12.0 Resources

- Energy Hierarchy
- Extending and Retrofitting
- Design Accreditation
- Materials and Techniques
- Resilience and Climate Adaptation
- SuDS
- Habitat and Species Considerations
- Pollution

12.0 Resources

Efficient and resilient.

12.1 Introduction

12.1.1 Central Bedfordshire must play a pivotal role in evolving the attitude, practices and behaviour of residents and business if we are to reach our sustainability goals. There is a key focus on working collaboratively to cut carbon dioxide emissions from the area's key emission sources: fossil fuel vehicles, existing homes, commercial and institutional buildings, and new developments.

12.1.2 This section of the Design Guide sets out guidance on all sustainability aspects, which developments must follow, including electric vehicles and sustainable drainage systems.

12.1.3 This section should be read in conjunction with chapters 2, 9, 11, 12, 14, 15, 16 and 17 of the NPPF, adopted Local Plan (policies, T1-T6, EE3, EE4, EE10, EE11, EE14, CC1-CC8, HQ1,HQ9, HQ11, DC1, DC5) and the National Design Guide, Resources R1 to R3, which highlights how new development needs to be efficient with conservation of natural resources and resilient to the impacts of climate change.

12.1.4 This section should be viewed alongside relevant guidance documents and resources which includes:

- CBC Sustainability Plan
- Central Bedfordshire 2050 Vision
- Central Bedfordshire Sustainable Drainage Guidance (2015)
- CBC Air Quality Guidance
- Building Regulations (Planning Portal)
- CBC Climate Change Risk Assessment
- The Environment Act 2021
- The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy (HM Government)
- United Nations Sustainable Development Goals
- Energy hierarchy and zero carbon hub
- Passivhaus standard
- BREEAM standard
- National Planning Practice Guidance Climate Change
- Renewable energy and technologies - www.energysavingtrust.org.uk; www.microgenerationcertification.org
- Green roofs
- UK Rainwater Harvesting Association
- Waterwise
- Building for a Healthy Life
- Your home in changing climate: retrofitting existing homes for climate change impacts. Arup, February 2008
- Designing homes for the 21st Century: Lessons for low energy design. NHBC Foundation, May 2013
- Understanding overheating - where to start: An introduction for house builders and designers. NHBC Foundation, July 2012
- Overheating in new homes. A review of the evidence. NHBC Foundation, November 2012
- Lessons from Germany's Passivhaus experience. NHBC Foundation, December 2012
- ROSPA managing risk around waterbodies
- Guidance - Contaminated Land Statutory Guidance

12.2 Key Sustainability Principles

Optimise Site Potential

12.2.1 Well-designed places must consider sustainability at an early stage and consider:

- Location in relation to opportunities to travel by sustainable modes to key services and facilities (work, education, shopping, and health)
- Orientation – seek to maximise daylight for optimum light, heating, cooling, and shading as appropriate. This is achieved by orientating buildings within 30 degrees of due south giving an east-west street pattern. Acoustic and visual privacy can also be achieved with a careful layout.
- Landscaping – retention and/or replacement of trees and shrubs should be part of the initial design and not a bolt-on. Consider both functional and visual aspects of landscaping for general amenity, shading, softening built form and increasing biodiversity.
- Sustainable drainage (SUDS) – to be considered at the outset of the design process and includes green, brown and blue roofs, permeable surfaces, swales and basins, infiltration trenches, filter drains, rainwater harvesting systems, rain gardens, soakaways, downpipes fed into gardens, bio retention tree pits, ponds and wetlands.
- Re-use of Buildings – consider whether it would be more sustainable to refurbish rather than demolish existing structures.

Follow the energy hierarchy

12.2.2 Well-designed places and buildings should follow the energy hierarchy of:

- Reducing the need for energy through passive measures including form, orientation, and fabric.
- Using energy efficient mechanical and electrical systems, including heat pumps, heat recovery and LED lights.
- Maximising renewable energy through decentralised sources, including on-site generation and community-led initiatives.

