

## **1.0 INTRODUCTION**

To provide guidelines on the methodology to hydraulically assess the impact of a proposed new development on the existing network infrastructure and the requirement for associated reinforcements or operational works as a consequence of the additional load.

Evaluation of new development on the network using the software:

- InfoWorks WS Pro
- Arcview GIS
- SCADA
- Waternet

### **1.1 Contents**

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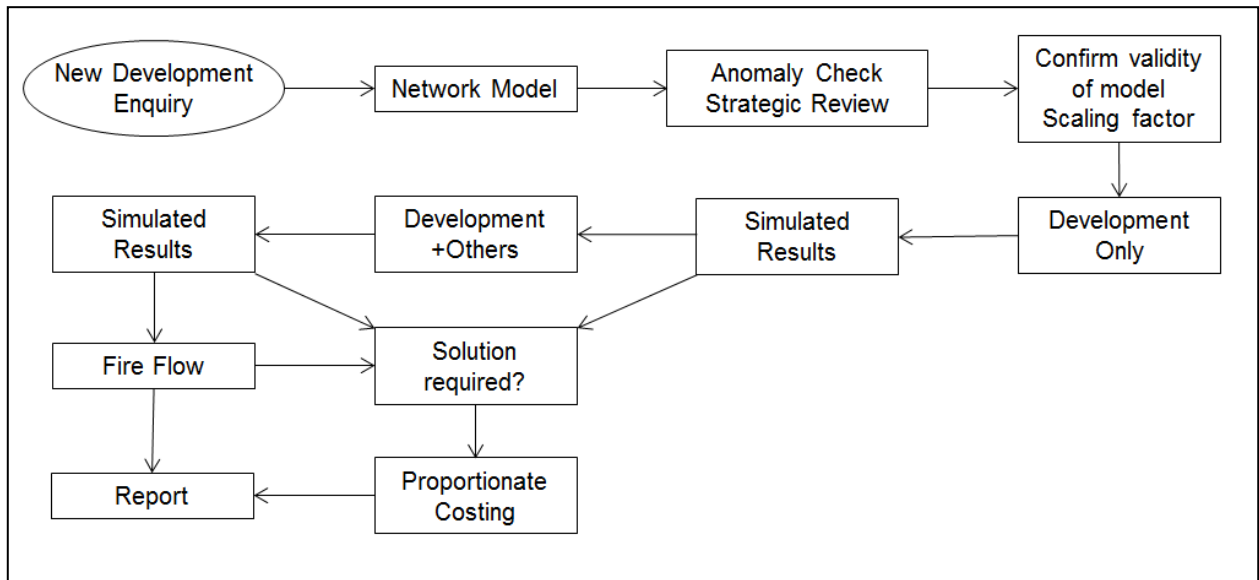
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## **2.0 ASSOCIATED DOCUMENTS**

AM213 – Level of Service for Hydraulic Modelling studies  
 FA100 – Data Storage Data Destruction  
 AM307- Design of Distribution Mains and Services  
 AW0265 - New Development Costing Guidance Note.  
 New development report templates  
 Outage report template

## **3.0 GUIDANCE**

*General view of the guidance note:*



*Procedure of new development enquiry*

Guidelines are used to direct the method of analysis to be applied but should not be taken as a strict procedure. Good engineering judgement should also be used; Affinity Water Asset Strategy team should be consulted if there is any area of concern or clarification required.

### **3.1 Request Details Review**

The request from Developer services is to include the following items:

- Location address
- Site map with boundary
- Demand type (see section 3.4)
- Demand (see section 3.4)
- Fire flow demand (see appendix 4.2)
- Preferred connection location (if known)
- If part of phasing / proposed phasing plan.

Any missing / confusion should be raised with the APM in DS at the initial review stage.

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The location should be confirmed in GIS to ensure the site history is confirmed before a request can be issued. The following items need to be confirmed:

- Has the site been assessed previously? If so, is the report still valid? Is the request a phase of a larger site already completed?
- Are there any nearby sites that could impact on the development? Do these have reinforcements?

Once this is understood the request can be issued.

### 3.2 Request Types

Sprinkler/Fire flow only –sprinkler assessments are to confirm impact on the network at the requested flow rate. Reinforcements are not proposed. Fire flow assessments are seen under section 3.6.

