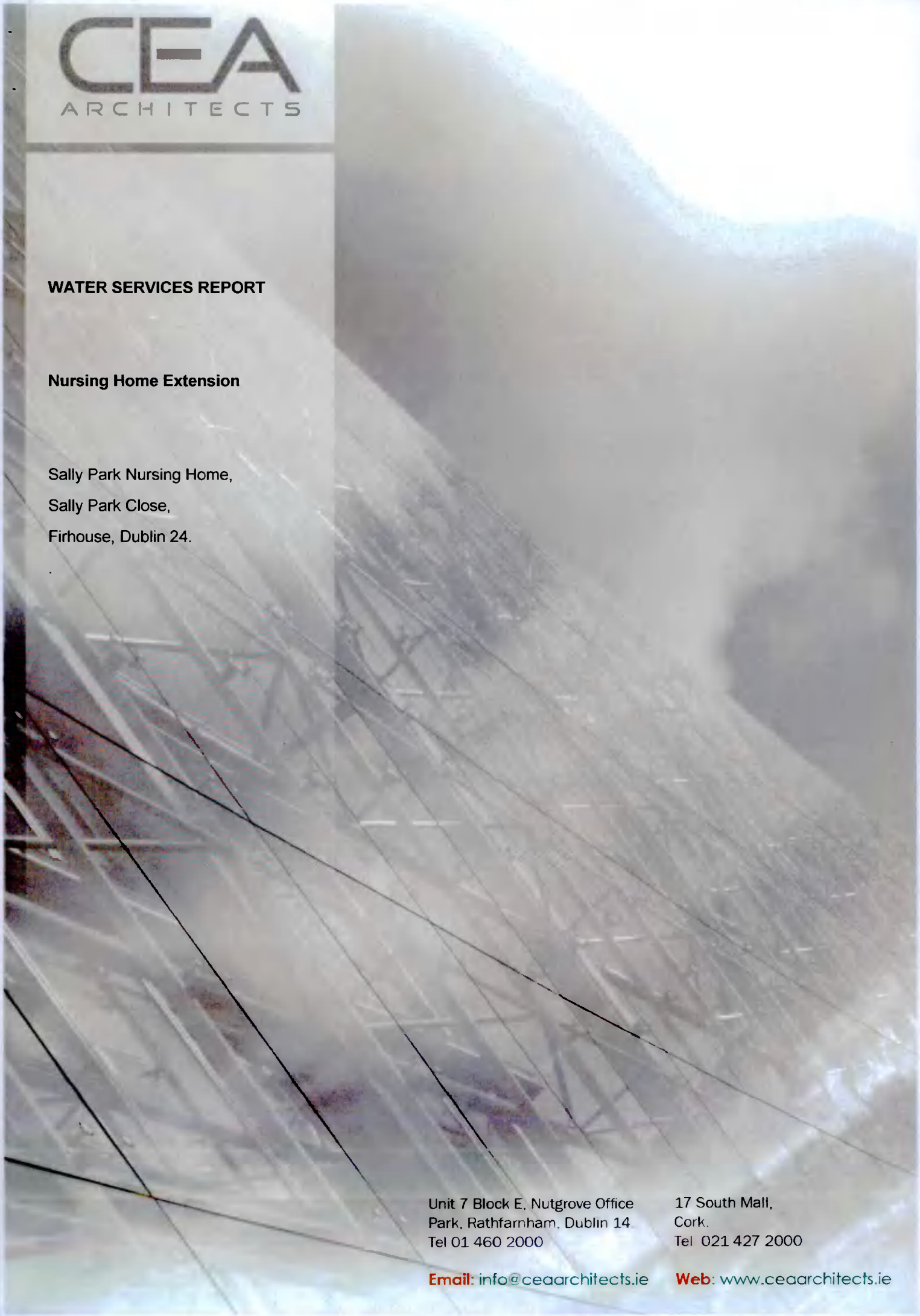
CEA
ARCHITECTS

WATER SERVICES REPORT

Nursing Home Extension

Sally Park Nursing Home,
Sally Park Close,
Firhouse, Dublin 24.



Unit 7 Block E, Nutgrove Office Park, Rathfarnham, Dublin 14
Tel 01 460 2000

17 South Mall,
Cork.
Tel 021 427 2000

Email: info@ceaarchitects.ie

Web: www.ceaarchitects.ie

Content

Appendices

1. Introduction

1.1 Site Location

The site is located at Sally Park Nursing Home, Sally Park Close, Firhouse, Dublin 24. It is bounded to the south, east and west by existing residential development. The exact site location is shown on Drawing No. xxx.

