
Appendix

Worksheets

Worksheet 1

Location of Water Meters

Account number	Meter number	Size/type of meter	Meter location
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Worksheet 2

Month	Year	Total for all meters (kL/month)	Water usage charges (\$)	Fixed water charges	Sewer usage charges (\$)	Fixed sewer charges (\$)	Trade waste charges (\$)	Total charges	Monthly production units	Benchmark L/unit of product
January										
February										
March										
April										
May										
June										
July										
August										
September										
November										
December										
Total										

Worksheet 3

Water-Use Inventory

Item	Location	Number of units (A)	Flow rate		Operating time (D)	Total water used (kL/day) (1000 US gal./day)		Water saving [1–2] (kL/day) (1000 US gal./day)
			Current (B)	Water-efficient models (C)		Current (A × B × D) [1]	Proposed (A × C × D) [2]	
Taps	Guest rooms, amenities, kitchen, laundry	400	12 L/min (3.17 US gal./day)	6 L/min (1.6 US gal./day*)	15 mins/day	72 (19)	36 (9.5)	36 (9.5)
Showers	Guest rooms	400	15 L/min	9 L/min	12 mins/day (2 showers/day)	81 (21.4)	48.6 (12.8)	32.4 (8.6)
Toilets	Guest rooms	300	11 L/flush	6/3 L/flush**	5 flushes/day	18.6 (4.9)	7.6 (2.0)	11 (2.9)
Wok stoves	Kitchen	2	8 kL/day	3 kL/day		16	6	10
Pre-rinse spray valves	Kitchen	3	19 L/min	6 L/min	5 hours/day	17	5.5	11.6

* US federal standard is 2.5 gal./minute

** US federal standard is 1.6 gal./flush

Check Sheet



Water saving check sheet for office buildings

Saving water in your business can reduce the stress on water resources, help protect the environment and save you money. This check sheet is intended to give facility managers of office building guidance on implementing actions to reduce water usage

Area	Question	Answer	Action
Amenities	Is the flowrate from the bathroom faucet less than 6L/min?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, install flow control to reduce water flow by over 50% (flow control will reduce flow to <6L/min in bathroom basins and <9L/min in kitchen sinks)
	Do you have dual flush toilets?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, where cost effective replace the cistern and pan with a 6/3L dual flush model
	Is the toilet flush volume greater than 6L?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, reduce flush volume by adjusting cistern float arm, installing a displacement device, or adjust flush valve to shorten the period of flush. For 11L cisterns, reducing flush volume to 8L will still provide an adequate flush
	Are cistern rubber seals regularly replaced?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, cistern rubbers should be replaced approximately every two years before leakage occurs
	If you have a flusherette system, have you checked the flush timing?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, check that the toilets are not being over flushed. A timing of 3 seconds for the flusherette valves should be adequate
	Do you have cyclic flushing urinals?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, adjust timing cycles and if possible reduce flush volumes, ensuring flushing occurs only during work hours. Replace with either manual or automatic sensor flushing which can reduce water use by 70%. Payback is typically less than 6 months
	Do you have automatic sensor urinals?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, check that the sensor beam is correctly set so that the urinal only flushes when in use, however not before 2 mins of detection and no more than 10min between flushes. In very busy areas timing between flushes should be reduced to no more than 6 mins. During out-of-hours periods either disable the flushing timer or minimise flush to once every 4 hrs
Do you have water-efficient showerheads?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, consider installing an AAA-rated showerhead that can reduce flow from to 9L/min or less, otherwise install restrictors in the tap assembly or existing showerheads	
Cooling*	Does the air-conditioning system run continuously?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, where possible turn off air-conditioning units when cooling is not required
	Is your water cooling tower cleaned regularly (every 6 months or less)?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, adopt a performance-based approach with your water treatment contractor to minimise the amount of cleaning required
	Is the floor area around the cooling tower constantly wet?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, install anti-splash louvres
	Does water overflow from the water cooling tower to the drain pipe?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, further investigation is required. There are several possible causes, such as incorrectly set ball float valves. Refer to Sydney Water's best practice guidelines for assistance
	Does the water cooling tower have a side stream filter that uses water for back flushing?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, capture the bleed-off from the cooling tower in a holding tank and use this water for backwashing. Alternatively, consider using a cartridge filter which will further reduce water usage
	Is the conductivity meter cleaned every month?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, ask the water treatment contractor to clean the probe every month and re-calibrate it at least every six months. A poorly maintained probe will increase bleed-off and waste water
	Does your water cooling tower operate at optimum cycles of concentration?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, reduce cooling tower bleed rate to achieve higher levels of dissolved solids. Consult with your water treatment contractor for advice. Increasing concentration cycles can reduce water and chemical costs by 50%
Are you considering replacing or retrofitting your water cooling tower?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, consider installing an air-cooled chilled water system. Air-cooled units of less than 500kWTR can be more cost effective and eliminate health risks	
Cleaning	Is wet carpet cleaning methods used?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, switch from steam carpet cleaning to dry powder cleaning
	Are windows cleaned regularly?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, switch from a 'regular' to an 'as required' cleaning schedule
	Do you hose down bathroom floors?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, use a mop rather than a hose
	Have you reviewed your toilet cleaning practices?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, ensure that toilet cleaners use water efficiently. Unnecessary flushing is a common occurrence with cleaning staff
Kitchen	Are taps left running during food preparation?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, install foot-operated faucets or sensor-controlled taps
	Are dishes rinsed prior to washing?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, scrape dishes before washing
	Are dishes washed by hand?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, don't let the water run while rinsing. Fill one sink with wash water and the other with rinse water
	Is food washed under running water?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, wash fruit and vegetables in a basin of water
	Is running water used to defrost food?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, plan ahead and defrost in the fridge overnight, or use a microwave
	Is more ice produced than required?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, adjust ice machines to dispense less ice
	Do you use water-cooled ice machines?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, where cost effective replace the water-cooled units with air-cooled ice machines
	Is the dishwasher loaded fully before use?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, wash full loads only. Otherwise, set the load adjustment button on your washing machine to actual load conditions