Full/ Budget request – these are based on the application types. All types except Pre-Development are classed as Full.

Outages/Diversions – These are to be completed under average conditions, unless specifically requested. These follow the operational outage template. Further guidance can be seen in Section 3.8.

LAR (Local Area Review)- A local review of the hydraulic impact of all proposed developments within an area. The analysis may conclude a range of infrastructure improvements / efficiencies to maintain Level of Service (LoS). A range of solutions may be considered to determine the preferred network improvements to be delivered from infrastructure charges. Proposals from these studies will feed into the strategic review.

Strategic Reviews – these take the total predicted developments, including the DS applications to HMSDS and the local plan council areas, which are applied to the model for total HDZ(s) assessment of the impact on network and water supplies. Any known sustainability reductions, source utilisation changes, and relevant planned capital works schemes are also considered to provide a total strategic review of the area. These are requested to be carried out after being identified as critical as they potentially have a supply/demand deficit due to the future demand imposing an additional load on the existing infrastructure. The analysis aims to develop a long-term solution to ensure water supply and to support Affinity Water future investment.

### 3.3 Request Issue

With the documentation, details and site history known an email request can be issued with the following body:

Hello,

Could this FULL/BUDGET/DIVERSION/FF request please be reviewed? Can you please respond with an ETA for the report.

Documents are saved here: [\\data03\Studies\P018199 - New Developments\](#)

### Summary

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|                  |  |
|------------------|--|
| HDZ              |  |
| Demand           |  |
| Fire Flow        |  |
| Known History    |  |
| Nearby Requests  |  |
| Strategic Review |  |

-----  
 CST; CSM; APM; modeller area champion

### 3.4 Model Accuracy Assessment

Prior to each study a number of checks need to be carried out to ensure that the model is deemed to be fit for purpose.

The DMA in the model should be assessed for accuracy against GIS. The network should be confirmed as accurate by considering if the boundary has been amended via rezoning, any new mains and additional properties, mains renewals or abandonment.

The inlet(s), any outlets and DG2/LOS locations should be confirmed as accurate to within  $\pm 2m$  and/or  $\pm 2l/s$  against telemetry, either Waternet or SCX. Any deviation from this should have a cursory investigation; however, if there is no apparent solution, highlight in the model accuracy section of the report.

The relevance of the peak to ensure the appropriate scaling factor is applied and that the model is consistent to the local historic telemetry data. A yearly

Any calibration actions within the DMA should be briefly assessed if still valid, but also referenced in the report. The removal of anomalies is not a valid solution, should one be required, as the action taken is to replicate the headloss and may not be the actual issue.

The network of future developments is to be confirmed for age or having been constructed and added to the model and is complete and current.

### 3.5 Demand

Capacity assessments for proposed new developments are done in peak demand condition to ensure that in all demand scenarios, the proposed development can be supplied to satisfactory standards.

The request should clearly include the demand required to be assessed from the new development and any fire flow requirements.

Residential demands should be a count of properties assessed at 375l/prop/day with UFW of 75l/connection/day.

When the capacity of the development is not specifically stated an assessment using loading units can be made using the re (Appendices 1 and 2), this assessment should be clearly stated in the report as the flow rate derived can be oversized due to a diversity factor not being

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applied to reflect the different loading on the system over time. It is primarily used for non-household demand.

Alternatively, where the loading units can be seen to be excessively large a fixed 650l/prop/day can be used for small shops or where loading units indicate likely low impact. This should be agreed with Asset Delivery and the DS APM before the assessment commences. The demand node(s) should be set at the maximum elevation of the site proposed boundary and the site elevation difference should be included. The asset code should be set to not be scaled in line with the DMA scaling factor.

Transfer nodes should not be used and the network of future developments only in InfoWorks should be maintained to be current.

The connection should be sized as SDR17 in AWC and AWE, and SDR11 in AWSE. The size considered should reflect the maximum velocity in section 3.1.2.2 and connected, where possible, to the nearest main of same size or larger. If this is not a feasible connection point, please note the x/y co-ordinates.

### **Demand Types**

The development is assessed by **use** of water – not the **type** of demand.

The **use** is domestic or non-domestic. A shop is commercial, but it'll only have toilets, sinks, kitchen for staff, etc. These are domestic use. A laundrette or swimming pool or food preparation company (such as around Heathrow for the airlines) are non-domestic. If a house wants to add a swimming pool or such, then it'll be non-domestic in a domestic setting. This governs the costs associated due to the charging arrangement.

