WGV Waterwise Development Exemplar

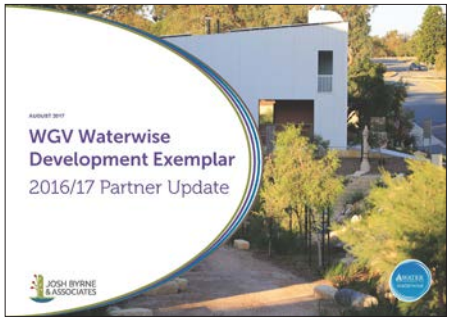
2018/19 Partner Update

September 2019

This report provides an update on the activities of the fourth year (2018/2019) of the WGV Waterwise Development Exemplar program.

Previous updates include:

- WGV Waterwise Development Exemplar - 2017/2018 Partner Update
- WGV Waterwise Development Exemplar - 2016/2017 Partner Update
- WGV Waterwise Development Exemplar - 2015/2016 Partner Update



The WGV WDE has been made possible through the continued support of the following partners.

LANDCORP

WATER CORPORATION

Government of Western Australia
Department of Water and Environmental Regulation

CRC for Water Sensitive Cities

LOW CARBON LIVING CRC

Curtin University

City of Fremantle

JOSH BYRNE & ASSOCIATES

Urban Development Institute of Australia WESTERN AUSTRALIA

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WGV - A Waterwise Development Exemplar

WGV is a 2.2ha infill development in the Fremantle suburb of White Gum Valley. The LandCorp 'Innovation through Demonstration' project showcases precinct-scale design excellence on many levels by incorporating a range of diverse building types, climate sensitive considerations, creative urban greening and leading-edge water management strategies. The innovations at WGV are being captured via a series of research programs in cooperation with a variety of research partners including Curtin University, the CRC for Low Carbon Living, CRC for Water Sensitive Cities and ARENA. WGV is a Water Corporation endorsed Waterwise Development.

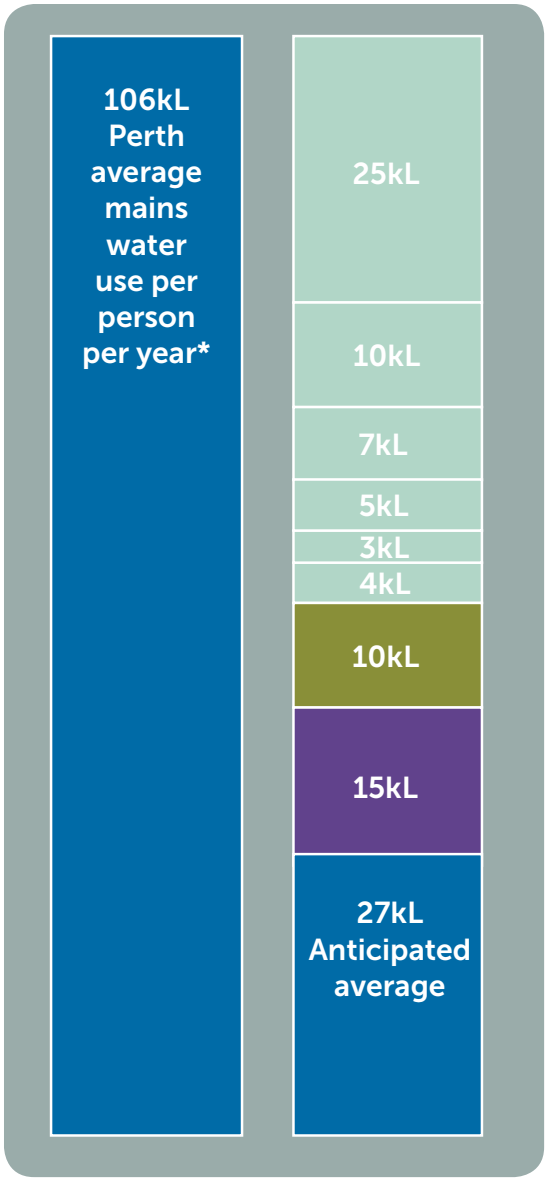
The WGV Waterwise Development Exemplar (WDE) is an initiative conceived by Josh Byrne & Associates (JBA) for the purpose of showcasing industry leading approaches to urban water management and scheme water optimisation.

