green building council australia

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Potable Water Calculator Guide

Green Star – Office Design v3 & Green Star – Office As Built v3

The Potable Water Calculator (the Calculator) estimates the potable water consumption based on efficiency of fittings (such as WC's, urinals, taps, and showers) and potable water consumption reduction through rainwater, greywater or blackwater harvesting.

The Potable Water Calculator is used in Green Star to estimate potable water consumption in projects, and forms the basis for points awarded in the Green Star Water category. The Calculator allows projects to be compared on identical terms, which is essential for fair and just Green Star assessment. The Calculator is built for Green Star assessment purposes and not for dimensioning sanitary and water systems.

The estimated potable water consumption is compared to benchmarks to determine the points achieved. The benchmarks used in this credit are based on:

- Australian Government Water Efficiency Labelling Standards (WELS) Scheme; and
- AS/NZS 6400:2005 Water Efficient Products – Rating and Labelling.

If all WCs, wash hand basins (WHBs), urinals and showerheads achieved a WELS 6 Star rating, and no rainwater or greywater systems were installed, then the Calculator would award one point. To achieve a greater number of points, further reduction in water consumption through greywater recycling and/or rainwater collection systems would be required.

The Calculator is divided into three sections. The first section establishes the predicted water consumption based on fittings and fixtures. The second section calculates predicted water savings in the building due to water recycling. The third section reports results of the above calculations and identifies the number of points achieved in Wat-1 'Occupant Amenity Water'.

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Predicted Water Consumption

The calculated potable water consumption is based on average usage of water consuming fixtures in the project. The average usage data is based on studies undertaken in the U.K. by the Water Centre at the Building Research Establishment for typical office buildings.

The usage per person per day is based on equal numbers of male and female occupants, outlined in Table 2. Male and female WCs are treated separately where urinals are installed. If there are no urinals then an average WC use of 2.3 per person per day is assumed for all occupants. The Calculator assumes the frequency of use of kitchen sinks to be the same as WHBs for the Indoor Tap calculation.

Type	No. of uses per day per person		Duration per use
	Male	Female	
WC	0.3	2.3	1 flush
Urinal	2	0	1 flush
Shower	Varies	Varies	5 minutes
Wash basin and kitchen sinks	2.5	2.5	9 seconds

Table 2 Data for average usage of water consuming facilities in offices used in the Potable Water Calculator.

Occupancy

The number of occupants used in the Calculator is based on one person per 15m^2 of NLA. The Calculator is designed to produce a benchmark for equitable comparison of office buildings. The Green Star tools assess base building features so hours of operation within the occupancy are not considered and no adjustment is made where the hours of occupancy may exceed normal hours of operation.

Fittings and Fixtures

When a WELS Star Rating for a particular fixture is selected; the highest consumption value for that WELS star rating is generated. The user is able to overwrite that value if required; however the star rating default will not be filled in a second time if the user wants to return to the default value. The actual flow rate can be entered manually to the calculator if known. Table 3 indicates the flows used in the Calculator. Water flow rates for fixtures are as per AS/NZS 6400:2005 Table 3.1

Flow controlling devices can only be considered for this credit if they are an intrinsic attribute of the fitting or fixture, and cannot be removed or adjusted by maintenance staff without specialist equipment.

Up to four different types of fittings can be inserted and described in the Calculator for WC, WHBs, urinals and showers. For each type, the water consumption measured in accordance with AS/NZS 6400:2005 must be entered, together with the percentage of each type of fitting in the building, as a percentage of all fixtures of that type. Where a fixture WELS Star rating is unknown, refer to AS/NZS 6400:2005 for the star rating.

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The WELS rating for urinals used in the tool is only relevant for one stall. The flow rates must be entered manually if pairs of stalls are used. Enter the star rating, flush volume and percentage of urinal stalls as a percentage of all urinal stalls.

AS/NZS 6400:2005 does not recognise flow rates for '4', '5' and '6' Star showers. The values generated in the calculator for these ratings are the same as a 3 star; the accurate values can be entered manually if known.

The average litres used for flushing a dual flush WC should be calculated as per the methodology in AS/NZS6400 i.e. averaging 1 full flush and 4 half flushes.