The type of demand is for the modelling demand profiles and how they take water.

There are, as a result, four categories:

- Household domestic use
- Non household domestic use
- Household non-domestic use
- Non Household non-domestic use

For the domestic use (HH and NHH) the developer is not being charged for reinforcements and the focus is on reinforcement required to be in place before connection for the assessed development only.

The impact of the accumulation of developments is not so much a concern for DS, but more internally as we have to manage it and it is funded by the infrastructure charge. This is covered by the Local Area Review and Strategic Review. This gives us the ability to ensure the best solution for an area as it is not being driven by any one development and then extended and made complicated by the next development and allows us to be more flexible and even resolve any existing issues. This was partially covered by strategic review. These are not driven by the same deadline as the DS report, which is why it is now a separate document.

For non-domestic use, the charging arrangement is almost the same as previous, so nothing has changed there – except the percentage calculation is only for the non-domestic use

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element rather than the whole development. The report has had a cosmetic change to fully separate, within the document, the impact of the development only and the accumulative impact as the previous report was causing a lot of confusion.

### **Domestic Use Only**

These are to be assessed for nearest and preferred connections based on the required size of the connecting supply main. With the size of the development and the demand known, the size of connection can be determined.

The nearest connection refers to the nearest connection of same size or greater to the development boundary. This is based on geography only and is not related to hydraulics.

The preferred connection is hydraulically relevant and may or may not require network reinforcements/ enhancements prior to build.

### **Non- domestic Use**

Any development with non-domestic use should be assessed based on the domestic element and the non-domestic element.

It is assessed as above but, depending on site specific context, the preferred connection should be use.

## **3.6 Other Development in Vicinity**

All analyses need to consider any other development in the local area unless covered by a Local Area Review or Strategic Review. Non-domestic reports require full assessment of future HDZ needs.

## **3.7 Fire Flow Assessments**

Fire flow assessments are based on Appendix 5 of the 'National guidance document on the provision of water for firefighting'.

Reinforcements proposals not required as standard and just the report on achievable fire flow rate. Specific request will state if fire flow reinforcements need to be considered.

As per section 3.5, operational changes are preferable to reinforcement options. These should be clearly marked with valve IDs on the map for easy reference.

## **3.8 Outages**

Outages and diversions require an isolation of a section of main to allow for works related to the development. The timeframe of works is usually not provided and as such the rezone option(s) should account for the whole 24 hours, if possible. The network should be assessed under average conditions, unless specified.

The outage should note the impact of the isolation only with a property count and map view.

The rezone should show the valve number and x/y co-ordinates on a GIS map view of the location showing two road names or an easily locatable address.

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Where pressures are expected to be low (<15m) or increased (>=+5m) these should be noted and a property count included.

Any potential impact to assets such as boosters, reservoirs/towers, etc. should be included.

Velocity elevations and reversals should be included, with graphs showing the worst impacted sections.

The summary section should be clear and concise of the request, impact of the isolation only, the rezone and the impact, both pressure and risk to water quality, of the rezone.

For complex scenarios, noting available timeframes, if the work can be accommodated outside of peak times. Map views should be considered to reflect these times, if contextually relevant, e.g. due to the network the loss of some capacity only peak times suffer and works can be carried out overnight.

Sacrificial areas can be considered but as a last option.

### 3.9 Local Area Reviews

Local area reviews are based on a scenario of assessing the hydraulic impact of all relevant proposed developments in the vicinity, but with no single development as a focus. This is to assess the reinforcements within an area and ensure that the optimal and cohesive plan is proposed to meet the expected future demand. Other solutions for DG2 and TMMs should be considered if they can be used to

The LARs are to cover a defined area comprising a group of hydraulically connected DMAs that can be included within the Strategic Review.

Cost proportioning is not required.

### 3.10 Strategic Reviews

These are requested based on known concerns which should be assessed as part of the review and are context specific. The analysis aims to develop a long-term solution to ensure water supply and to support Affinity Water future investment. A substantial programme, in line with the requirements set out by the Water Framework Directive and the need to prevent any environmental deterioration, will be based on the increased investment by Affinity Water in infrastructure as well as on funding for the reinforcements coming from the infrastructure charge levied on developers to ensure that future generations will continue to have enough high-quality water to meet their needs.