WGV is targeting a 60% - 70% reduction in mains water consumption across a suite of initiatives, which equates to 30kl - 40kL per person per year, in contrast to the Perth average of 106kL per person per year.*

The water saving potential will be achieved by implementing a suite of initiatives that take in to account a range of factors such as cost, maintenance, water savings, sustainability and economies of scale.

* 2008/2009 Perth Residential Water Use Study - Water Corporation, 2010

Achieving the Water Saving Potential



* Water Corporation, 2010

Density Savings (25kL)

'Embedded' water efficiency gains are expected from increased development density when compared to the historical Perth average*.

Indoor Water Efficiency (10kL)

Inclusion of minimum specified water efficient fixtures (9 L/ minute, 3 stars WELS rating) for all new dwellings under the National Construction Code (NCC).

Indoor Water Efficiency + (7kL)

Additional efficiency gains achieved via enhanced water efficient fixtures and appliances over and above the NCC requirements included in the development Design Guidelines (DGs).

Landscape Efficiency (5kL)

Mandated installation of water efficient irrigation with a rain sensor and programmable controller connected to the meter. Recommended adoption of hydrozoning principles, irrigation controls such as evapotranspiration sensors or soil moisture sensors, and the creation of microswales and basins to reduce runoff and recharge soil moisture.

Behaviour Change (3kL)

Planned resident education and support initiatives have been integrated with the One Planet Living Action Plan.

Smart Metering (4kL)

Real-time data logging will provide leak detection and feedback to users to support efficient water-use behaviour.

Rainwater Harvesting (10kL)

The supply and installation of a 3,000L rainwater tank is available in the sustainability package. DGs mandate dual plumbing to toilets and washing machines, provision of sufficient space for a rainwater tank and roof catchment area.

Community Bore (Groundwater) 15 (kL)

Groundwater from the superficial aquifer is supplied via a centrally controlled third pipe (purple pipe) system. DGs stipulate that irrigation controllers and individual meters be installed for optimal efficiency.

Design Guidelines

The *Design Guidelines* and the *Comprehensive Guide for Residents* were developed to clearly communicate the intent of the project and ensure early uptake by residents.

These documents provide information for residents on mandated 'development controls' and recommended 'design guidance' to ensure initiatives are implemented and the sustainable design aims for the site are achieved. Residents are required to submit their plans to the WGV estate architect for review prior to planning application and building licence approval.

