel Regional water plan 2010-2030 Department of Water

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Future

Licensed private use effect of demand on groundwater availability-Perth

	Groundwater available by 2030GL/y		
2030 demand scenario	Wet climate	Median Climate	Dry climate
Constrainted demand(250gl/y)	-37	-74	-107
10% reduction	-12	-49	-82
20% reduction	13	-24	-57

Source: Draft Perth-Peel Regional water plan 2010-2030 Department of water

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Future

As pressures on our water resources increase, and systems become fully allocated, new strategies are being developed to supplement natural groundwater resources and increase water availability. Managed aquifer recharge (MAR) provides a means to generate water supplies from sources that may otherwise be wasted. It can provide environmental, social and economic benefits. MAR involves recharging an aquifer under controlled conditions to store the water for later abstraction, or to achieve environmental benefits.

Source: MAR operational policy Department of Water

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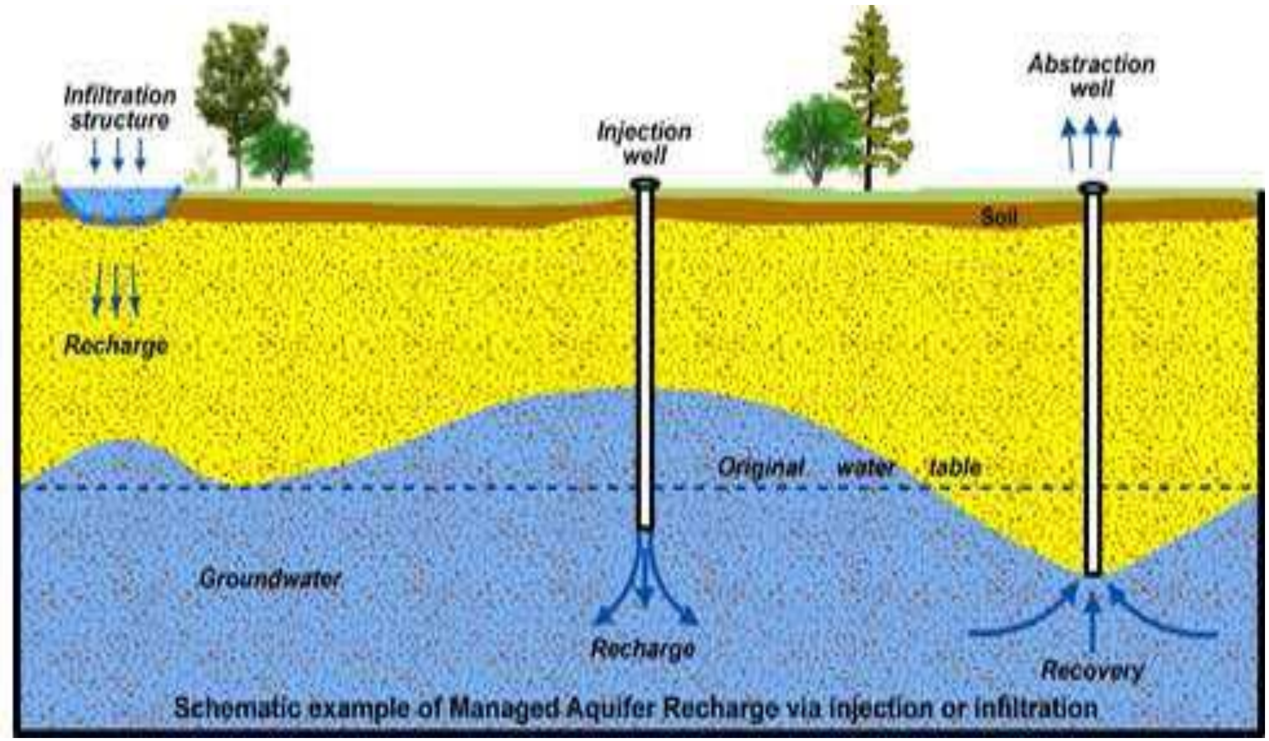
What is MAR