Optimise Energy and Water Use

12.2.3 Well-designed buildings should be efficient and maximise resources:

- Explore the potential to deliver Passivhaus or net zero carbon buildings.
- Consider the use of renewable energy or low carbon energy.
- Use water efficient appliances and low water flow fittings.
- Provide facilities to recycle water like water butts.
- Provide sufficient insulation (glazing, lagging etc.) and provide sufficient ventilation to minimise unwanted solar gains that lead to overheating.
- Consider operational and maintenance practices at the preliminary design phase to reduce lifetime building running costs and allow the monitoring of energy usage.

Greener Construction

12.2.4 Well-designed buildings should have green construction at the heart of the development:

- Reduce embodied carbon.
- Consider lower toxicity materials from sustainable sources.
- Minimise construction waste (for further information see CBC guidance).
- BREEAM accredited or equivalent to create a sustainable built environment.

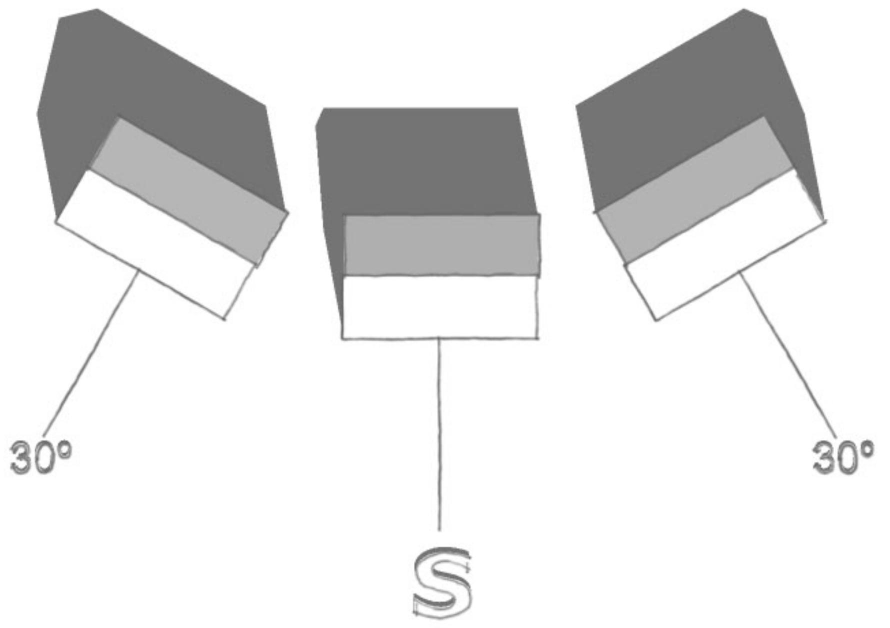

Figure 312: Site orientation for optimum solar gain

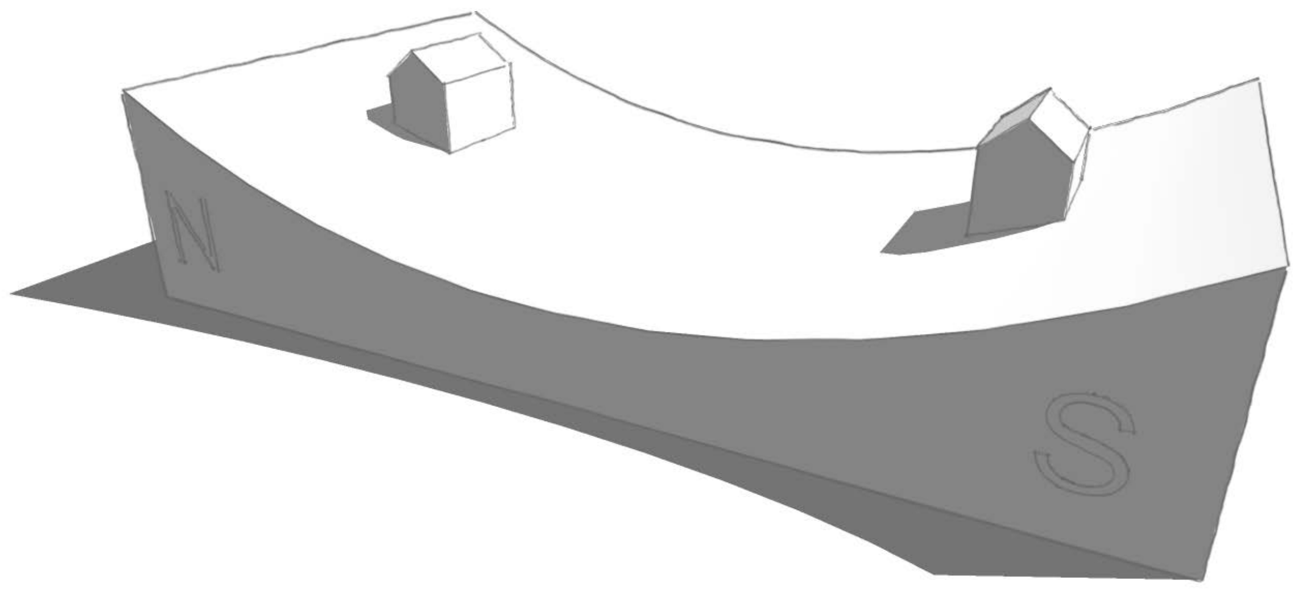

Figure 313: Building orientation on a sloping site

12.3 The Energy Hierarchy and Zero/Low Carbon Buildings

12.3.1 In accordance with the National Design Guide well-designed places and building must follow the energy hierarchy of:

- Reducing the need for energy through passive measures including form, orientation and fabric.
- Using energy efficient mechanical and electrical systems, including heat pumps, heat recovery and LED lights.
- Maximising renewable energy especially through decentralised sources, including on-site generation and community-led initiatives.

12.3.2 The initial design should consider orientation and layout to minimise energy demand and increase energy efficiency of buildings. Higher energy efficiency can be achieved using low U-value materials, avoiding thermal bridging and maximising air tightness. Carbon emissions can then be further reduced using efficient heating/cooling systems, energy efficient appliances, and the installation of renewable energy technologies. Carbon emission reductions which cannot be achieved in individual dwellings or within the site can be offset through investment in an accredited carbon offset scheme.