### 3.11 Level of service

#### 3.11.1 Company standard

Affinity Water has a duty to supply its customers with water at adequate pressure 24/7. The indicator set by OFWAT with regards to pressure is a DG2 measure for inadequate pressure.

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The reference level of service is defined as ten metres head of pressure (this is pressure sufficient to raise water to a height of ten metres) at a boundary stop tap with a flow of nine litres a minute. This should be sufficient to fill a 4.5-litre container in 30 seconds from a ground-floor kitchen tap.

There are a number of exceptions to this, to allow for circumstances beyond a company's control. Some pressure problems, for example, are caused by the consumer's own plumbing.

Since it is impractical to measure the pressure and flow at the boundary of every consumer's property, each company is allowed to report against an alternative **reference level of 15 metres head of pressure in the distribution main supplying the property**. This is a sufficiently high pressure, even allowing for the connection from the water main to the property boundary.

### **3.11.2 Design and Hydraulic modelling standard**

#### **3.11.2.1 Minimum pressure**

For hydraulic modelling purposes, a minimum of 20m pressure is required at the critical point. This minimum value may be reduced to 15m pressure providing the difference between the daily fluctuating of maximum and minimum pressure values at the critical point are less than or equal to 5m. This reduced minimum pressure reference of 15m will apply in pressure managed areas or areas with a high elevation and in the vicinity of a water tower or reservoir.

#### **3.11.2.2 - Maximum headloss and maximum velocity**

The fluid velocities in water systems should not exceed certain limits. This is to reduce the energy lost during the transportation of water, to avoid noise and to reduce the risk of hydraulic shocks (also known as transient surges of water).

The maximum headloss recommended when designing a pipeline in water supply system is 15m/km.

For hydraulic modelling purposes, the recommended maximum headloss is 10m/km. This prevents water in the pipeline reaching maximum velocity under all demand scenarios (including network rezoning, natural growth in demand, etc...).

The maximum recommended velocity will depend on the pipe material properties.

For "plastic type" pipelines, which include MDPE, HPPE, UPVC and Protecta-Line, the maximum recommended velocity is 1.3m/s.

For "metallic type" pipelines which include Cast Iron, Ductile Iron, Steel with no lining, the maximum velocity recommended is 1m/s.

### **3.12 Network enhancements prior proposed new development**

Network Enhancement is the process of dealing with pre-existing shortfalls in capacity that are not in consequence of new development growth. The cost of addressing pre-existing shortfalls in capacity, enhancing the network's performance, or improving networks flexibility, may not be recovered under infrastructure charges and as such are not accounted for in costing.

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Enhancements should not be proposed as part of a development, unless directly hydraulically relevant to the development. The requirement for enhancements should be noted in the report for further investigation.

The requirement for network reinforcement prior to the proposed development will be assessed based on the OFWAT reference level and the DG2 register. See section 3.3

### **3.13 Network reinforcements or operational works following proposed new development**

Operational changes, including amending DMA boundaries and operational settings for PRVs and boosters, are the preferred option for mitigating potential poor pressures, although changes should be minimised and/or restricted to day time settings to minimise potential leakage implications. Where necessary, these should be noted, e.g. areas may experience higher pressures and potential increased burst rate.

The preferred reporting technique is to incorporate a graph of the current and proposed PRV settings or delivery pressure and flows for boosters.

Where operational changes are not the optimal solution and new assets are required, the maximum velocity and minimum pressure loss specified in section 3.2 are ideals that should be used for new assets. High velocity alone should not trigger network reinforcement.

Network reinforcement may include:

- enlarging existing or proposed pipes to increase capacity for a specific development, or growth more generally
- upsizing existing or proposed pumping stations
- providing new cross-connections to improve network capacity under differing network conditions
- other infrastructure required to provide network capacity for growth resulting from new development.

Network reinforcement should not be triggered in the event that the additional load due to the proposed development causes pressure to drop by less than 5% of the original pressure.

In the event that pressure reduction due to proposed new development is 5% or greater, network reinforcement could normally triggered, but careful consideration and review is required.

Anomalies should be highlighted and reported but not as a solution. Where an anomaly could negate the need for reinforcement a separate solution should be provided in case the anomaly cannot be resolved and highlighted in the report summary.

