



NSW Department Of Education
North Kellyville New Public School
Hydraulic Infrastructure & Services and Water Cycle
Management Report

August 2017

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1. Introduction

1.1 Purpose of this report

The proposed North Kellyville New Primary School project covers 25,000m² of previously partially developed site. This project will redevelop the site with the provision of a new multistorey school building and provision of new landscaping features and sport fields.

This report sets out integrated water management strategies proposed for the new Primary School, North Kellyville to achieve efficient use of water across the site. It also outlines available infrastructure and services of the site.

1.2 Scope and limitations

This report: has been prepared by GHD for NSW Department Of Education and may only be used and relied on by NSW Department Of Education for the purpose agreed between GHD and the NSW Department Of Education.

GHD otherwise disclaims responsibility to any person other than NSW Department Of Education arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s). of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

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GHD has not been involved in the preparation of the Environmental Impact Statement (EIS) and has had no contribution to, or review of the EIS. GHD shall not be liable to any person for any error in, omission from, or false or misleading statement in, any other part of the EIS.

1.3 Assumptions

The site is a green / brown field development and with all services being newly installed at this stage of the project, we do not have any assumptions regarding existing services and/or conditions.

1.4 Design approach

The overarching design approach for the water cycle management is to re-use collected rainwater as much as possible and to use Recycled Water from the Authority where it can substitute domestic water.

Below is a simple concept of the rainwater and recycled water re-use scheme.

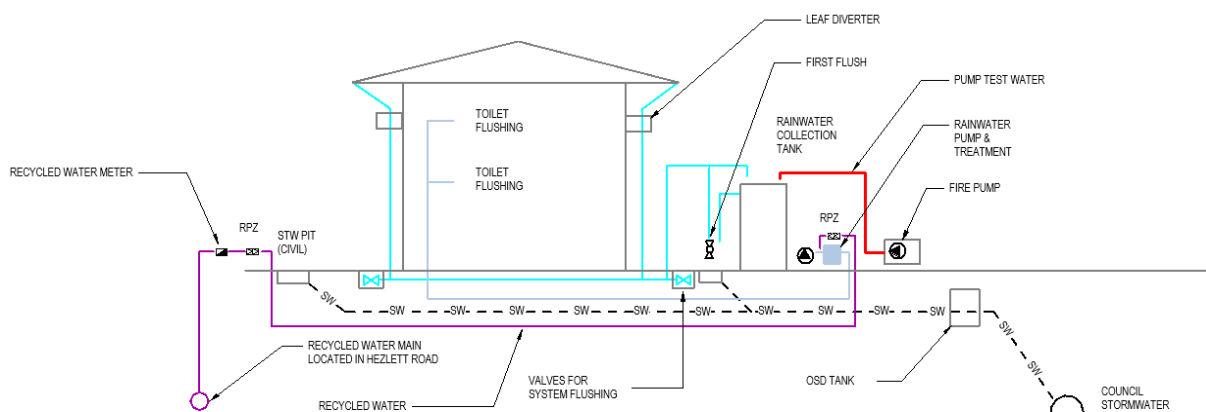


Figure 1 Rainwater Re-use Concept

1.5 Reference Documents

In preparation of this report, the documents listed in Table 1 have been the primary source of information used.

Table 1 Reference Documents

Abbreviation	Document Name	Revision
AS 2419.1	Fire hydrant installations Part 1: System design, installation and commissioning	2005
AS 1851	Routine service of fire protection systems and equipment	2012
AS 2441	Installation of fire hose reels	2005
AS/NZS 3500	Plumbing and Drainage	2015
HB-230	Rainwater Tanks	2006

1.6 Definitions

1.6.1 General

Definitions of terms and abbreviations used in this report are based on definitions given in relevant code or regulations' glossary of terms or dictionary, unless defined in the section below where these definitions shall take precedence.

1.6.2 Abbreviations

AS:	Australian Standard
BCA:	Building Code of Australia, NCC Volume 1
CO ₂ -e:	Carbon Dioxide Equivalents in kilograms
GBCA:	Green Building Council of Australia
IWM:	Integrated Water Management
NCC:	National Construction Code
NZS:	New Zealand Standard
PVC:	Polyvinyl chloride
UNO:	Unless Notified Otherwise

1.6.3 Terms

Above ground: This term shall apply to all areas where components are not buried. This term does not mean areas above finished ground level. Areas covered by this term shall include; tunnels, sumps, etc.

Equivalent Person: ¹

Water: Means a standard unit of demand for water based on the average usage of water by a typical person in a residential setting over the long term for drinking, cooking, bathing, washing and cleaning, flushing, irrigation and all other purposes and taking into account the system losses incurred in delivering the water to the person.

Sewage: Means a standard unit of sewage generation based on the average generation by a typical person in a residential setting over the long-term by toilet use, cooking, bathing, washing and cleaning, and all other activities and taking into account the infiltration into the reticulation that occurs in transporting the sewage to the treatment plant.

Hose Tap: The terms "Hose Tap" and "Hose Cock" are interchangeable and refer to the same item of plumbing. "Hose Tap" is the preferred term.

Recycled water: Water that has been used before. Recycled water is cleaned, treated and purified by the Water Authority to a standard that is suitable and safe for its intended use.

2. Methodology

2.1 Integrated Water Management Analysis

2.1.1 Analysis

The site analysis is based on time step of every day over 10-year period from 1 January 2002 to 31 December 2011. 10 years of Kellyville, daily weather data, sourced from the Australian Bureau of Meteorology, was used in the analysis rather than climate averages based on the last 100 years so as to allow for recent trending weather patterns due to climate change.