12.3.3 For further information and as an example see the Biggleswade energy strategy document.

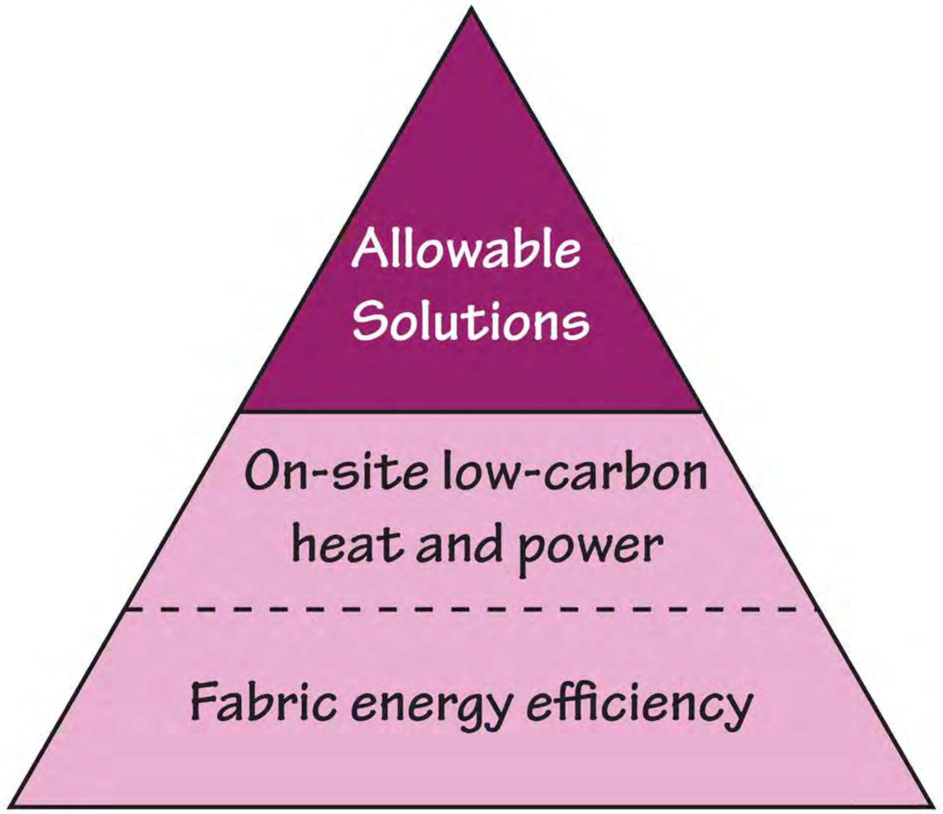

Figure 314: Energy Hierarchy – steps to achieving zero carbon

Distributed or Onsite Generation

12.3.4 Distributed or onsite generation is the generation of electricity from many small energy sources. The main advantage of distributed onsite generation over centralised generation is that electricity supply is not wasted with the inefficiencies of transmission over long distances and there is an improved security of supply.

12.3.5 The characteristics of a development and the site's constraints will favour different low, and zero carbon technologies and a range of approaches should be explored. Ground source heat pumps combined with solar are the preference for the residential scale.

Photovoltaic (PV) cells

12.3.6 PV systems generate electricity from daylight. Solar panels can be used from small-scale rooftop installations to large-scale solar farms. Solar microgeneration systems should include battery storage to maximise energy retention and low carbon footprint. They are most suitable for buildings with a roof or wall that faces within 90 degrees of south, as long as it is not overshadowed, and the building is designed to take the weight of the panels.

Wind Turbines

12.3.7 Small scale wind generation turbines can be pole or roof mounted. The effectiveness of wind turbines at the residential or urban scale is questioned, and studies should be conducted before installation. Wind turbines are more effective at large commercial scale.