If a number of urinals feature a timed automatic flush (as may be found in refurbishment projects) rather than a manual or sensor flush, then the actual details of cisterns are to be inserted, together with the percentage for each fixture as a percentage of all urinals, measured by urinal 'stalls' (600mm of trough or individual urinal stalls) throughout the project. Insert the flush capacity for timed flush cisterns, or the average flush capacity where multiple timed automatic flush cisterns are installed.

For refurbishment projects only, waterless urinals can be deemed 'waterless' without completely removing existing plumbing if the water supply to them has been permanently disabled (i.e. physically dismantled in such a way that the water supply reconnection for flushing in NOT an option without additional construction work). The specification of water based-urinals that will use cartridges to negate the need for water does not allow the urinals to be deemed 'waterless'.

Fixture Type	Water consumption unit	Rating						
		0 Star	1 Star	2 Star	3 Star	4 Star	5 Star	6 Star
WC	L (average flush volume)	Warning	5.5	4.5	4.0	3.5	3.0	2.5
Urinal flushing	L per stall or 600mm width of trough wall	2.5	2.5	2.5	2.0	1.5	1.0	1.0
Indoor taps & flow controls	L/min	Warning	16.0	12.0	9.0	7.5	6.0	4.5
Showers	L/min	16.0	16.0	12.0	9.0	9.0	9.0	9.0

Table 3 Water consumption for each Star rating used in the Potable Water Calculator. This is a summary only; please refer to AS/NZS 6400 for full details.

Shower Use

Shower use varies depending on the facilities provided in the building. Enter the fixture description and Star rating or enter the flow rate to be used, followed by the percentage of fixtures as a percentage of all fixtures of that type.

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Other Predicted Consumption

Other demands within the project can be entered into the 'Other Predicted Water Consumption' section of the Calculator. These values are used to calculate how much of the recycled water is available for reductions in the potable water consumption. Annual demands should be calculated and converted to litres per day values for entry into these fields.

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Predicted Reduction in Potable Water Consumption

The results from the Potable Water Calculator are based on default values for occupancy and usage, these results are not accurate representations of the actual potable water consumption. The results for reduction of water use from the Potable Water Calculator are only intended for benchmarking purposes in Green Star and should not be used to size and specify rainwater and greywater recycling systems. If detailed rainwater harvesting calculations have been undertaken - including storage tank efficiency - for the system, then refer to the Detailed Calculation section below.

Rainwater Recycling

The Calculator produces an estimate of the amount of rainwater that could be collected and used to replace part or all of the potable water demands entered elsewhere in the calculator, based on:

- monthly rainfall;
- collection area;
- run-off coefficient;
- annual number of rainy days;
- storage capacity; and
- volume of rainwater collected used for irrigation or other purposes.

Where the design does not allow the total demand type to be supplied by rainwater i.e. 50% of WC's are fed by rainwater system, the amount may be entered by selecting the 'Other (daily demand in kL)'and entering the amount. Table 4 displays the run-off coefficients for rainwater collection systems used in the Calculator:

Roof Type	Run-off Coefficient
Pitched tile roof (>30° angle)	0.9
Steel roof (>30° angle)	0.8
Flat smooth roof (<30° angle)	0.5
Flat gravel or turf roof (<30° angle)	0.4

Table 4 Run-off coefficients used in the Potable Water Calculator

To complete the rainwater component of the Calculator, work through the question as shown below:

Are there any rainwater systems proposed for the project?

> If **NO** then this section of the Calculator is now complete. Go to the greywater and blackwater sections of the Calculator.
>
> If **YES** then select the type of demands that the rainwater is used for, by checking any or all of the check boxes in the fields "Rainwater collected is used for" area. Note that these fields can be selected in rain, grey or black water sections of the calculator i.e. if Irrigation is selected in the rain, grey and blackwater calculators; the demand is split equally across all 3 recycling processes. Other daily demands such as Irrigation, Cooling Tower and Fire

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Test water have been entered previously and do not need to be entered again.

Enter the collection area, storage tank capacity and runoff co-efficient.

Monthly rainfall and number of rain days must now be entered. The information can be obtained from the Australian Government Bureau of Meteorology website at http://www.bom.gov.au/climate/averages/. On the website select "(1) Type of Data", select "Monthly Statistics", and on selection "(2) Site Selection"' select "Main Capital City" or select State based data, then the location closest to the project.

This section of the calculator is now complete and the quantity of potable water that is replaced by the rainwater system is shown in litres per day per m^2.

Greywater Recycling

To complete the greywater component of the Calculator, work through the question as shown below:

Are there any greywater systems proposed for the project?