Area	Question	Answer	Action
	Do you hose down kitchen floors?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, consider alternatives such as sweeping, using a mop or squeegee
	Are spray guns used when hosing is necessary?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, use trigger-operated spray guns on all hoses
Laundry	Do you wash full loads?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, wash full loads only
	Have you evaluated the machine cycle efficiency?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, consult with your supplier to determine if it is possible to eliminate a cycle from the wash
	Do you reuse the water from the final rinse?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, consider installing a storage tank to recover water from the final rinse cycle for use in the next load, which can reduce water usage by 15%
	Are front loading washing machines utilised?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, consider using front loading washing machines, which use only half the amount of water used in conventional top loading washers. Front loading washing machines will also save energy
Monitoring	Is at least one of your staff responsible for water usage?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, assign a water-efficiency manager and link water conservation outcomes to performance review
	Is site water usage regularly monitored?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, read water meter(s) at least once a week. Graph data to identify usage trends. This will also help identify leaks as they occur
	Do you have a permanent water monitoring system?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, consider installing a permanent monitoring system to assist in the identification of leaks and other problems
	Are staff aware of trends in water usage?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, communicate water usage trends and progress reports through staff bulletins, newsletters and emails
	Do you benchmark your water usage?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, benchmark water usage against best practice. If below industry standards then carry out an audit to identify water-saving opportunities
Maintenance	Are leaks checked for in your regular maintenance schedule?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, check the water supply for leaks and turn off unnecessary flows during maintenance checks. Report leaks and other water losses immediately. Dye tests can help identify leaks
	Are there unused areas or equipment within your facility?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, shut off the water supply to areas and equipment that are not used
	Is water efficiency formally considered when replacing fixtures?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, ensure low flow/high efficiency devices are installed when replacing water-using equipment. AAA-rated dishwashers, for example, use 18L of water per load, whereas older units use up to 60L per load
	Are overflow pipes regularly checked?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, ensure all overflow pipes on tanks, cooling towers and other equipment are checked on a weekly basis
Outdoor[†]	Is the garden bed mulched?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, use mulch to prevent weed growth and reduce evaporation loss by 70%
	Is the garden regularly watered?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, look for signs of wilt before watering established plants. Also, water early morning or late evening to minimise moisture loss
	Does your garden have drought-tolerant plants?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, adopt drought-tolerant, native plants and lawns like Nioka and Palmetto which require less water and are low maintenance
	Do you have a drip irrigation system?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, consider installing a drip irrigation system, which is the most efficient method of irrigating and can save up to 50% over conventional systems
	Do you separately meter your irrigation supply?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, separately meter water supply so that usage can be monitored and adjusted to prevent over watering
		Do you hose down hard surfaces?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Pools	Is splash-out common?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, lower pool levels
	Do you back-flush filters daily?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, consider reducing back-flush frequency to once a week in summer and once a fortnight in winter
	Does the pool area have a wash bay?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, retrofit shower with water-efficient shower head rated at 9L/min
	Is your pool maintained by external contractors?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, consider managing your pool in-house. External contractors tend not to focus on water usage and are also located off site. Problems encountered between scheduled visits can go unchecked for several weeks
	Is your pool area hosed down frequently?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, consider reducing hose down frequency or using a mop. Install water-efficient spray guns on your hoses
	Is your pool heated?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes, reduce water temperature if possible to minimise water evaporation. Energy savings can also be substantial
	Do you use pool covers?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, install a pool cover to reduce evaporation and heat loss when the pool is not used. Without a cover, over half of the water in your pool can evaporate over a year
Training	Are awareness campaigns conducted amongst staff and customers?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, consider using signage to convey water conservation messages. Posters, hotel room cards and maintenance stickers are available from Sydney Water
	Are staff trained how to operate water-using equipment?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, train staff about the efficient operation of water-using equipment. This information should be readably available form the vendor
	Do you encourage ideas from staff to save water?	Yes <input type="checkbox"/> No <input type="checkbox"/>	If no, seek employee suggestions through regular team meetings and create a water conservation ideas box for innovative ideas