Source: Department of Water website

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From This

Image 2010

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To This increase in hard surface run off

Image 2013

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Increase in hard surface run off

In a factsheet published by the Swan River Trust, Perth's Drainage System, it is noted that many urban drainage lines and sumps were once natural streams and wetlands, but these have been highly modified to cope with the increased runoff caused by urban development. The factsheet also notes that under natural conditions most rain falling on a catchment soaks into the soil, tops up aquifers, is used by vegetation, travels over or under the ground towards rivers, lakes, reservoirs or the ocean, but that urban development creates impervious surfaces such as roofs, roads and pavements, which means rainfall no longer infiltrates where it falls and large volumes of water are artificially drained away.

Source: Shire of Kalamunda, Hartfield Park, Water Resource Management Operating Strategy for a Stormwater Harvesting and MAR Trial, Rockwater Pty Ltd 2013

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Hartfield Park MAR

- Hartfield Park Reserve (HPR) is the largest sport and recreation reserve within the Shire of Kalamunda.
- HPR contains a wide range of sporting and recreation facilities that service an extensive area.
- The Hartfield Park Master Plan (2010) and Community Facilities Plan (2011) identified the need to increase the amount of active playing field space at HPR, and recommended that alternative water sources be identified to ensure the long term sustainability of maintaining the site.

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Site Map

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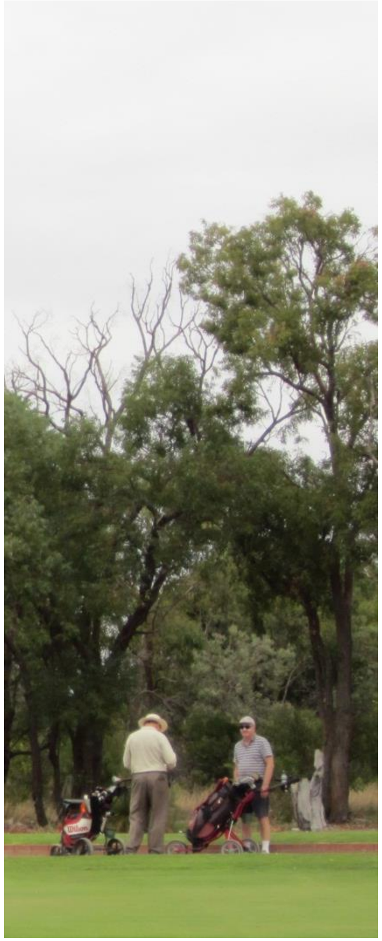
Harvesting Concept



- Harvest valuable stormwater from the onsite Water Corporation, Woodlupine main drain, which would normally be channelled away into the urban water run-off system.
- Water will be extracted from the drain in the winter months, which would be re-injected into the aquifer under the Department of Water Managed Aquifer Recharge (MAR) policy.
- The proposed aquifer recharge system would capture and filter the water, re-inject it into the aquifer and increase the Shire license to take water allocation, under the RIWI rights in water and irrigation Act 1914.

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Objectives

The re-injected aquifer water will be used during the summer months in the following ways:

- To provide a solution to the problem raised by the Hartfield park master plan. Alternative water sources be identified to ensure the long term sustainability of maintaining the site.
- To sustain water extracted from the licensed irrigation bores.
- Provide long term, sustainable water source for the future growth in participant numbers and playing surface area.