If **NO** then this section of the Calculator is now complete. Go to the blackwater section of the Calculator.

If **YES** then select the type of demands that the rainwater is used for, by checking any or all of the check boxes in the fields "Greywater harvested is used for" area. Note that these fields can be selected in rain, grey or black water calculators i.e. Irrigation is selected in rain grey and blackwater calculators; the demand is split equally across all 3 recycling processes.

Enter the percentage of each type of fixture used for collection and the storage volume of the greywater tank. Enter any other sources of collection of water for greywater processing such as fire test water.

This section of the calculator is now complete and the quantity of potable water that is recycled by the greywater process is shown in litres per day per m^2.

Blackwater Recycling

To complete the Blackwater component of the Calculator, work through the question as shown below:

Are there any blackwater systems proposed for the project?

If **NO** then this section of the Calculator is now complete.

If **YES** then select the type of demands that the blackwater is used for, by checking any or all of the check boxes in the fields "Blackwater harvested is used for" area. Note that these fields can be selected in rain, grey or black water calculators i.e. Irrigation is selected in rain grey and blackwater calculators; the demand is split equally across all 3 recycling processes.

Enter the percentage of each type of fixture used for collection and the storage volume of the blackwater tank. Enter any other sources of collection of water for blackwater processing such as fire test water.

This section of the calculator is now complete and the quantity of potable water that is recycled by the blackwater process is shown in litres per day per m^2.

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The resulting predicted potable water consumption is calculated by subtracting the predicted reduction in potable water consumption from the predicted consumption from fixtures. The result is then compared to consumption benchmarks and a Green Star Wat-1 score is generated.

Sewerage Calculator

The Sewerage Water Calculator is a reporting tool. Data entered to the Potable Water Calculator is used to report on expected flow to sewerage. The flow is then compared to flow reduction benchmarks that are set against a standard case.

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Potable Water Calculator Example

Example 1

An office building is to be extended to 3,000m^2 with 95% new floor area. Existing inefficient water fittings and fixtures, which are the same throughout the building, are to be retained. However, the fittings and fixtures in the new areas (95% of the total fittings) will all have Star ratings. There are no showers in the existing building, however the new areas are to have 5 Star rated showerheads.

Given the above information, the first section of the Potable Water Calculator would be completed as shown in the following page. Totals for each fixture type are given and a summary of fixture flows is shown at the bottom of the table.

As there is no rainwater harvesting or greywater re-use, the rest of the Calculator can be left blank and the estimated water consumption of the fittings will be the same as the Estimated Potable Water Consumption figure. This figure is used to determine the points achieved, which in this example achieves a zero star rating.