Water consumption has been calculated on expected water usage based on:

- Sanitary fixture type and fixture water demand;
- Expected populations (based on Equivalent Persons) of the building taking into account weekends and public holidays;
- 100% occupancy rates during weekdays; and

Daily water demand based on student numbers was calculated. A comparison between standard water demand and low flow fixtures in combination with using recycled water from the Authority's Recycled Water Main was undertaken.

2.1.2 Standard Demand

To assist in determining the effect integrated water management strategies have on the water usage, a standard demand scenario has been developed. Details of the configuration of a standard demand and the proposed demands detailed in sections 2.3 and 2.4 of this report.

2.2 Equivalent Persons

Domestic water demands used in this report are based on Equivalent Persons unit which the average usage of water and sewage produced by a typical person in a residential setting (refer to section 1.6.3 for further information).

2.3 Domestic Water Demands

Table 2 details the domestic water demands used in the analysis.

Table 2 Domestic Water Demands

Demand Type	Standard Demand	Proposed Building Demand
Ablutions	16.7 L/EP/Day	13.7 L/EP/Day
Toilet (WC)	25 L/EP/Day	Provided by treated rainwater and recycled water
Leakage and Wash down	2.6 L/EP/Day	2.0 L/EP/Day

Toilet (WC) demand is based on 6/3 L dual flush toilet suites in the standard demand and 4.5/3 L flush toilet suites in the proposed building.

Ablutions demands are based on:

- Shower roses with a 9 L/min demand for the standard demand;
- Shower roses with a 6.5 L/min demand for the Proposed Building;

- Shower times of 5 minutes in both cases;
- The population showering is less than 1% of the total population; and
- Allowance of 5 L/EP/Day for hand washing and basin use.

Leakage and wash down allowance is based on 5% of domestic water use.

2.4 Fire Services Water Consumption

The volume of water consumed for the wet fire services is based on the commissioning requirements of AS 2419.1, AS 2118.1 and AS 2118.6 and maintenance testing requirements of AS 1851. Table 3 details the values used in the Integrated Water Management analysis.

Table 3 Water Consumption of Wet Fire Services Maintenance Testing

Test	Unit	Litres	Test Frequency	Justification
Fire Hydrants (all)	L/FH/Test	150	Annual	AS 1851 Table 4.4.3, item 3.2. Allowance to observe water at each hydrant.
Fire Hose Reel	L/FHR/Test	5	6 monthly	AS 1851 Table 9.4.1, item 10.1. Allowance to observe water at each FHR.
Fire Hydrant Flow and Pressure Testing	L/Test	6,000	Annual	AS 1851 Table 4.4.3, item 3.7. Allowance for fire hydrant flow and pressure testing. 10L/s per operational hydrant for 5 minutes.
Fire pump flow test	L/Test	6,000	Monthly	AS 1851 Table 3.4.1, item 3.7. Allowance for pump flow and pressure testing. 10L/s per operational hydrant for 10 minutes.
Fire Brigade Boost Assembly Flow and Pressure Testing	L/Test	21000	5 yearly	AS 1851 Table 4.4.4, item 4.2. Allowance for fire brigade booster assembly boost test. 20L/s Hydrants and 15L/s SPR for 10 minutes.

3. Conclusions

3.1 Recycled Water Usage from Authority Recycled Water Main

The site of the proposed North Kellyville school has frontage to a Sydney Water recycled water main. It is proposed to use the recycled water main to top-up the rainwater re-use system in times of prolonged dry weather.

This design approach will ensure that no domestic water is required to provide water for toilet flushing.

This will further reduce the demand of recycled mains water for toilet flushing by 60%.

3.2 Rainwater Tank Size

Based on the rainfall patterns, the available surface area to capture rainwater and the estimated demands, it is recommended that a 20m³ storage tank be used in the proposed building.

The volume of 20m³ will provide 63% of water that is required for toilet flushing without excessive capital cost.

3.3 Grey Water and Black Water Treatment

It is recommended that grey water and black water treatment systems should not be used as the capital cost, ongoing operational and maintenance cost, occupational health and safety issues, energy consumption and low contribution that these systems make to the overall water efficiency of the building do not justify such systems.

4. Infrastructure and Services

4.1 Existing site conditions:

4.1.1 Domestic Cold Water

North Kellyville New Primary School has frontage to the following services located in Hezlett Road:

- an existing DN100 DICL (ductile iron cement lined) Sydney Water Corporation (SWC) water main
- an existing DN450 DICL Sydney Water Corporation (SWC) water main
- an existing DN200 DICL Sydney Water Corporation (SWC) water main
- an existing DN450 mPVC Sydney Water Corporation (SWC) recycled water main

Upon suitable notification and application Sydney Water shall indicate, which main shall provide cold water to the site. A new DN50 domestic water connection, a DN40 recycled water connection and a DN150 firewater connection to the existing domestic water main shall be required.

The North Kellyville school shall have a back flow prevention device installed directly downstream of the Sydney Water master water meter and Sydney Water recycled water meter. Additional backflow prevention shall be provided for:

- Fire services and equipment
- Mechanical plant and equipment;
- Recycled water system top-up; and
- Irrigation plant and equipment.

4.1.2 Sanitary Drainage and Plumbing

The school has frontage to a DN 150 VC (vitrified clay) sewer main located in Thorogood Bvd.

Upon suitable notification and application, Sydney Water shall indicate to which main the new school shall be connected.

4.1.3 Gas Service

North Kellyville New Primary School has frontage to a DN110, 210kPa gas main located in Hezlett St. A new gas connection shall be made to the existing gas main to service the new building with natural gas for hot water generation and room heating.

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