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The Process

- Defining the need or problem that requires a solution
- Evaluate options
- Who owns the infrastructure
- Regulatory requirements
- Council presentation
- Engage relevant stakeholders
- Establish scope of works (satisfy MAR policy)
- Engage specialist (Hydrologist/Hydraulic engineer) to complete feasibility study

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Feasibility Findings

- The desktop feasibility study captured two main water harvesting concepts involving the:

  - Leederville Aquifer

  - Superficial Aquifer

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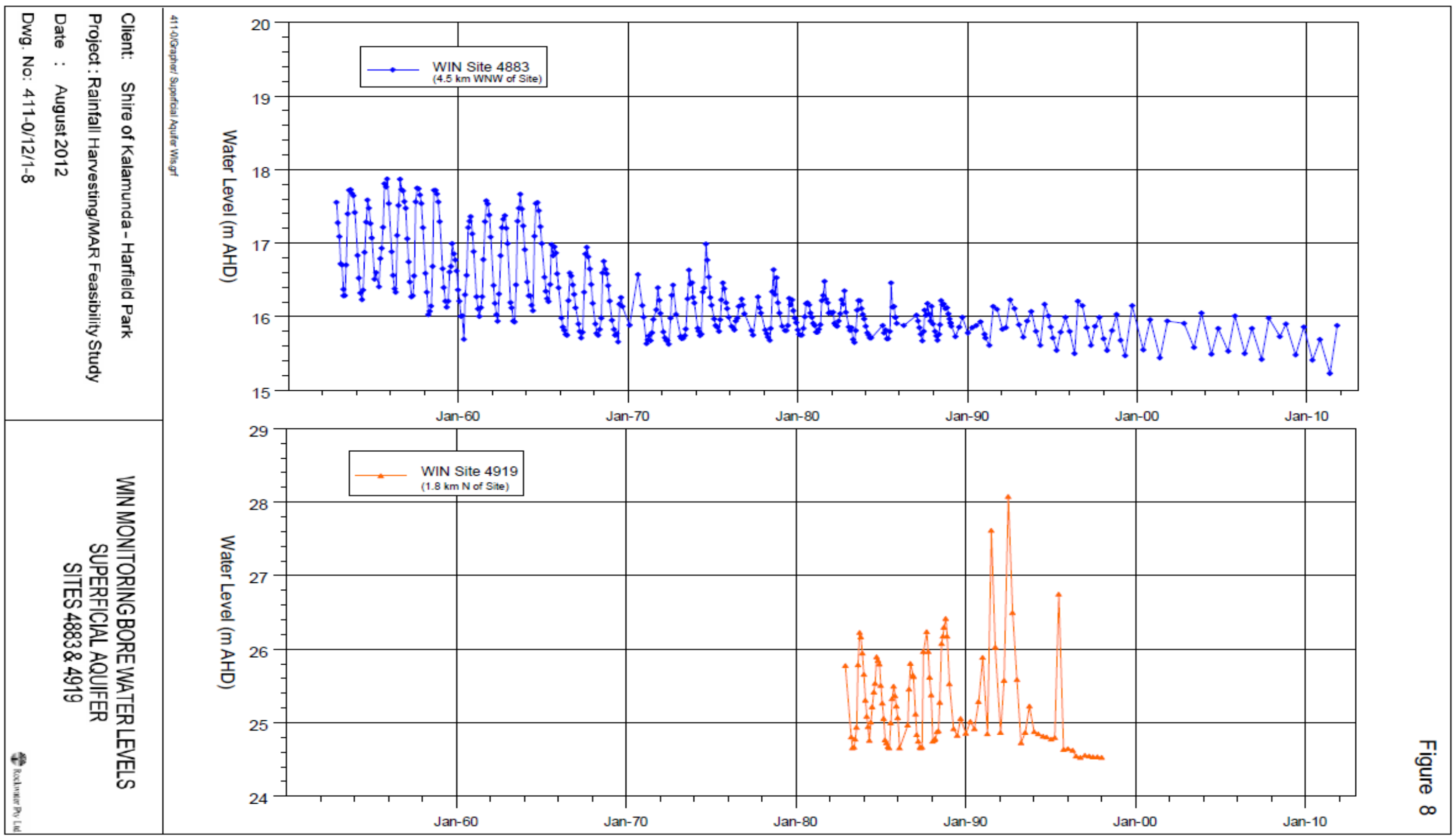
Feasibility Findings