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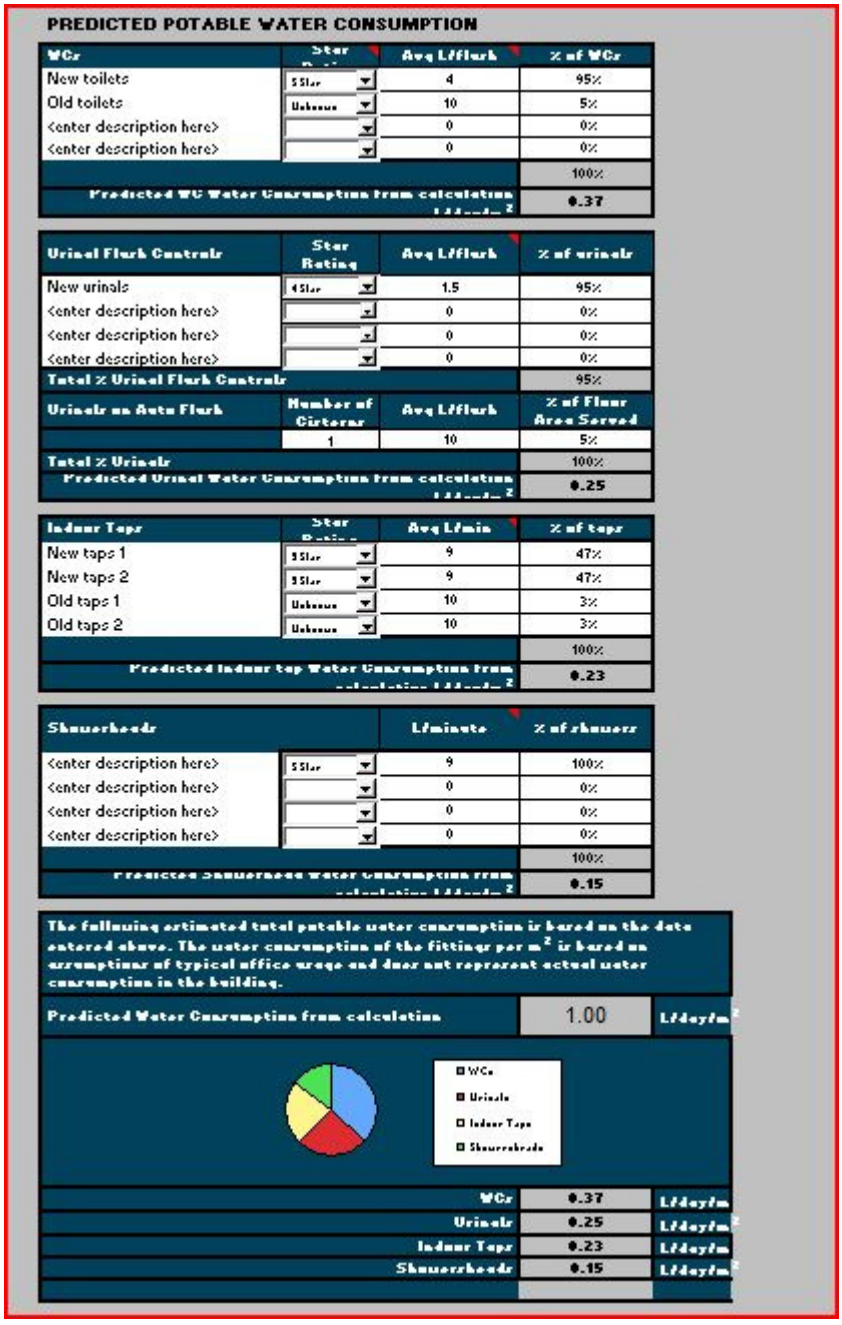

PREDICTED POTABLE WATER CONSUMPTION

WCs	Star	Avg L/flush	% of WCs
New toilets	5 Star	4	95%
Old toilets	Unknown	10	5%
<enter description here>		0	0%
<enter description here>		0	0%
			100%
Predicted WC Water Consumption from calculation			0.37

Urinal Flush Controls	Star Rating	Avg L/flush	% of urinals
New urinals	4 Star	1.5	95%
<enter description here>		0	0%
<enter description here>		0	0%
<enter description here>		0	0%
Total % Urinal Flush Controls			95%
Urinals on Auto Flush	**Number of Cisterns**	**Avg L/flush**	**% of Floor Area Served**
	1	10	5%
Total % Urinals			100%
Predicted Urinal Water Consumption from calculation			0.25

Indoor Taps	Star	Avg L/min	% of taps
New taps 1	5 Star	9	47%
New taps 2	5 Star	9	47%
Old taps 1	Unknown	10	3%
Old taps 2	Unknown	10	3%
			100%
Predicted Indoor tap Water Consumption from			0.23

Showerheads		L/minute	% of showers
<enter description here>	5 Star	9	100%
<enter description here>		0	0%
<enter description here>		0	0%
<enter description here>		0	0%
			100%
Predicted Showerhead water consumption from			0.15

The following estimated total potable water consumption is based on the data entered above. The water consumption of the fittings per m^2 is based on assumptions of typical office usage and does not represent actual water consumption in the building.

Predicted Water Consumption from calculation	1.00	L/day/m^2

WCs	0.37	L/day/m^2
Urinals	0.25	L/day/m^2
Indoor Taps	0.23	L/day/m^2
Showerheads	0.15	L/day/m^2

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Example 2

The same client then asks how many extra points could be achieved for the same building if rainwater, greywater and blackwater harvesting systems are implemented. The metal deck roof area to be used for water collection is 3500m^2, a 20 kL storage tank is proposed and the average monthly rainfall data for Brisbane is used.

Demands on the recycling systems other than occupant ammenity water must be defined in the 'Other Predicted Water Consumption' area of the calculator. For this example, enter the irrigation demand, 1000 litres per day, cooling tower demand, 2000 litres per day and fire system test water, 1500 litres per day.