Design Guidelines.pdf

Comprehensive Guide for Residents.pdf

Research Aims & Monitoring Architecture

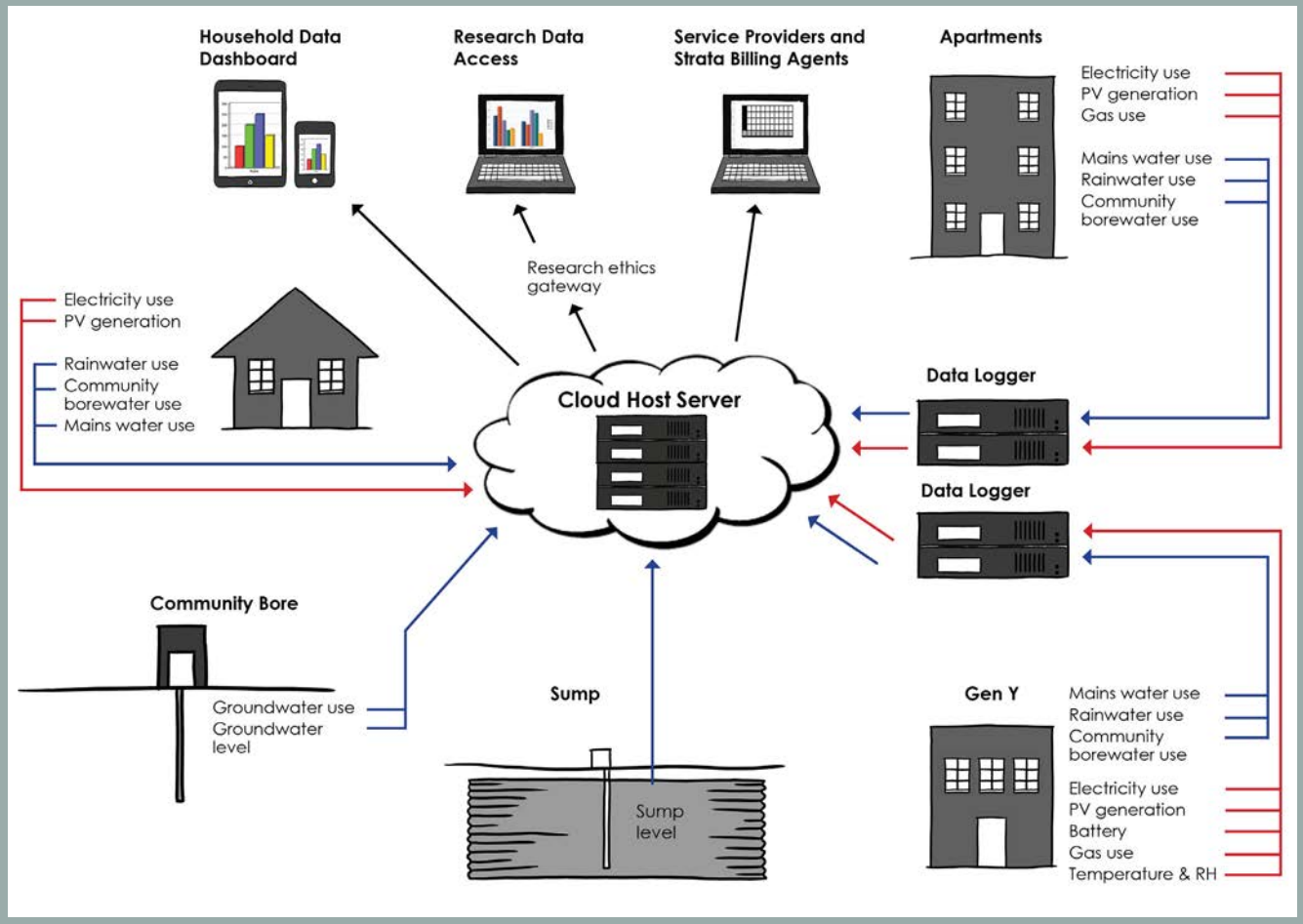
The last of the lots at Waterwise Development Exemplar are nearing development and as more residents move into WGV the information collected will further validate the site's success as an exemplar. This includes performance data collected via monitoring to help evaluate the various initiatives, as well as the design, governance and operational experiences that are shared via events and case studies.

The principal research aims for the WGV WDE research program are:

- To quantify the scheme water savings across a range of residential typologies.
- To monitor the performance of the various water-based initiatives (technical, operational and behavioral) deployed at WGV.
- To critically assess the performance of the stormwater drainage design requirements for the site via real-time data capture.
- To analyse data and report on the performance findings to a broad audience that includes industry, local government and the community.

The following schematic shows the various components that are being monitored.

WGV Precinct Monitoring Architecture



Project Update

The majority of lots at WGV have now been built out and, consequently, remote monitoring equipment has been installed and water data is being collected. Only three of the twenty-two single residential lots and one of the four multi-residential sites are yet to be constructed. The remote monitoring network has been producing data for some sites for over a year, while others have come on-line more recently.

