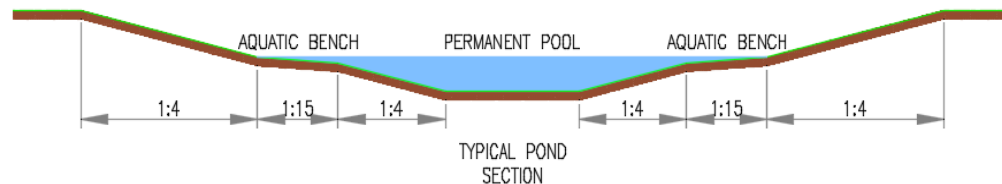


## 7. ATTENUATION POND DETAILS

### 7.1. Attenuation Pond Layout

The attenuation pond layout is shown on drawing No. 421-200 Drainage Strategy contained within Appendix F and a typical section shown below:-



### 7.2. Attenuation Pond Design

The ponds have been designed to provide storage and treatment to the surface water run-off from the proposed residential development.

Hydraulic modelling of the pond has been carried out using micro-drainage with results enclosed within Appendix H for reference and summarised in Section 6.3.

To provide treatment to the surface water run-off from the development and remove pollutants prior to discharge to the downstream receiving waters, the pond has a permanent pool volume. The combination of the permanent pool and the use of at source SuDS means that the overall treatment volume meets current guidance; refer to Section 6.5 for further details.

### 7.3. Pond Edge Geometry

The pond has been designed with slopes of 1 in 4 for safety and maintenance purposes with a shallow zone (aquatic bench) along the edge of the permanent pool to support wetland planting which will act as a biological filter and safety margin. The pond will provide ecology, amenity and biodiversity benefits and will add to the aesthetics of the open space.

### 7.4. Landscaping

The landscaping and aquatic planting for the pond will be designed by the Landscape Architect to provide a diversity of plant species to enhance visual interest and provide a variety of wildlife habitats. Details of the planting will be agreed with the Local Planning Authority and adopting body at the detailed engineering stage.

### 7.5. Adoption, Management & Maintenance

For the pond to operate efficiently it will need to be correctly managed and maintained. Please refer to Section 7.7 for further details on adoption.

#### Pond Access

Access to the pond will be via the new development roads. A grassed maintenance strip will be provided around the perimeter of the pond to allow routine maintenance activities and inspections to be carried out.

## Operation and Maintenance Schedule

Regular inspection and maintenance is important for the effective operation of the pond. Table 23.1 from Ciria C753 below can be used as a guide to the routine maintenance and inspections requirements for the pond. Full details will be developed and agreed with the Local Planning Authority and adopting body.

| Maintenance schedule   | Required action   | Typical frequency   |
|------------------------|---|---|
| Regular maintenance    | Remove litter and debris  | Monthly (or as required)  |
|                        | Cut the grass – public areas  | Monthly (during growing season)   |
|                        | Cut the meadow grass  | Half yearly (spring, before nesting season, and autumn)                               |
|                        | Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)   | Monthly (at start, then as required)  |
|                        | Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage  | Monthly   |
|                        | Inspect water body for signs of poor water quality  | Monthly (May – October)   |
|                        | Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options | Half yearly   |
|                        | Check any mechanical devices, eg penstocks  | Half yearly   |
|                        | Hand cut submerged and emergent aquatic plants (at minimum of 0.1 m above pond base; include max 25% of pond surface)   | Annually  |
|                        | Remove 25% of bank vegetation from water's edge to a minimum of 1 m above water level   | Annually  |
|                        | Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)   | Annually  |
|                        | Remove sediment from any forebay.   | Every 1–5 years, or as required   |
|                        | Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.   | Every 5 years, or as required   |
| Occasional maintenance | Remove sediment from the main body of big ponds when pool volume is reduced by 20%  | With effective pre-treatment, this will only be required rarely, eg every 25–50 years |
| Remedial actions       | Repair erosion or other damage  | As required   |
|                        | Replant, where necessary  | As required   |
|                        | Aerate pond when signs of eutrophication are detected   | As required   |
|                        | Realign rip-rap or repair other damage  | As required   |
|                        | Repair / rehabilitate inlets, outlets and overflows.  | As required   |

## **7.6. Health and Safety**

The attenuation pond has been designed as online hydraulic features for attenuation and water quality purposes and is not intended for recreational usage. Fencing would isolate the pond and reduce its amenity benefit. Barrier planting and landscaping will therefore be used to discourage public access to the open areas of water.

The aquatic bench, although provided primarily for ecological purposes will act as a safety margin helping prevent access to the deeper areas of water in the centre of the pond.