Given the above information the sections of the Potable Water Calculator below fixtures and fittings would be filled in as shown in the following page. Note that the addition of irrigation in the 'Other Predicted Water Consumption' section does not add to the potable water demand (it is not used for occupant amenity and is only used to manage recycled water calculations). Also note also that when Question 1 is answered "yes" in the rain/grey/black water sections, the text for the other questions appears.

Where loads are entered for Irrigation, Cooling Tower and Fire Test Water, they must be justified in relation to credits claimed in Wat-3 and Emi-6.

The Rainwater Calculator would be filled in using Bureau of Meteorology data as shown. A 5000 litre storage tank is proposed.

The Calculator then combines the information on the fittings with the information on rainwater and greywater to give an Estimated Potable Water Consumption figure which is used to determine the points achieved, as shown below.

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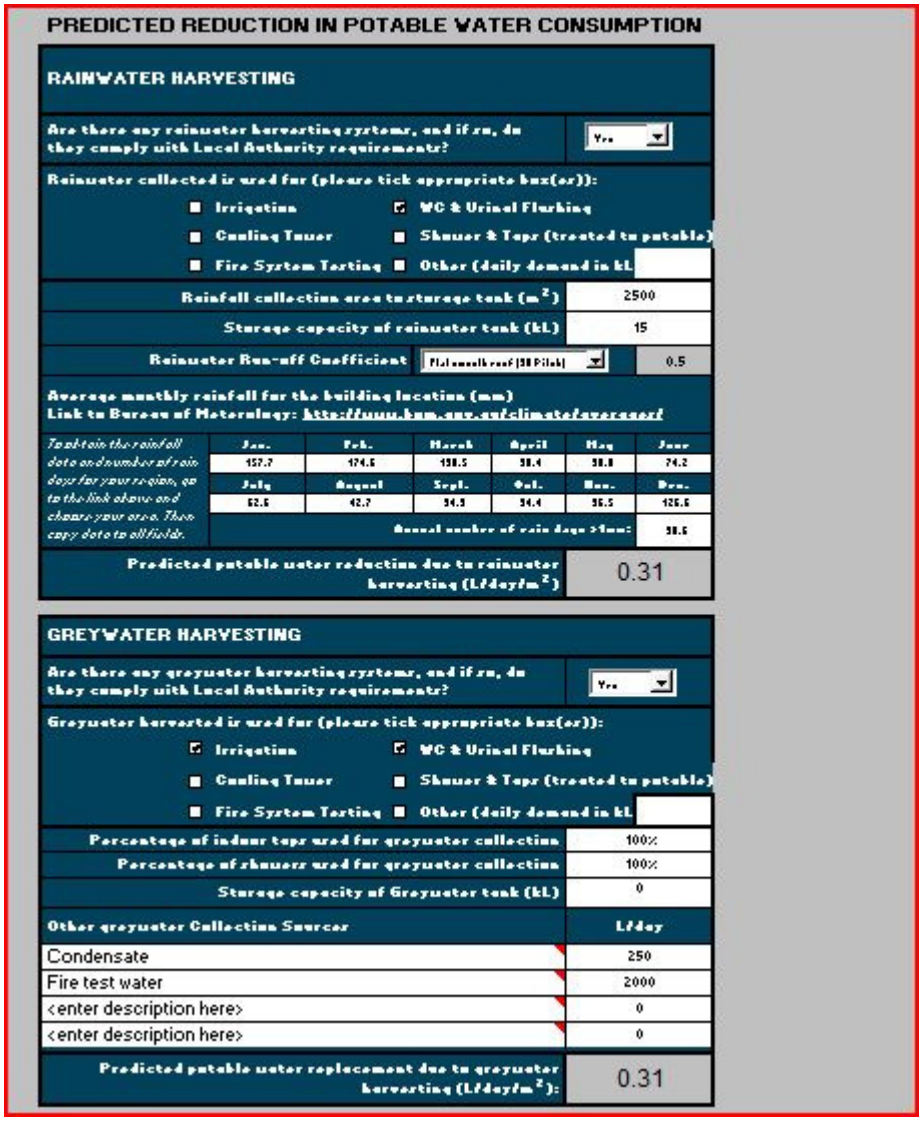

PREDICTED REDUCTION IN POTABLE WATER CONSUMPTION

RAINWATER HARVESTING

Are there any rainwater harvesting systems, and if so, do they comply with Local Authority requirements? Yes

Rainwater collected is used for (please tick appropriate box(es)):