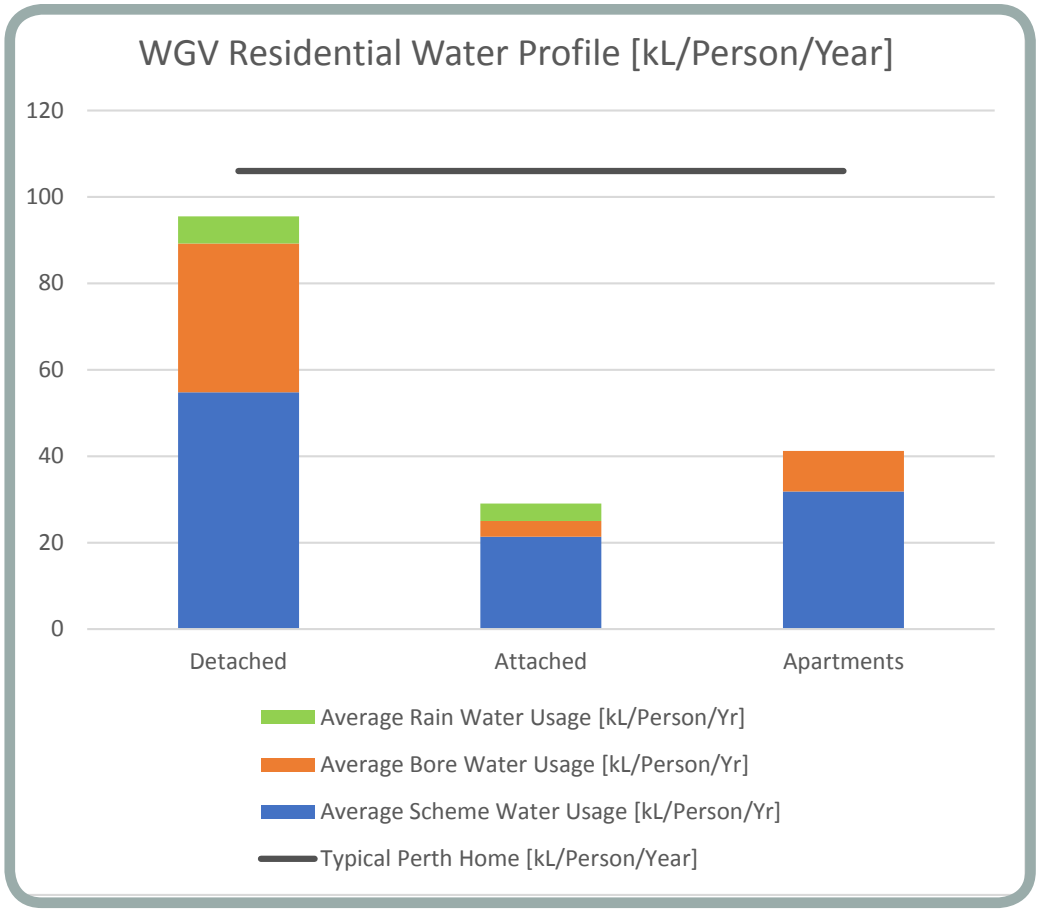
The data is being analysed and compared to the modeled predictions for the project. The following table shows the original target set for the project and the performance currently being achieved. The original targets were for a 60-70%* reduction in mains water consumption across the original mix of typologies, which resolved to an estate-wide weighted average of 66% reduction, or target consumption of 36 kilolitres/person/year.

WGV water consumption targets and current performance

Perth average mains water use per person per year* (kL/person/year)	106		
WGV average mains water use per person per year [Target] (kL/person/year)	36		
Targeted Reduction	66%		
WGV typologies	Detached housing	Attached housing	Apartments
Measured Mains Water consumption [by typology] (kL/person/year)	55	21	32
Measured Mains Water consumption [WGV weighted average] (kL/person/year)	39		
Achieved reduction	63%		

* Water Corporation, 2010

The following chart shows mains water performance based on up-to-date data.



WGV residential water consumption by typology

Observations by typology

- Mains water consumption for the detached dwellings averages 55 kL/person/year, which is a 48% reduction compared to the Perth average*. Bore use for garden irrigation averages 34 kL/person/year and rainwater use (toilets and washing machines) averages 6 kL/person/year.
- For the attached dwellings, the average mains water use is 21 kL/person/year, which is a 80% reduction to the Perth average*. Bore use for garden irrigation is 4 kL/person/year, and rainwater is also 4 kL/person per year.
- For the apartments, the average is 32 kL/person/year, which is a 70% reduction to the Perth average*, and bore use average 9kL/person/year.

Overall the average resident at WGV consumes 37 kL/year of mains water, representing a 63% reduction* on the most recently documented Perth average.

Equipment Installed

The installation of water consumption monitoring equipment has been in part a function of construction at the site. Water meters have been installed as sites are ready for construction and remote reading equipment was generally installed only once site works were largely complete on any given lot. Rainwater systems have been installed after builder's works are complete, with remote monitoring installed once the systems are operational. So far one detached housing lot owner has elected not to install a rainwater system, with three lots yet to complete construction. It is understood that one detached housing lot owner has chosen not to connect to the shared bore system for irrigation. The following table summarises the status of data connection installations, meaning that in each case equipment is installed, commissioned, and is sending data.