1.2 Proposed Development

The proposed development consists of a 27 room extension to the existing Sally Park Nursing Home.

The additional surfaced area of the proposed extension, including roads, and roofs, is approximately 0.082 Ha.

The overall site area is approximately 0.393 hectares. The site is a currently occupied by the existing Sally Park Nursing Home with its associated parking and open space areas.

1.3 Background of Report and Summary

This report describes the criteria used to design and detail the options available for the disposal of storm water (subject to a restriction to the discharge rate), disposal of foul water, water supply and roads from the developed site.

It is proposed to drain the foul effluent from the proposed extension to the existing 225mm diameter foul sewer to the east of the subject site.

Surface water from the proposed extension will drain via gravity and discharge at a restricted rate to the existing 225mm diameter surface water sewer to the east of the subject site on Sally Park Close. Surface water runoff from the site will be restricted to 2.0 l/s as recommended by the requirements of the Greater Dublin Strategic Drainage Study (GDSDS). Surface water attenuation will be provided within a surface water attenuation tank below ground, prior to discharging to the existing surface water sewer.

The attenuation of surface water is necessary to ensure that there is no impact on the existing drainage infrastructure, either in terms of quality or volume of runoff, as a result of the site development works.

Potable water to the proposed development will be provided from the existing watermain on the subject site.

All water supply details shall be in accordance with Irish Water requirements.

The proposed development will be accessed from Sally Park Close via the existing site entrance, no new site access is required.

2. Foul Water Drainage

2.1 Receiving Environment

The existing drainage on the subject site comprises of a 225mm diameter foul water network to the northeast of the subject site which outfalls to the foul sewer network on Sally Park Close.

It is proposed to drain the foul effluent from the proposed extension to the existing 225mm diameter foul water sewer to the west of the subject site.

Drawing No. xxx shows the proposed foul sewer network for the subject site.

2.2 Foul Water - General

Drains in other areas will be PE to Irish Water specification or concrete socket and spigot pipes (to IS 6).

Drains will be laid to comply with the Requirement of the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H.

Foul water sewers will consist of concrete socket and spigot pipes (to IS 6) and laid strictly in accordance with Louth County Council requirements for taking in charge.

All manholes will be watertight to prevent ground water ingress into the foul drainage system. Construction details for the proposed drainage systems are included in the accompanying planning submission drawings.

2.3 Foul Water Calculations

Pipe capacities and velocities have been calculated using the Colebrook-White equation with a roughness coefficient of 1.5mm. Calculations for the foul sewer network are illustrated in Table 2 below.

The design of the foul water drainage has been based on GDSDS and the EPA Waste Water Treatment Manual.

A schedule of the proposed uses for the development is included below from which the total foul flow is calculated (Table 2). These are based on Table 3 of the EPA Waste Water Treatment Manual publication.

The estimated foul flows generated from the proposed development are as follows:

Table 2.1. Calculation of Proposed Foul Water Flow

Description	No. of Units / Floor Area	Population Per unit	PE	Infiltration Factor	Flow l/h/d	Total Discharge (l/d)
Nursing Home Extension	27 bed	1 per unit	27	1.1	350	10,395
					Total	**10,395**

Total Daily Discharge *(from Table 2.1.)*	10,395	l/d
Dry Weather Flow (DWF)	0.12	l/s
Peak Foul Flow (= 6 x DWF)	***0.72***	***l/s***

The proposed foul outfall is a 225mm-diameter pipe laid at a gradient of 1:200, giving a capacity of 32 l/s and therefore has adequate capacity to cater for the flows from the development.

3. Surface Water Drainage

3.1 Introduction

It is proposed that the extension will drain via gravity and discharge, via a separate surface water drainage network to the existing nursing home, at a restricted rate to the existing 225mm diameter surface water to the east of the subject site on Sally Park Close.

Surface water from the development site will drain via gravity and discharge at a restricted rate to the existing 225mm diameter surface water sewer to the east of the subject site. Surface water runoff from the site will be restricted to 2.0 l/s as recommended by South Dublin County Council. This is in accordance with the requirements of the Greater Dublin Strategic Drainage Study (GDSDS). Surface water attenuation will be provided within a surface water storage tank, below ground, prior to discharging to the existing combined water sewer.

The attenuation of surface water is necessary to ensure that there is no impact on the existing drainage infrastructure, either in terms of quality or volume of runoff, as a result of the site development works.