Any wider impact to the network that requires further investigation separate from the development should be highlighted in the report for Local Area Review or Strategic Review.

All Solutions should be in compliance with AM307.

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### 3.14 Proportionate costing

Proportionate costing calculations are not carried out for developments of domestic use only, as the reinforcements are to be funded by infrastructure charges. Where network reinforcements are required to facilitate a development request for non-domestic use or requested fire hydrants, costing calculations for the development are also required. These should be done in accordance with Guidance note AW0265.

### 3.15 Strategic overview

Once the immediate review is carried out the engineer in charge of the analysis will look at the strategic supplies for priority zones. This analysis will demonstrate whether there is creep in demand in each HDZ that needs a local area or strategic review to be carried out, or to be updated.

### 3.16 Report Structure

The report should aim to be able to be clear, concise and minimally technical. The audience covers a wide range of hydraulic capabilities and the report should reflect as such. Any assets referenced should be referred to be site name, logger RADCOM reference, valve ID/ hydrant ID or other such reference that can be found via GIS. InfoWorks model references should be avoided.

There are two reporting structures available: short form or full report.

#### 3.16.1 Short Form report

Usually for:

- Sprinkler/Fire flow only –with achievable (Y/N) or small reinforcements, respectively.
- Simple domestic or non-domestic only –minimal impact with the development only or small amount of local offsite network reinforcement/ valve rezoning. Particularly in areas of existing strategic review. Assessment of connection location based on preferred and nearest main of suitable size.

The header is to incorporate the DS number, whether it is a full/budget request and an x/y coordinate of the development site.

The text at the top should incorporate the demand, address, DMA and HDZ with the HDZ schematic hyperlinked.

The table is to be filled in as given, and the associated graphs should be created and saved in the system folder and hyperlinked in the accuracy.

The map view should show clearly the development only impact view of the site and surrounding area of an appropriate scale so the development, critical point and DMA can be seen, if the DMA is not too large. A zoom box to show the development boundary and both preferred and nearest connection locations (if different) are to be included, if possible. Circles and attached labels are to show the development, critical point and telemetry location are to be included.

The graphs are to clearly demonstrate the impact and the summary is to be clear and concise.

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Ideally, this should be a single page report; however, a second page is acceptable should the need arise.

### 3.16.2 Full report

Usually for Complex Domestic, non-domestic and mixed sites: typically the larger sites or with complex solutions with greater offsite network reinforcement requirements

This document and the report template cover much that is required; however, further guidance for particular scenarios is included below:

- Fire flow reinforcements (if required) should not have a dedicated main of sufficient length and size that accidental tapping could occur resulting in WQ issues.
- If the site is large and/or extensive reinforcements are required, the tipping point should be considered for inclusion; however, this is dependent on site-specific context.

### 3.17 Report Review

All reports submitted need to be reviewed and signed off. It is important that that the author of the report considers the above as it is not the responsibility of the reviewer to correct reports to any extent.

This review should cover:

- Is the report clear?
- Does it use the most up to date model for the analysis?
- Has the analysis been validated with current GIS and SCADA or site logging?
- Are there any anomalies in the analysis that don't make sense and need further investigation?
- Does the analysis cover any other developments in the area? If marginal e.g. low existing pressures –have Ops been consulted and solution agreed?
- Do we have all the information required?
- Are the recommendations aligned on the company procedures and guidance? Do the recommendations make sense?
- Is there a strategic view that needs to be taken?

### 3.18 Validity duration of report

The capacity assessments will become out of date 2 years after the design report has been submitted.

### 3.19 Responsibilities

All staff are responsible for their own compliance with data storage policies and procedures.