Safety signage and information boards can be provided around the perimeter of the ponds to improve awareness, discourage unauthorised access and inform the public of the potential danger. During a heavy storm the depth of water within the pond could be significant, up to a maximum 2.15m deep (top of bank level + permanent pool depth); life belts could also be provided for emergency use if required. Fencing or guarding will be provided around any structures such as headwalls where there is a vertical drop of 600mm or more.

Full safety details will be considered prior to construction and will be agreed with the Local Planning Authority and adopting body at the detailed engineering stage.

## **7.7. Adoption**

Details for the adoption and maintenance of the pond will be agreed with the local planning authority prior to construction under the Flood & Water Management Act 2010 (FWMA).

It is anticipated that the pond and SuDS in public/shared ownership will be adopted/owned by:

- a. The Local Planning Authority (Cheltenham Borough Council) as part of the open space; or
- b. Private Management Company with appropriate experience.

## 8. MANAGEMENT & MAINTENANCE

- 8.1. Foul and surface water sewers will be offered to Severn Trent Water for adoption under Section 104 of the water Industry Act 1991. Severn Trent Water will be responsible for the management and maintenance of all public sewers once they are adopted.
- 8.2. Highway drains and gullies will be offered to Gloucestershire County Council for adoption under Section 38 of the Highway Act 1980. Gloucestershire County Council will be responsible for the management and maintenance of the highways, including any highway drainage once they are adopted.
- 8.3. Drainage/SuDS for buildings, access roads, car parks, landscaping, etc. in private ownership will be managed and maintained by the homeowners.
- 8.4. Details for the management and maintenance of any SuDS within shared areas and open space such as the pond will be agreed with Cheltenham Borough Council prior to construction.
- 8.5. To ensure that any private shared ownership SuDS will operate effectively for its lifetime a management plan for the operation and maintenance of the SuDS will be produced prior to construction and agreed with CBC, based on Chapter 32 of Ciria C753:

**TABLE 32.1 Typical key SuDS components operation and maintenance activities (for full specifications, see Chapters 11–23)**

| Operation and maintenance activity   | SuDS component |         |                 |                    |          |                     |              |                 |                   |                          |              |             |                               |
|--------------------------------------|----------------|---------|-----------------|--------------------|----------|---------------------|--------------|-----------------|-------------------|--------------------------|--------------|-------------|-------------------------------|
|                                      | Pond           | Wetland | Detention basin | Infiltration basin | Soakaway | Infiltration trench | Filter drain | Modular storage | Pervious pavement | Swale/bioretention/trees | Filter strip | Green roofs | Proprietary treatment systems |
| <b>Regular maintenance</b>           |                |         |                 |                    |          |                     |              |                 |                   |                          |              |             |                               |
| Inspection                           | ■              | ■       | ■               | ■                  | ■        | ■                   | ■            | ■               | ■                 | ■                        | ■            | ■           | ■                             |
| Litter and debris removal            | ■              | ■       | ■               | ■                  | □        | ■                   | ■            | □               | ■                 | ■                        | ■            |             | □                             |
| Grass cutting                        | ■              | ■       | ■               | ■                  | □        | ■                   | ■            | □               | □                 | ■                        | ■            |             |                               |
| Weed and invasive plant control      | □              | □       | □               | □                  |          | □                   | □            | □               |                   | □                        | ■            |             |                               |
| Shrub management (including pruning) | □              | □       | □               | □                  |          |                     |              | □               | □                 | □                        |              |             |                               |
| Shoreline vegetation management      | ■              | ■       | □               |                    |          |                     |              |                 |                   |                          |              |             |                               |
| Aquatic vegetation management        | ■              | ■       | □               |                    |          |                     |              |                 |                   |                          |              |             |                               |
| <b>Occasional maintenance</b>        |                |         |                 |                    |          |                     |              |                 |                   |                          |              |             |                               |
| Sediment management <sup>1</sup>     | ■              | ■       | ■               | ■                  | ■        | ■                   | ■            | ■               | ■                 | ■                        | ■            |             | ■                             |
| Vegetation replacement               | □              | □       | □               | □                  |          |                     |              |                 | □                 | □                        | ■            |             |                               |
| Vacuum sweeping and brushing         |                |         |                 |                    |          |                     |              | ■               |                   |                          |              |             |                               |
| <b>Remedial maintenance</b>          |                |         |                 |                    |          |                     |              |                 |                   |                          |              |             |                               |
| Structure rehabilitation /repair     | □              | □       | □               | □                  | □        | □                   | □            | □               | □                 | □                        | □            |             |                               |
| Infiltration surface reconditioning  |                |         |                 | □                  | □        | □                   | □            | □               | □                 | □                        |              |             |                               |