The layout of the proposed surface water drainage network is shown on drawing No. xxx.

3.2 Surface Water – General

Sustainable Urban Drainage systems (SUDS) have been developed and are in use to alleviate the detrimental effects of traditional urban storm water drainage practice that typically consisted of piping runoff of rainfall from developments to the nearest receiving watercourse. Surface water drainage methods that take account of quantity, quality and amenity issues are collectively referred to as sustainable urban drainage systems; they are typically made up of one or more structures built to manage surface water runoff.

The proposed surface water drainage system for this development has been designed as a sustainable urban drainage system and uses water butts, storage tanks, permeable paving together with flow control device and petrol interceptor to:

- Treat runoff and remove pollutants to improve quality
- Restrict outflow and to control quantity

Strict separation of surface water and wastewater will be implemented within the development. Drains will be laid out to minimise the risk of inadvertent connection of waste pipes etc. to the surface water system.

Drains will consist of PVC (to IS 123) or concrete socket and spigot pipes (to IS 6). These drains will be laid to comply with the Requirement of the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H.

The surface water drainage system was designed with reference to the Sustainable Urban Drainage Systems 'SuDS' published by the Construction Industry Research and Information Association.

3.3 Proposed Surface Water Drainage Strategy

It is proposed that the proposed extension will outfall to the existing 225mm diameter surface water sewer to the east of the subject site on Sally Park Close.

The surface water shall discharge via a hydrobrake at a restricted rate of 2.0 l/s. This is the maximum allowable discharge for soil type 2 as detailed in the Institute of Hydrology Report 124 and in Table 6.5 of Volume 2 - Regional Drainage Policies of the Greater Dublin Strategic Drainage Study.

The site shall drain via gravity and excess storm water will be stored in a storage tank below ground. Surface water runoff from the subject site shall be restricted via a hydrobrake and the restricted flows shall discharge to the existing surface water sewer to the east of the subject site over an extended period of time. Please refer to drawing No. xxx for details of the proposed drainage arrangements.

The Suds strategy for the proposed development is set out in Section 3.6 below.

3.4 Site Characteristics

The following site characteristics are contained in the Attenuation calculations in Appendix A, and are reiterated in the following sections.

Table 3.1 Hardstanding Area

	Catchment
Proposed Development	820 m^2

Table 3.2 Surface Water Catchment Details

	Catchment
Site Area (Catchment) – Ha	0.393
Impermeable Area - Ha	0.082
% Hardstanding	43.4
SAAR - mm	817
SOIL Index	0.3
Climate Change	1.1

3.5 Outflow Limits

The outflow limits are calculated in accordance with the Institute of Hydrology report No 124 "Flood Estimation for Small Catchments", where:

$Qbar = 0.00108(Area)^{0.89} \times (SAAR)^{1.17} \times (SOIL)^{2.17}$

Greenfield Run-off = Qbar x ("n-year" factor)

Allowable Discharge = Greenfield Run-off x Area

Where:

- Area = Site area in km2 (Or 50 hectares if site is less than 50 Hectares)
- SAAR = Taken from "Extreme Rainfall in Ireland" maps (800mm)
- SOIL = Runoff constant (Varies between 0.1 and 0.53: Given as 0.3 for an average soil)

⇨ $Qbar_{rural} = 0.00108(0.5)^{0.89} \times (817)^{1.17} \times (0.3)^{2.17}$

⇨ $Qbar_{rural}$ = 109.18 l/s (For a 50 hectare site)

⇨ $Qbar_{rural}$ = 2.18 l/s/Ha

Therefore, the permitted outflow for varying return periods has been calculated as follows:

Table 3.3 Surface Water Outflow

	Catchment
Site Area (Catchment) - Ha	0.393
$Qbar_{rural}$ – l/s	2.00*

* 2.0l/s is the minimum practical flow achievable as recommended by manufactures, any outflow rate below this would lead to blockages within the hydrobrake, therefore the rate of 2.0l/s was used for calculations

3.6 SUDS Selection Criteria

The SUDS selection process used for this site is in accordance with SUDS selection flow chart, Volume 3, Section 6.5, Figure 48 of the GDSDS. The characteristics of the site are utilised to select the various SUDS techniques that would be applicable.

The applicant has considered the use of all appropriate SUDS devices as part of the site SUDS strategy and has concluded that the following SUDS devices are most appropriate for the subject site.