* For more information on cooling tower operation refer to Sydney Water's 'Best practice guidelines for cooling towers in commercial buildings.' This document is available on the Sydney Water's website; www.sydneywater.com.au

[†] Mandatory water restrictions are now in force across Sydney, Illawarra and the Blue Mountains. Check Sydney Water's website for details; www.sydneywater.com.au

Conversions

SI Prefixes

Prefix name	Prefix symbol	Power-of-ten
yocto	y	10^{-24}
zepto	z	10^{-21}
atto	a	10^{-18}
femto	f	10^{-15}
pico	p	10^{-12}
nano	n	10^{-9}
micro	μ	10^{-6}
milli	m	10^{-3}
centi	c	10^{-2}
deci	d	10^{-1}
deka	da	10^{+1}
hecto	h	10^{+2}
kilo	k	10^{+3}
mega	M	10^{+6}
giga	G	10^{+9}
tera	T	10^{+12}
peta	P	10^{+15}
exa	E	10^{+18}
zeta	Z	10^{+21}
yotta	Y	10^{+24}

Length

Metre (m)	Millimetres (mm)	Inches (in.)	Feet (ft)
1	1000	39.37	3.28
0.001	1	0.039	0.0032
0.0254	25.4	1	0.083
0.3048	304.80	12	1

1 micrometre (μm) = 1×10^{-3} mm = 4×10^{-5} in.

1 thousandth of an inch (mil) = 25.4 μm

1 kilometre = 1000 m = 0.621 miles

Area

Square metre (m ²)	Square (ft ²)	Hectare (ha)	Acre (a)
1	10.764	0.0001	0.00247
0.093	1	9.29×10^{-6}	2.29×10^{-5}
10,000	107,640	1	2.471
4,046	43,561	0.4047	1

1 square kilometre (km²) = 100 ha = 0.38610 square miles

Volume

Liters (L)	Gal. (US) (US gal.)	Gal. (UK) (Imp. gal.)	Cubic meters (m ³) (kL)	Cubic feet (ft ³)
1	0.264	0.220	0.001	0.035
3.785	1	0.833	0.00378	0.134
4.546	1.20	1	0.004546	0.160
1000	264	222	1	35.315
28.32	7.481	6.23	0.02832	1

1 acre-foot = 325 851 US gal. = 1234 m³

1 barrel = 159 L = 42 US gal.

1 ton of crude oil = approximately 7.3 barrels

1 quart (US) = 0.964 L

1 quart (UK) = 1.136 L

Flow

Litres/second (L/s)	Gal. (US)/minute (US gpm)	Gal. (UK)/minute (Imp. gpm)	Cubic meters/day (m ³ /day) (kL/day)	Cubic feet/second (ft ³ /s)
1	15.9	13.2	86.4	0.035
0.06	1	0.83	5.44	0.002
0.08	1.20	1	6.54	0.003
0.012	0.18	0.15	1	0.0004
0.008	0.12	0.10	0.68	1

1 acre -ft/day = 14.276 L/s

1 million US gal./day (mgd) = 3.069 acre-ft/day

Weight

Kilogram (kg)	Pound (lb)	Ton (ton)
1	2.20	0.001
0.456	1	4.55×10^{-4}
1,000	2,200	1

1 kilogram (kg) = 1000 grams
 1 kilogram (kg) = 35.274 ounce
 1 ton = 0.984 long ton
 1 ton = 1.1 short ton
 1 gram = 15.4 grains

Pressure

kiloPascal (kPa)	Pound per square inch (psi)	Bar
1	0.14505	0.01
6.894	1	0.00689
100	14.5034	1

1 kiloPascal (kPa) = 0.0102 kg/cm^2
 1 kiloPascal (kPa) = 2.985 ft of water (ft-H₂O)
 1 kiloPascal (kPa) = 7.5 torr
 1 mm Hg = 0.133 kPa
 1 in. Hg = 3.386 kPa

Energy

Kilo Joule (kJ)	British Thermal Unit (Btu)	kilo Calorie (kcal)	kWh
1	0.9478	0.238	2.78×10^{-4}
1.055	1	0.252	2.93×10^{-4}
4.1868	3.968	1	1.16×10^{-3}
3,600	3,412.3	859.8	1

1 therm (US) = 100 000 Btu = 105.5 MJ.

Power

Kilo Watt (kW)	British Thermal Unit per hour (Btu/hr)	Horsepower (UK) (hp)
1	3,412	1.342
2.93×10^{-4}	1	3.93×10^{-4}
0.7457	2.54×10^3	1

1 MW = 3.6 GJ
 1 ton refrigeration = 3.517 kW
 1 boiler horsepower = 9.810 kW