Ground Source Heat Pumps (GSHP) and Air Sourced Heat Pumps (ASHP)

12.3.8 Ground source heat pumps (GSHPs) transfer heat from the earth into the home through a heat exchange system that upgrades heat to a higher temperature to provide space heating and hot water. This system can also be reversed for cooling purposes. An appropriately sized system can produce all the heating and hot water requirements of a well-insulated home. Air source heat pumps absorb heat from the outside to heat buildings.

Community Heating

12.3.9 Combined Heat and Power (CHP) as the engine for a District Heating Network, can provide community heating and cooling. CHP units, which can be powered by a range of fuels, such as gas or biomass, are most efficient when run at full capacity continuously. This would mean that heat generated during low demand periods from one user should be exported to other user(s) to avoid the 'dumping' heat to the environment

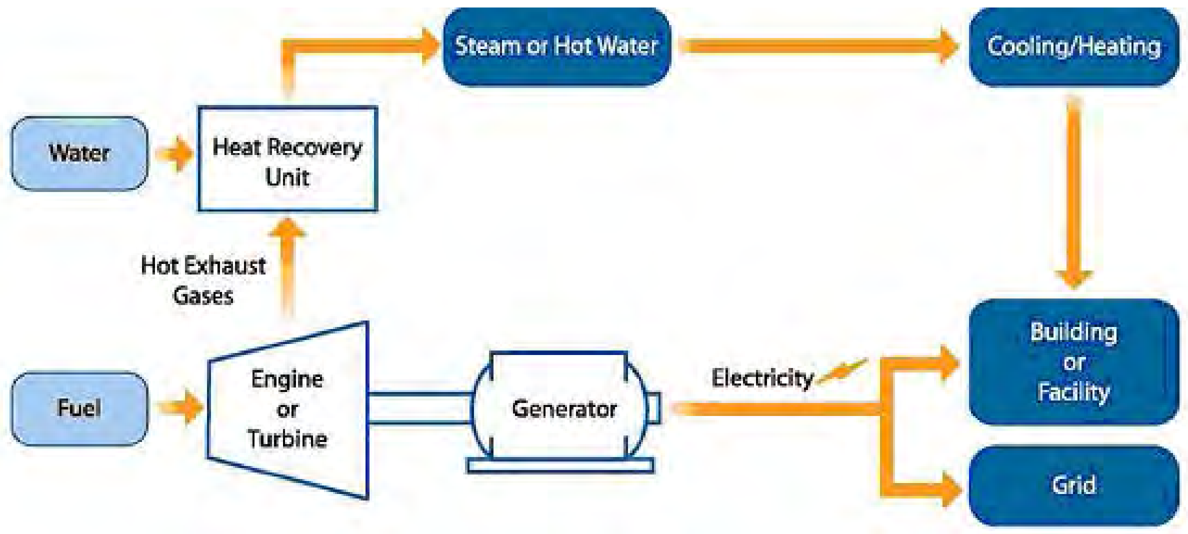

Figure 315: Combined Heat and Power system

Figure 316: Wind farm

12.3.10 The energy demand profile of different occupiers within the development site will need to be analysed to determine the suitability of CHP. As a rule of thumb CHP is most likely to be suitable for mixed use sites which have a high heat user all year round, for example an industrial heat user or leisure complex.