- ☐ Irrigation
- ☑ WC & Urinal Flushing
- ☐ Cooling Tower
- ☐ Shower & Taps (treated to potable)
- ☐ Fire System Testing
- ☐ Other (daily demand in kL)

Rainfall collection area to storage tank (m^2)	2500
Storage capacity of rainwater tank (kL)	15
Rainwater Run-off Coefficient [Flat smooth roof (90 Pitch)]	0.5

Average monthly rainfall for the building location (mm)
Link to Bureau of Meteorology: http://www.bom.gov.au/climate/averages/

To obtain the rainfall data and number of rain days for your region, go to the link above and choose your area. Then copy data to all fields.

Jan.	Feb.	March	April	May	June
157.7	174.6	158.5	98.4	98.8	74.2
July	**August**	**Sept.**	**Oct.**	**Nov.**	**Dec.**
62.6	42.7	54.9	54.4	96.5	126.6

Annual number of rain days >1mm: 98.6

Predicted potable water reduction due to rainwater harvesting (L/day/m^2)	0.31

GREYWATER HARVESTING

Are there any greywater harvesting systems, and if so, do they comply with Local Authority requirements? Yes

Greywater harvested is used for (please tick appropriate box(es)):

- ☑ Irrigation
- ☑ WC & Urinal Flushing
- ☐ Cooling Tower
- ☐ Shower & Taps (treated to potable)
- ☐ Fire System Testing
- ☐ Other (daily demand in kL)

Percentage of indoor taps used for greywater collection	100%
Percentage of showers used for greywater collection	100%
Storage capacity of Greywater tank (kL)	0

Other greywater Collection Sources	L/day
Condensate	250
Fire test water	2000
<enter description here>	0
<enter description here>	0

Predicted potable water replacement due to greywater harvesting (L/day/m^2):	0.31

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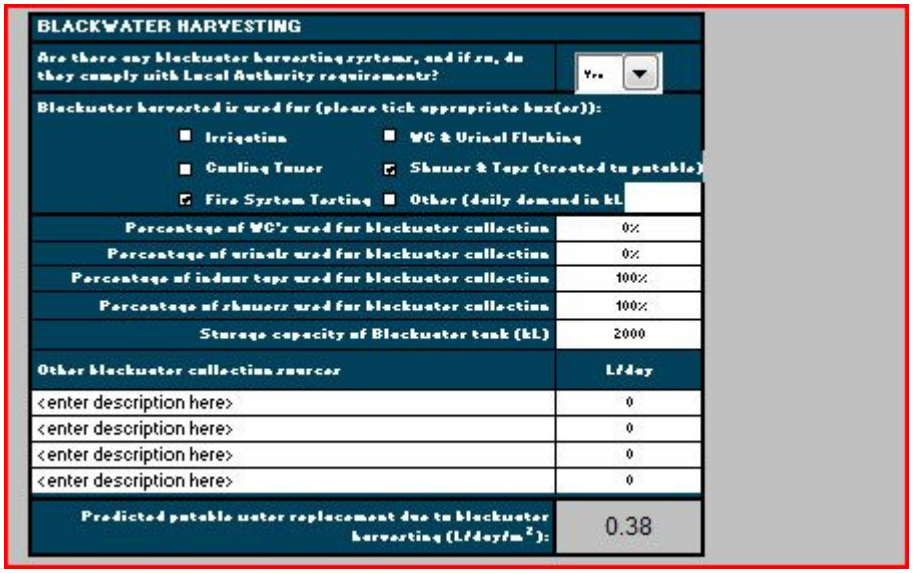
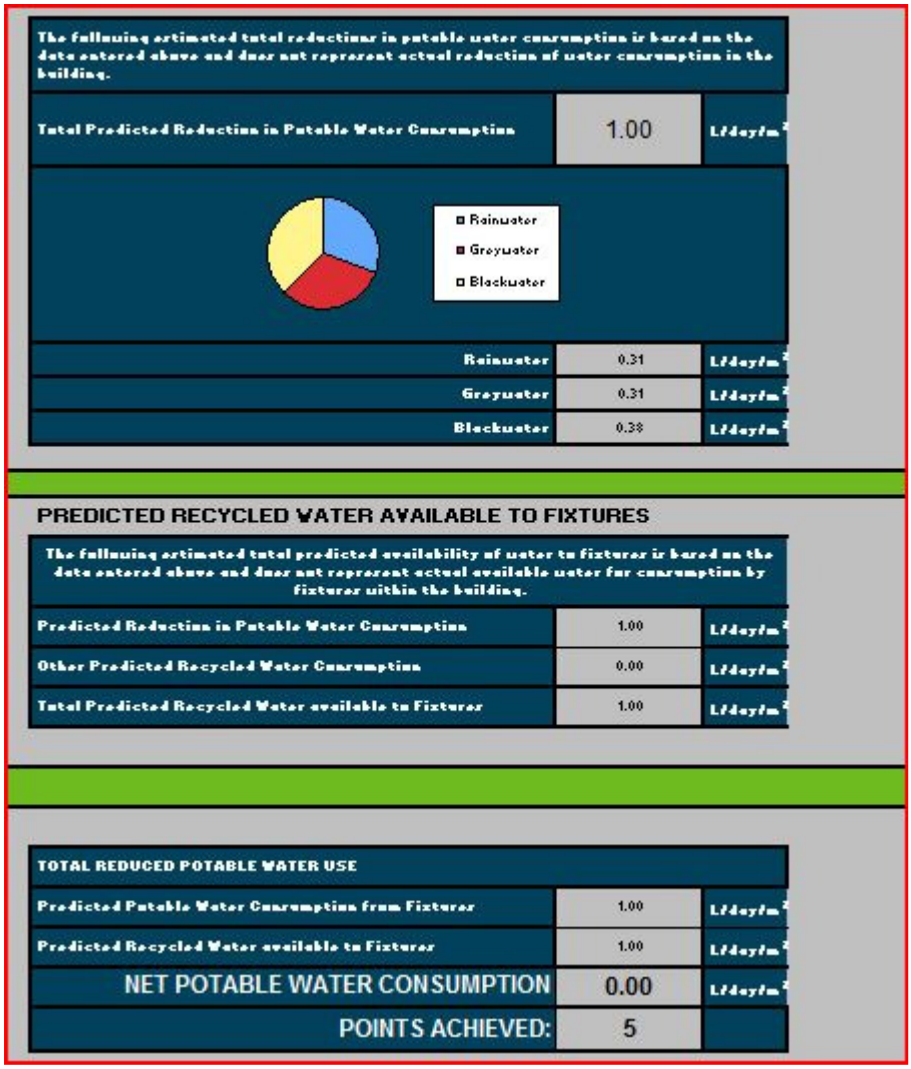