Status of completed mains water data gathering points at WGV

WGV typologies	Mains Water - Data connection installed	Mains Water - Data connection yet to be installed
Detached housing	19	3
Attached	1	0
Apartments	3	1

* Water Corporation, 2010

In all except a few cases where access to meters has been restricted, remote readings have been verified by manual readings taken on a regular basis. This process has established that for all the verified sites the remote reading system is within 3% of the manual reads. This error is expected to reduce over time as the slight offset caused by the precise timing of the manual reads becomes less significant, and as there are less interruptions to the online system for installation and commissioning. Data from individual apartments has been provided by the strata companies and is being verified against the manual reads for the total water consumption of the buildings.

An additional multi-residential site is in the process of being subdivided by the subsequent owner. It is unlikely to be completed in time to be part of this project.

Equipment for remote monitoring of levels is installed and operational on the shared bore and on the infiltration system at the sump site. This is on City land on the southwest corner of WGV. The sump site was converted into a public pocket park in a collaboration between LandCorp and the City of Fremantle. There is also manual monitoring of bore water consumption for irrigation of public green spaces.

What's Ahead

The true impacts of the initiatives being demonstrated at WGV are becoming apparent now that real world data is replacing initial modelling and water efficiency targets. This data is being used in a number of ways.

Research

Water system data from WGV is now being made available to researchers through the Curtin Research Database, administered by the Curtin University Sustainability Policy Institute. There are PhD candidates and post-doctoral researchers now looking at this data and using their analysis for a range of research projects.

LandCorp Projects

There are LandCorp projects that can be considered direct descendants of WGV, particularly East Village at Knutsford, in Fremantle, and Hamilton Senior High School Redevelopment, another infill development in Hamilton Hill. Importantly, there is also an internal process whereby LandCorp development managers are being exposed to the detail of the water initiatives at WGV and have an opportunity to implement what are now proven approaches.

East Village at Knutsford

LandCorp's East Village at Knutsford represents an evolution in the delivery of state-of-the-art sustainable housing with efficient design, innovative servicing and local identity at its core.

Including 60 apartments and 36 architecturally designed town homes, the site will join WGV as part of a network of sustainable communities demonstrating how to plan and deliver water sensitive urban developments.

The project is targeting 80% reduction in mains water consumption*. It will be home to several research projects including the Curtin University Legacy Living Laboratory (L3) national iHUB project and the Cooperative Research Centre (CRC) for Water Sensitive Cities' 'Water Sensitive Outcomes for Infill Developments' research.

Outreach

A communications plan is in place for a new phase of industry engagement based on what has worked and lessons learned along the way. Being able to discuss dramatic actual reductions in mains water consumption changes the dynamic compared to a discussion of targets and intentions and is expected drive strong interest from developers and policy makers alike.

Hamilton Senior High School

The former Hamilton Senior High School (HSHS) site is a LandCorp demonstration residential infill project targeting the highest level of sustainability.

The new residential community has the potential for 225 lots and 333 homes, together with quality public open space.

HSHS is targeting a 70% reduction in mains water consumption* through a balanced approach to water use by combining alternative water supply with reduced demand to support green spaces, the environment and community wellbeing.

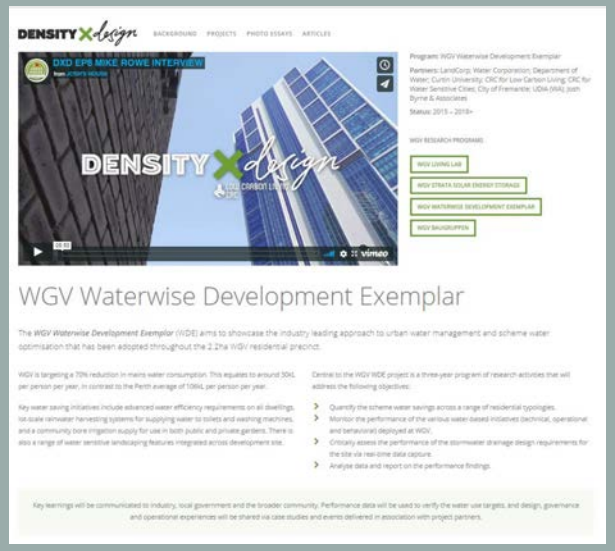
The HSHS Waterwise Program (WPP) will investigate, document and communicate how integrated water management approaches at the development can become mainstream practice in Perth's urban development industry. The WPP is supported by the Water Corporation and LandCorp, City of Cockburn and Department of Water and Environmental Regulation (DWER).