- Permeable Paving
- Water butts
- Storage Tank
- Petrol interceptor

The effectiveness of each SUDS / drainage mechanism proposed is outlined below:

Permeable Paving:

Permeable pavements are alternative paving surfaces to standard finishes that allow stormwater runoff to filter through voids in the pavement surface into an underlying stone reservoir, where it is temporarily stored and/or infiltrated.

Water butts:

It is proposed to provide water butts for external gardening and wash down use only, which will ensure interception at source.

Storage Tank:

The storage tank proposed for this development will provide treatment to the storm water before it passes to the local network. The location of this storage tank is indicated on drawing No. xxx. This ensures the development will not give rise to any impact downstream of the site.

Petrol interceptor:

A petrol interceptor is a trap used to filter out hydrocarbon pollutants from rainwater runoff. It is typically used in road construction to prevent fuel contamination of water courses carrying away the runoff.

Petrol interceptors work on the premise that some hydrocarbons such as petroleum and diesel float on the top of the water. The contaminated water enters the interceptor typically after flowing off roads and entering a channel drain before being deposited into the first tank inside the interceptor. The first tank builds up a layer of the hydrocarbon as well as other scum preventing it from entering the watercourse

In conclusion the water quality from this catchment will be improved due to the above mentioned measures, which are applied in a treatment train to treat the water before discharge at a restricted rate to the local network.

The above measures ensure a suitable **management train** is provided.

3.7 Storm Water Calculations

The total impermeable area of the catchment including roads, car-parking and roofs, is approximately 820m^2. It is proposed that, in accordance with the recommendations of the Greater Dublin Strategic Drainage Study, that the 1 in 100 year critical design storm will be used for storm water attenuation volumetric calculations.

Calculations for pipe sizes and gradients are based on storm water runoff from the roofs and surfaced areas using the Rational Method for surface water design (Bilhams Formula), with a storm return period (N) of 5 years.

Pipe capacities and velocities have been calculated using Colebrook-White formula with a roughness coefficient (Ks) of 0.6mm.

The total impermeable area for the subject site set out above was used in the calculations for the design of the surface water system which are included in Appendix A.

The outfall sewer downstream of the hydrobrake is a 225 mm diameter pipe laid at 1 in 200, which has a capacity of 36 l/s. The maximum attenuated outflow from the subject site at this location is calculated as 2.00 l/s.

Excess storm water shall be attenuated in the underground storage tank, as indicated on drawing No. xxx. The storage tank will normally be dry and will only fill up during storm events. The stormwater will then be released after the storm at a controlled rate via a hydrobrake, as indicated on the drainage drawing. The storm water system will be designed to cater for the 1 in 100 year storm with 20% climate change allowed.

Storage design calculations are included in Appendix A of this report. Storage requirement's calculations indicate that for a return period of 100 years the 120-minute winter storm is the critical storm and requires a storage volume of approximately 37.5 m^3.

The storage capacity of the proposed underground storage tank is approximately 38 m^3. Therefore there is sufficient storage capacity available in the storage tank to store water from the critical 100-year storm for the subject site with a further 20% storage available to facilitate climate change.

4. Water Supply

4.1 Water Supply – General

It is proposed to provide potable water for the development via a connection to an existing watermain running on site. Please refer to drawing No. xxx for details of the watermain to serve the subject lands.

4.2 Water Demand Calculation

An estimate of water demand from the public water supply system for the proposed extension has been based on the provision of 27 additional beds to the nursing home. Details are shown below.

Table 4.1 Total Water Demand

Development Description	PE	Flow (l/h/day)	Total Water Demand (l/day)
Nursing Home	27	350	9,450
		Total	**9,450**

*Please refer to Table 2.1 for calculation of PE

The total water requirement, from the public supply for the development is estimated at 9.45 m^3/day.

4.3 Water Conservation

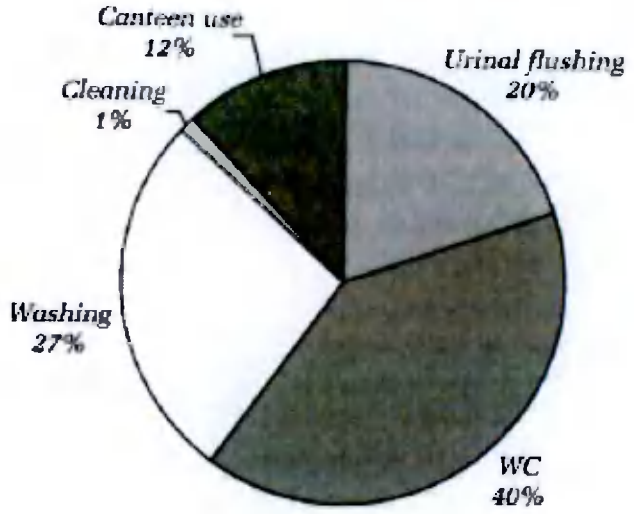
The water demand for the development can be subdivided as follows:

- Potable / Non-potable Breakdown

Detailed studies have quantified the breakdown between potable and non-potable uses for commercial uses.