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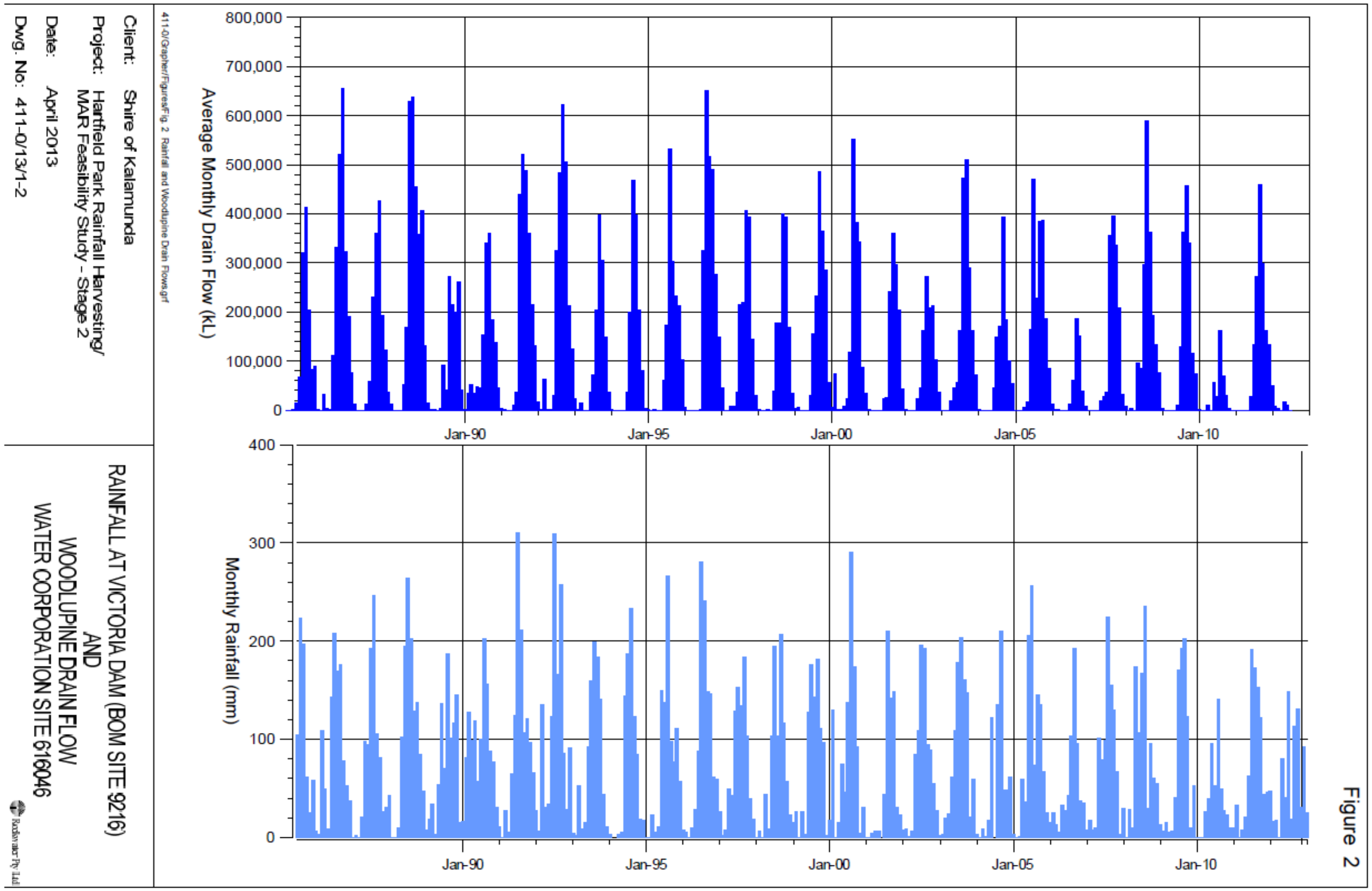
Feasibility Findings