*Compared to the Perth average on a per person basis (Water Corporation, 2010).

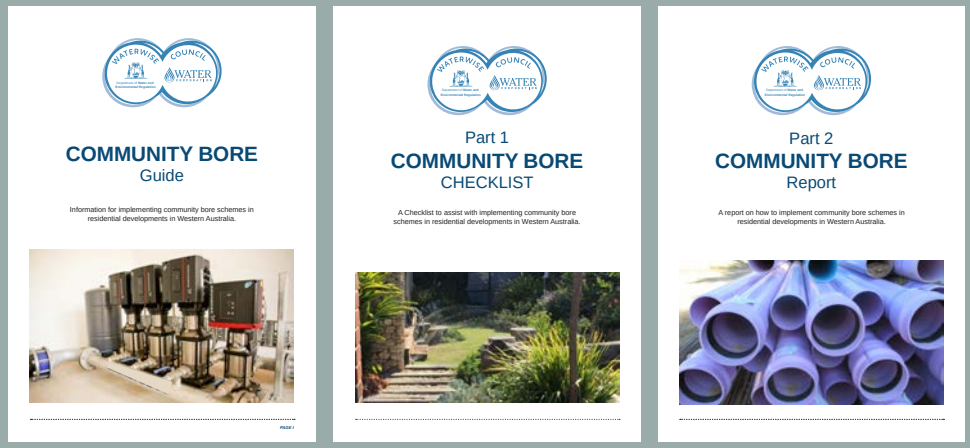
Communications Activities

The WGV Waterwise Development Exemplar Community Engagement Strategy continues to be supported and shared by stakeholders fostering continued interest in the project. Communication events for the 18/19 year included video production and screenings, research publications, site tours with key political and industry representatives, and presentations. A selection of the key achievements include:

- *Mainstreaming Low Carbon Residential Precincts: the WGV Living Laboratory* - Final Report - CRC for Low Carbon Living
- Australian Business Awards - Community Contribution Award and Sustainability Award
- *WGV Project Series Wrap - What have we Learned?* - video - Density by Design
- *WGV Engaging People and Fostering Community* - video - Density by Design
- *WGV Water Sensitive Urban Design* - video - Density by Design
- *WGV Mike Rowe Director General - DWER* - video extra - Density by Design