**Key**  
 ■ will be required  
 □ may be required

## 8.6. Permeable/Porous Pavements

| TABLE 20.15 Operation and maintenance requirements for pervious pavements |  |  |
|---|--|--|
| Maintenance schedule  | Required action  | Typical frequency  |
| Regular maintenance   | Brushing and vacuuming (standard cosmetic sweep over whole surface)  | Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment |
| Occasional maintenance  | Stabilise and mow contributing and adjacent areas  | As required  |
|   | Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying  | As required – once per year on less frequently used pavements  |
| Remedial Actions  | Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving   | As required  |
|   | Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material | As required  |
|   | Rehabilitation of surface and upper substructure by remedial sweeping  | Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)   |
| Monitoring  | Initial inspection   | Monthly for three months after installation  |
|   | Inspect for evidence of poor operation and/or weed growth – if required, take remedial action  | Three-monthly, 48 h after large storms in first six months   |
|   | Inspect silt accumulation rates and establish appropriate brushing frequencies   | Annually   |
|   | Monitor inspection chambers  | Annually   |

## 8.7. Filter Trenches

| TABLE 16.1 Operation and maintenance requirements for filter drains |  |                             |
|---|--|-----------------------------|
| Maintenance schedule  | Required action  | Typical frequency           |
| Regular maintenance   | Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices                            | Monthly (or as required)    |
|   | Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage            | Monthly                     |
|   | Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies          | Six monthly                 |
|   | Remove sediment from pre-treatment devices   | Six monthly, or as required |
| Occasional maintenance  | Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010) | As required                 |
|   | At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium                       | Five yearly, or as required |
|   | Clear perforated pipework of blockages   | As required                 |

## **9. CONCLUSIONS**

- 9.1.** The site at Kidnappers Lane is considered within the L2SFRA as part of its evidence base for Gloucester, Cheltenham and Tewkesbury Joint Core Strategy. The site forms part of “Site C17” at Leckhampton and Shurdington.
- 9.2.** The L2SFRA, CBC, and EA mapping identifies the site as being entirely within Flood Zone 1 (low risk, less than 1:1,000 annual probability of flooding).
- 9.3.** This site specific FRA has been produced in accordance with the requirements of the NPPF, Planning Practice Guidance, and EA advice notes, and demonstrates that the proposed development will be safe from flood risk and that it will not increase flood risk elsewhere.
- 9.4.** Flood risk from all sources (sea, fluvial, pluvial, surface water, sewers, groundwater, artificial) has been assessed and it has been demonstrated that the proposed development will not be at risk from flooding from these sources. Refer to Section 5 for further details.
- 9.5.** A surface water drainage strategy has been developed that incorporates a Sustainable Drainage System (SuDS) and is shown on drawing No. 421-200 Drainage Strategy contained within Appendix F. The proposed SuDS will ensure that flood risk resulting from pluvial events (rainfall) will be managed on-site and that flood risk will not be increased elsewhere as a result of the development.
- 9.6.** To mitigate for the additional surface water run-off volume resulting from the proposed development the EA/Defra and Ciria guidance together with BS8582 recommend that Extended Attenuation Storage is provided and that run-off is restricted to 5 l/s for all events up to the 1:100 with allowance for climate change. This approach ensures that sufficient run-off is retained on site for extreme events to protect the receiving water course in times of flooding.
- 9.7.** A 40% allowance for climate change has been included in the SuDS attenuation assessment to take in to account the predicted increase in rainfall intensity over the lifetime of the development.
- 9.8.** Micro-drainage has been used to calculate the proposed attenuation pond volumes for the 1 in 1:1, 1:30, and the 1:100+40% climate change events. The results of the simulation are contained within Appendix H and summarized in Section 6.3.
- 9.9.** The proposed SuDS will provide treatment to the surface water run-off from the development and will follow the SuDS treatment train approach to remove pollutants.
- 9.10.** Flood routes will be provided for exceedance events, or for local failure of the drainage system, and will ensure that flood flows are directed safely through the development to the downstream drainage system.
- 9.11.** The proposed Sustainable Drainage System for the development will be managed and maintained to ensure that it will operate effectively for its lifetime.

- 9.12.** This Flood Risk Assessment and Drainage Strategy demonstrates that the proposed development meets with all the national and regional policy requirements and satisfies all the criteria of the Environment Agency.
- 9.13.** The Flood Risk Assessment concludes that the site can be safely developed without flood risk and without increasing flood risk elsewhere through the use of an appropriately designed Sustainable Drainage System.