The following diagram illustrates the current percentage breakdown of water usage in commercial circumstances and is from Griggs and Shouler 1994 as published in Chapter 11 of 'Water, Sanitary & Waste Services for Buildings' by Wise and Sheffield.

Figure 1: Current Commercial Water Usage Breakdown



In addition, water conservation measures will be used, to further reduce overall water demand, which will include:

- Low volume flush / dual flush WC's
- Aerated shower heads
- Spray taps
- Draw off tap controls
- Leak detection measures – through the metering of supply

APPENDICES

A. Surface Water Attenuation Calculations

Column1	Proposed Development
Site Area (Catchment) – Ha	0.393
Impermeable Area - Ha	0.082
% Hardstanding	21%
SAAR - mm	817
SOIL Index	0.3
Climate Change	20%

QBAR (50 Hectares)	109.18	l/s
QBAR per Hectare	2.18	l/s/Ha

Column1	Proposed Development
Site Area (Catchment)	0.393
$Qbar_{rural}$	2.00

Rainfall (mm)							
Duration							
(min)	1	5	10	20	30	50	100
30	8.20	14.20	17.30	21.40	24.20	28.20	35.70
60	10.70	18.40	21.90	27.00	30.30	35.10	45.30
120	14.40	23.90	27.70	33.90	38.00	43.70	57.60
240	18.60	31.10	35.10	42.60	47.60	54.50	73.30
360	21.80	36.30	40.40	48.80	54.30	61.90	84.40
720	28.70	47.10	51.20	61.30	67.90	77.20	107.40
1,440	37.80	61.30	64.90	77.10	85.10	96.10	136.70
2,880	46.50	72.50	75.80	89.00	97.50	109.00	151.80

Inflow (m3)							
Duration	Return Period (Years)						
(min)	1	5	10	20	30	50	100
30.00	7.40	12.81	15.60	19.30	21.83	25.44	32.20
60.00	9.65	16.60	19.75	24.35	27.33	31.66	40.86
120.00	12.99	21.56	24.99	30.58	34.28	39.42	51.96
240.00	16.78	28.05	31.66	38.43	42.94	49.16	66.12
360.00	19.66	32.74	36.44	44.02	48.98	55.83	76.13

720.00	25.89	42.48	46.18	55.29	61.25	69.63	96.87
1,440.00	34.10	55.29	58.54	69.54	76.76	86.68	123.30
2,880.00	41.94	65.40	68.37	80.28	87.95	98.32	136.92
Outflow (m3)							
Duration	Return Period (Years)						
(min)	1	5	10	20	30	50	100
30.00	3.60	3.60	3.60	3.60	3.60	3.60	3.60
60.00	7.20	7.20	7.20	7.20	7.20	7.20	7.20
120.00	14.40	14.40	14.40	14.40	14.40	14.40	14.40
240.00	28.80	28.80	28.80	28.80	28.80	28.80	28.80
360.00	43.20	43.20	43.20	43.20	43.20	43.20	43.20
720.00	86.40	86.40	86.40	86.40	86.40	86.40	86.40
1,440.00	172.80	172.80	172.80	172.80	172.80	172.80	172.80
2,880.00	345.60	345.60	345.60	345.60	345.60	345.60	345.60
Storage Reqd. (m3)							
Duration	Return Period (Years)						
(min)	1	5	10	20	30	50	100
30.00	3.80	9.21	12.00	15.70	18.23	21.84	28.60
60.00	2.45	9.40	12.55	17.15	20.13	24.46	33.66
120.00	0.00	7.16	10.59	16.18	19.88	25.02	37.56
240.00	0.00	0.00	2.86	9.63	14.14	20.36	37.32
360.00	0.00	0.00	0.00	0.82	5.78	12.63	32.93
720.00	0.00	0.00	0.00	0.00	0.00	0.00	10.47
1,440.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,880.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00