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Feasibility Findings

Table 4: Viability Assessment Criteria		
Attribute	**Superficial Aquifer**	**Leederville Aquifer**
1. Is there a sufficient demand for water?	Yes - Increasing demand for water by Hartfield Park and Hartfield Country Club Golf Course	
2. Is there an adequate source of water available for allocation to recharge?	Yes - Woodlupine Drain contains an adequate supply and DoW and Water Corporation have provided in principle support	
3. Is there a suitable aquifer for storage and recovery of the required volume?	Inconclusive – Extent of suitable sands and aquifer permeability is uncertain, as is the depth to water	Yes - From available data. Pilot hole would confirm thicknesses of sand beds and confining layers
4. Is there sufficient space available for capture and treatment of the water?	Yes - Preliminary plan to pump water from the drain to the recharge point using predominantly existing infrastructure	
5. Is there a capacity to design construct and operate a MAR project?	Yes - Infiltration basins/galleries requiring tractable ongoing management	Inconclusive - Injection bore likely to require significant commissioning cost and considerable on-going management to reduce clogging

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The Next Step

- Evaluate feasibility study
- Detailed Hydrological assessment
- Establishing the criteria to define the scope of works

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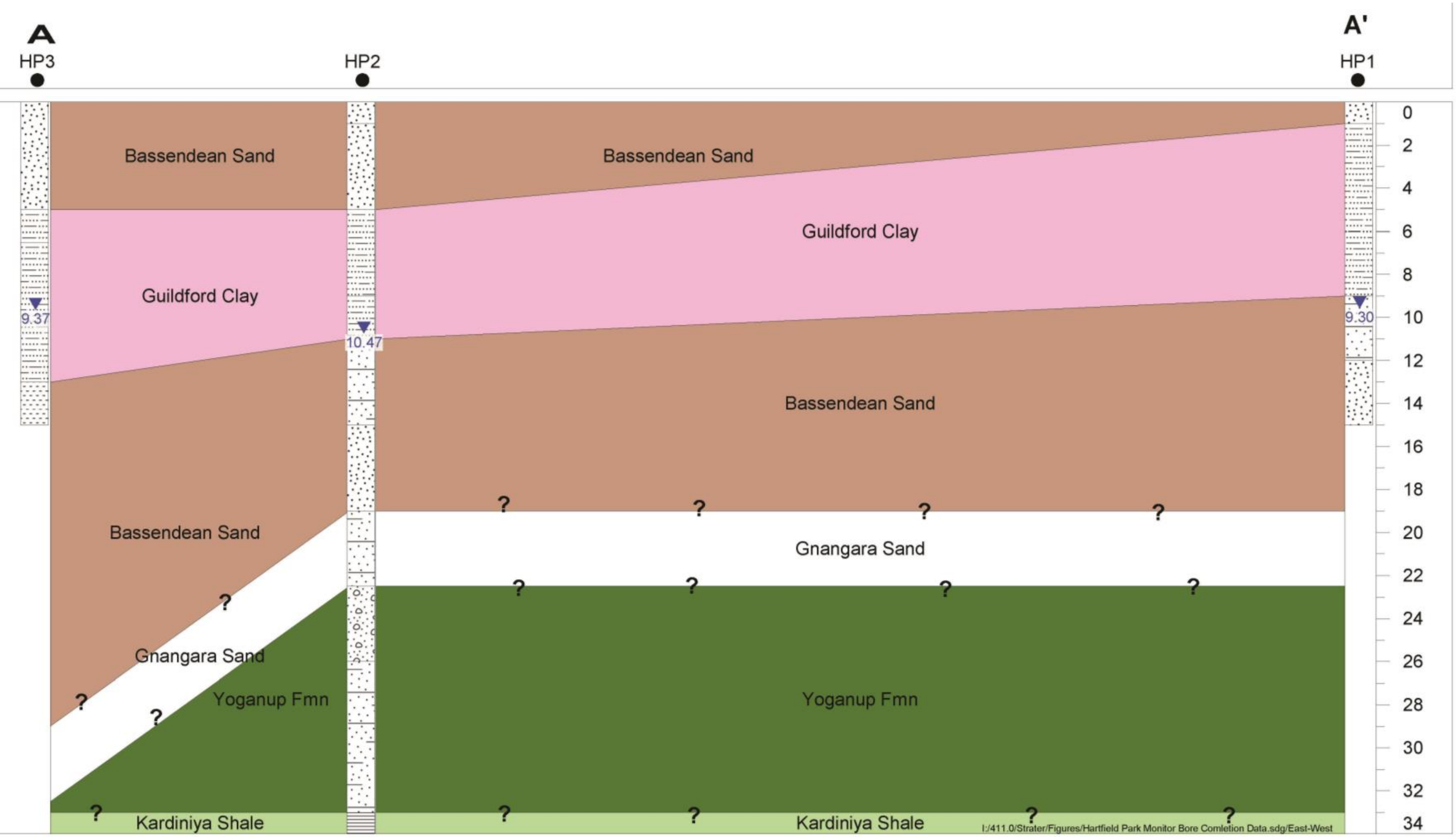
Site Geology