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## **4.0 APPENDICES**

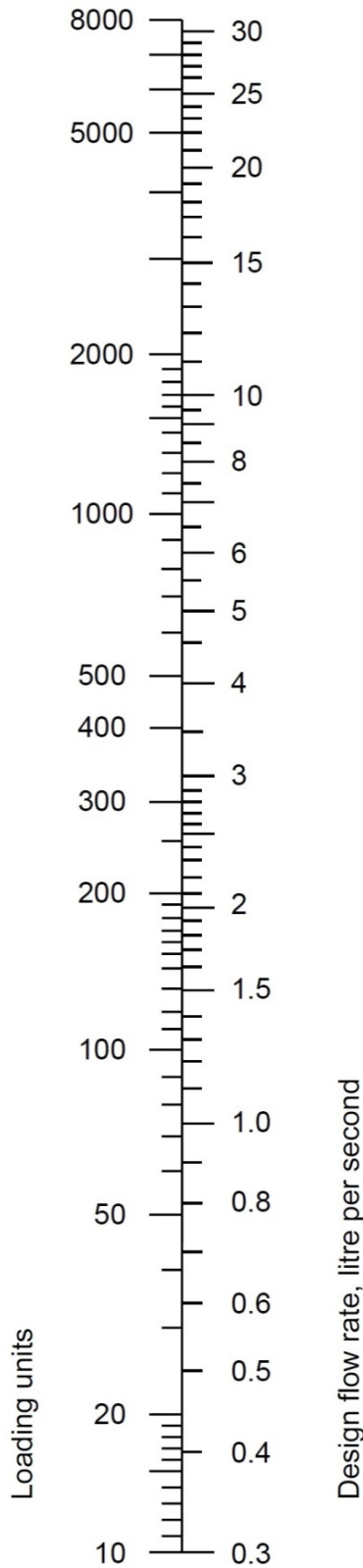
### **4.1 Loading Units**

The assumed loading units for various common fittings for use in service sizing can be found below. The loading units used by AW are from BS 6700:2006+A1:2009.

| <b>Type of Fitting</b>        | <b>Loading Units</b> |
|-------------------------------|----------------------|
| w/c flushing                  | 2.0                  |
| wash basin in house           | 1.5                  |
| wash basin elsewhere          | 3.0                  |
| bath (tap size 20mm)          | 10.0                 |
| bath (tap size > 20mm)        | 22.0                 |
| shower                        | 3.0                  |
| sink (tap size 15mm)          | 3.0                  |
| sink (tap size > 15mm)        | 5.0                  |
| spray tap                     | 0.5                  |
| bidet                         | 1.5                  |
| domestic appliance            | 3.0                  |
| communal/commercial appliance | 10.0                 |
| other water fitting           | 3.0                  |

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## 4.2 Conversion of Loading Units to Design Flow Rate



## 4.2 National guidance document on the provision of water for fire-fighting Appendix 5:

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| <b>National guidance document on the provision of water for fire fighting</b> |                 |
|---|-----------------|
| Demand type   | Flow rate (l/s) |
| Domestic housing (detached or semi) not more than 2 floors                    | 8               |
| Multi occupancy above 2 floors  | 20              |
| Transport (lorry/coach parks/multi-storey / service stations)                 | 25              |
| Industry <1ha   | 20              |
| Industry 1-2 ha   | 35              |
| Industry 2-3 ha   | 50              |
| Industry 3ha>   | 75              |
| Shopping, offices, recreation, tourism  | 20              |
| Village halls   | 15              |
| Primary schools and single storey health centres                              | 20              |
| Secondary schools, colleges, large health and community facilities            | 35              |

### 4.3 Domestic use

Domestic use is defined in section 218 of the ‘Water Industry Act 1991’:

#### 218. Meaning of “domestic purposes” in relation to water supply.

218.—(1) Subject to the following provisions of this section, in this Act references to domestic purposes, in relation to a supply of water to any premises or in relation to any cognate expression, are references to the drinking, washing, cooking, central heating and sanitary purposes for which water supplied to those premises may be used.

(2) Where the whole or any part of the premises are or are to be occupied as a house, those purposes shall be taken to include—

(a) the purposes of a profession carried on in that house or, where—

(i) that house and another part of the premises are occupied together; and

(ii) the house comprises the greater part of what is so occupied,

in that other part; and

(b) such purposes outside the house (including the washing of vehicles and the watering of gardens) as are connected with the occupation of the house and may be satisfied by a supply of water drawn from a tap inside the house and without the use of a hosepipe or similar apparatus.

(3) No such reference to domestic purposes shall be taken to include a reference—

(a) to the use of a bath having a capacity, measured to the centre line of overflow or in such other manner as may be prescribed, of more than two hundred and thirty litres;

(b) to the purposes of the business of a laundry; or

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to any purpose of a business of preparing food or drink for consumption otherwise than on the premises.

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