BLACKWATER HARVESTING	
Are there any blackwater harvesting systems, and if so, do they comply with Local Authority requirements?	Yes
Blackwater harvested is used for (please tick appropriate box(es)):	
☐ Irrigation ☐ WC & Urinal Flushing	
☐ Cooling Tower ☑ Shower & Taps (treated to potable)	
☑ Fire System Testing ☐ Other (daily demand in kL	
Percentage of WC's used for blackwater collection	0%
Percentage of urinals used for blackwater collection	0%
Percentage of indoor taps used for blackwater collection	100%
Percentage of showers used for blackwater collection	100%
Storage capacity of Blackwater tank (kL)	2000
Other blackwater collection sources	L/day
<enter description here>	0
<enter description here>	0
<enter description here>	0
<enter description here>	0
Predicted potable water replacement due to blackwater harvesting (L/day/m²):	0.38



The following estimated total reductions in potable water consumption is based on the data entered above and does not represent actual reduction of water consumption in the building.

Total Predicted Reduction in Potable Water Consumption	1.00	L/day/m²

Rainwater	0.31	L/day/m²
Greywater	0.31	L/day/m²
Blackwater	0.38	L/day/m²

PREDICTED RECYCLED WATER AVAILABLE TO FIXTURES

The following estimated total predicted availability of water to fixtures is based on the data entered above and does not represent actual available water for consumption by fixtures within the building.

Predicted Reduction in Potable Water Consumption	1.00	L/day/m²
Other Predicted Recycled Water Consumption	0.00	L/day/m²
Total Predicted Recycled Water available to Fixtures	1.00	L/day/m²

TOTAL REDUCED POTABLE WATER USE		
Predicted Potable Water Consumption from Fixtures	1.00	L/day/m²
Predicted Recycled Water available to Fixtures	1.00	L/day/m²
NET POTABLE WATER CONSUMPTION	0.00	L/day/m²
POINTS ACHIEVED:	5	