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Risk Assessment

	MAR Hazards	Maximal Risk				Pre-commissioning Residual Risk			
		Human endpoint - irrigation	Environmental endpoint - irrigation	Environmental endpoint - Conservation Wetlands	Environmental endpoint - aquifer	Human endpoint - irrigation	Environmental endpoint - irrigation	Environmental endpoint - Conservation Wetlands	Environmental endpoint - aquifer
1	Pathogens - pathogens present in untreated stormwater. No water will be injected from first flush events.	H	L	L	M	L	L	L	L
2	Inorganic chemicals - none likely present at levels of concern for irrigation.	L	L	L	L	L	L	L	L
3	Salinity and sodicity - stormwater of better quality than groundwater.	L	L	L	L	L	L	L	L
4	Nutrients - nitreogen, phosporous and organic carbon. None likley present at levels of concern for irrigation.	L	L	L	M	L	L	L	L
5	Organic chemicals - none likely of concern for irrigation.	L	L	L	M	L	L	L	L
6	Turbidity and particulates - not present at levels of concern for irrigation, but may cause clogging (operational risk).	L	M	L	H	L	L	L	L
7	Radionuclides - none likely present at levels of concern for irrigation.	L	L	L	L	L	L	L	L
8	Pressure, flow rates, voumes and groundwater levels. Small scheme in semi-confined aquifer. Injection pressures will need to be monitored and controlled.	N/A	L	L	M	N/A	L	L	L
9	Contaminant migration in fractured rock and karstic aquifers. Not applicable in Bassendean Sand aquifer.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10	Aquifer dissolution and stability of well and aquitard - predominantly quartz aquifer.	L	L	L	L	L	L	L	L
11	Aquifer and groundwater-dependent ecosystems - aquifer likely confined by Guildford Clay beneath Conservation wetland. No direct connection anticipated.	N/A	L	L	L	N/A	L	L	L
12	Energy and greenhous gas considerations - unknown compared to other options.	N/A	U	N/A	N/A	N/A	U	N/A	N/A

H = high risk; M = moderate risk; L = low risk; N/A = not applicable; U = unknown.