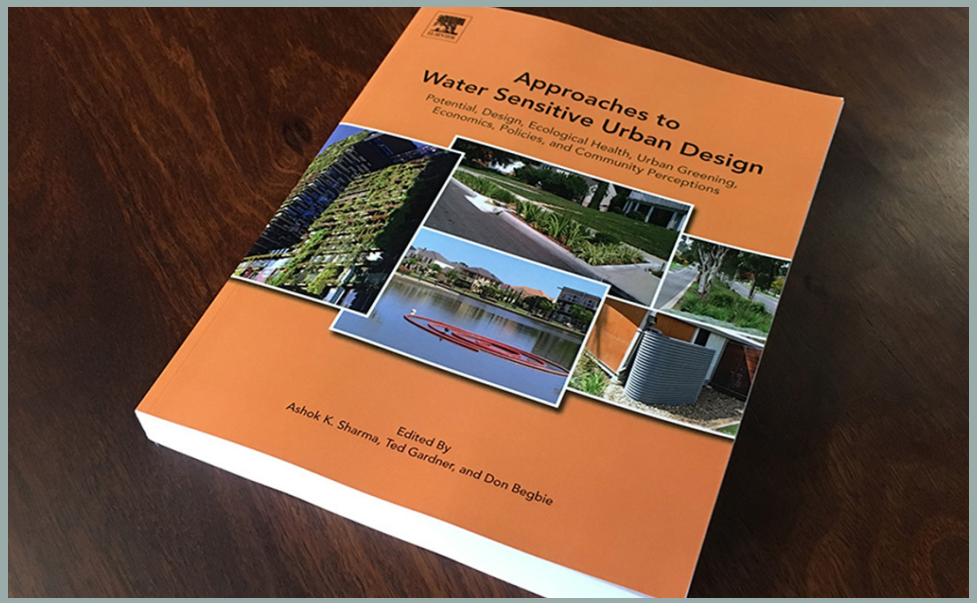


Density by Design - WGV Waterwise Development Exemplar Web Page



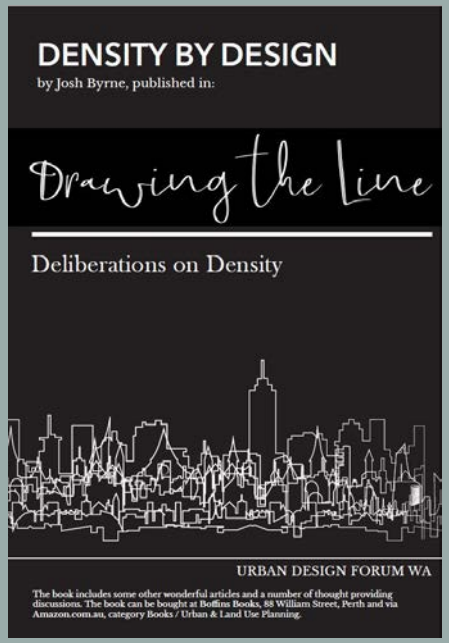
Community Bore Guide - Water Corporation

- *WGV Waterwise Development Exemplar* - web page - Density by Design
- *Community Bore Guide - Information for implementing community bore schemes in residential developments in Western Australia* - Water Corporation
- *A Conversation About Making the Most Out of Demonstration Projects* - presentation - UDIA Water Committee
- *Towards Zero Carbon - Living a Low Carbon Life* - video - CRC Low Carbon Living
- *Solar Electric Homes* - presentation - NXGen '19 Future Housing Taskforce event Gold Coast
- *WGV Research Database* - CRC Low Carbon Living - State by State Research to Reality Expo - presentations - Perth
- *WGV Innovation through Demonstration* - Onsite signage update
- Evermore data dashboard and PL induction session - event & presentations - WGV Sullivan Hall
- Innovation Site Tour x 2 - Department of Mines, Industry Regulation and Safety - hosted by Warren Phillips
- *WGV by LandCorp One Planet Action Plan* - annual review
- *Living Labs WGV to East Village Research Rumble* - presentation - Curtin University



WSUD Implementation in a Precinct Residential Development: Perth Case Study

- Byrne, J. Green, M. & Dallas, S. (2018). *WSUD Implementation in a Precinct Residential Development: Perth Case Study*, in *Approaches to Water Sensitive Urban Design*, edited by Sharma, A. Begbie, D. & Gardner, T, Elsevier, UK
- Innovation in the Development Sector - presentations x 3 - Water Sensitive SA, Clearwater Vic and Splash Network NSW
- WGV - Greening the Greyfields - presentation - Environmental Health Australia Conference
- Bank of Australia - WGV site tour - Partnerships and Community Partnership Managers
- CRC Case Study - Federal Minister - Department of Industry, Innovation and Science
- *Mainstreaming Zero Energy Housing: From House to Precinct* - presentation - ASBEC National Council
- *WGV Water Sensitive Urban Design* - video screening - GRIHA Summit New Delhi
- WGV Site Tour - International Cities Towns Communities (ICTC) 2018 Conference
- *Mainstreaming Zero Energy Housing: From House to Precinct* - presentation - CRC LCL National Forum
- *Sustainability Frame Works OPL and WGV* - Notre Dame University - Mark Taylor
- *Energy Positive Homes – From House To Precinct* - Spark Conference Plenary - Moreland Energy Foundation
- WGV Video Showcase - Sustainable Housing Event - Australian Embassy Serbia
- One Planet Community Developments - panel discussion - Sustainable House Day
- Sustainable House Day - Grand Designs Fremantle exhibition
- *Keeping the Green in Densifying Cities* - TREENET 19th National Symposium Presentation
- WGV tour - Cockburn Council
- 2018 WA Local Government Convention WALGA - WGV Site Tour
- Using Data for Good: in conversation with Josh Byrne and Natasha Hurley Walker - Disrupted Festival of Ideas
- *Water Sensitive Urban Design - WGV in White Gum Valley, WA* PLA Conference
- Byrne, J. (2018) *Density by Design*, in *Drawing the Line, Deliberations on Density*, Urban Design Forum - PIA
- *Planning Sustainable Living Insights From Josh's House And WGV Precinct - Lecture* - UNSW
- WGV tour - Director General Department of Planning Lands and Heritage



Urban Design Forum Book