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ASR Concept

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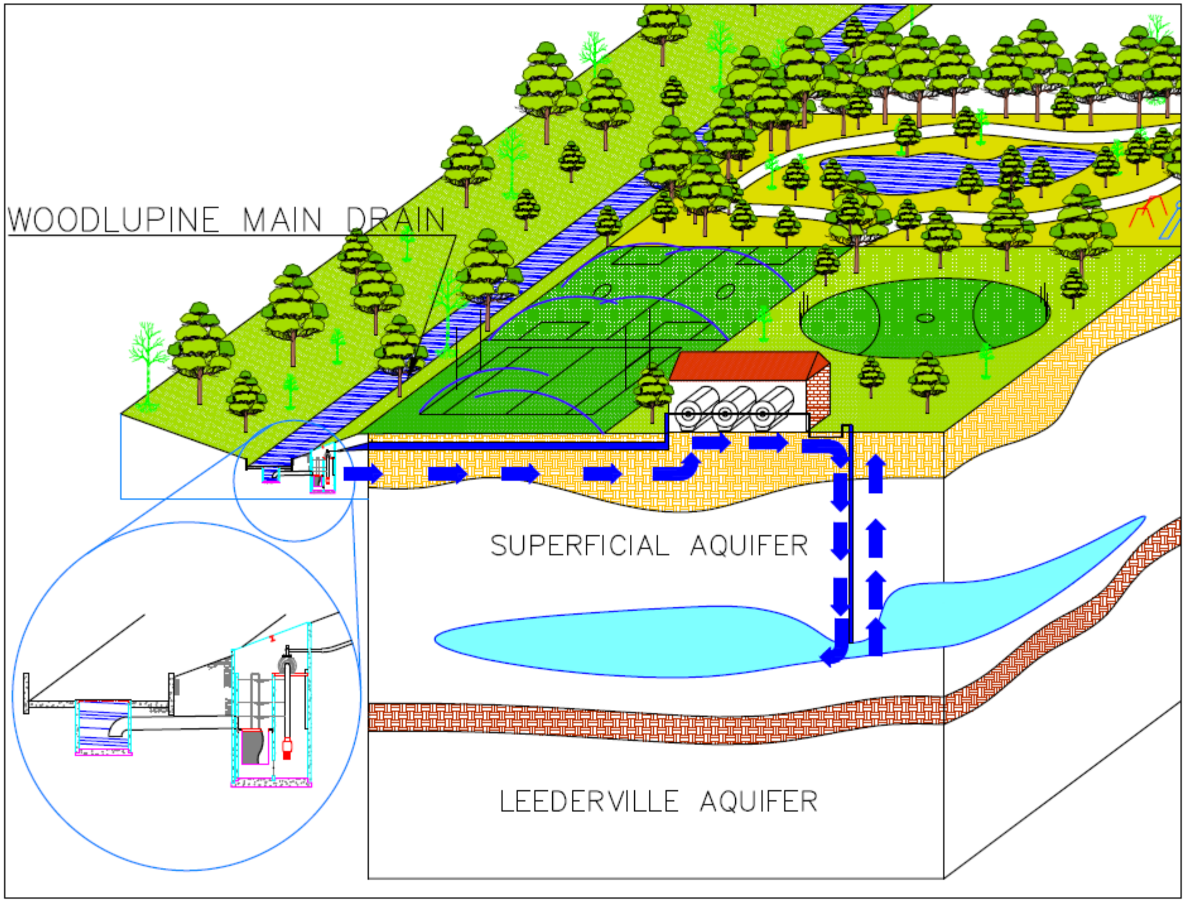
ASR Concept



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Advantages to MAR

Nature provides the storage for free

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Approvals

- Owner of the infrastructure

- Department of Water

Other government departments DEC, DOH, EPA

Project Update

- Approval has been given to proceed by the Water corporation.
- Viability assessment completed satisfying the DOW MAR policy 1.01.
- Operating strategy completed
- Licensing approvals granted from the DOW,DOH and DEC.
- Tender submissions currently being assessed for the proposed trial.

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Getting Started

- Why MAR?, what is the problem that requires this type of solution.
- Understand the MAR operational policy 1.01.
- Identify and engage relevant stakeholders.
- Aligning the concept to councils strategic plans.
- Defining a scope of works to engage a specialist.

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Thank you

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