- The electricity produced by the CHP unit can either be used by occupiers of the site or exported to the National Grid.
- Wind turbines and ground level solar PV arrays can supply renewable electricity to the scheme or export it to the National Grid
- For more guidance on large scale renewable development please refer to the Council's technical guidance notes for large scale Renewable Energy.

12.4 Design Considerations

12.4.1 Larger development sites will provide more opportunities and fewer constraints to delivering resource efficient and climate change resilient development. The scale will have a bearing on selection of suitable measures. The following sections contain examples of potential suitable measures to be considered at:

- Strategic scale (at the development site scale)
- Individual building scale
- Extensions and, or retrofitting of existing buildings

Strategic and Development Site (Masterplan) Scale

Site Layout to Reduce Energy Demand

12.4.2 Site layout and orientation of buildings has a significant impact on the amount of passive solar gain and energy demand for heating and cooling. Energy demand can be significantly reduced by orientating the longest face of the building within 30 degrees of south, and therefore roads should be aligned east-west. South easterly orientation is preferable to south westerly as it maximises early morning solar gains and reduces overheating in the afternoons.

12.4.3 To avoid summer overheating, especially in buildings with south to west facing elevations, shading or other solar control measures should be considered in the design of a building (more detail in the building scale section). Deciduous trees are very effective in providing shade in summer and allowing sun light to get through in winter months.

Figure 317: South easterly orientation maximises early morning solar gains and reduces overheating in the afternoon

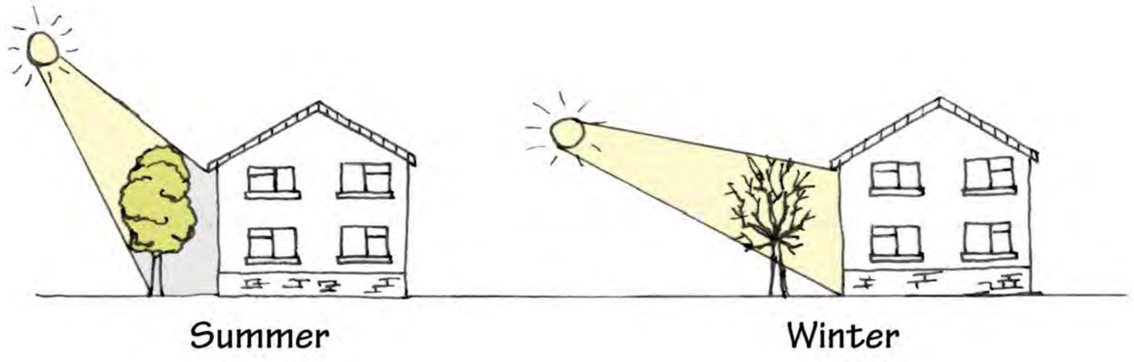

Figure 318: Deciduous trees provide effective shading from the summer sun, whilst allowing warming sun rays through in winter months

Building Scale

12.4.4 Energy efficiency and reductions in carbon dioxide emissions should be achieved by following the energy efficiency hierarchy. This starts with good passive solar design, efficient fabric of the building, efficient heating and cooling systems, provision of energy from zero and low carbon sources and as a last resort the use of carbon offsetting and allowable solutions. Below is a range of practical examples of how the energy hierarchy could be delivered at an individual building scale.

Passive Design and Energy Efficient Fabric Solutions

12.4.5 As homes are built with better insulation, overheating in the summer months is becoming a greater issue. The Good Homes Alliance 'Overheating in New Homes – Tool and Guidance' and National House Builders Council 'Understanding Overheating' guide outlines the factors that increase and reduce the risk of overheating. Specific measure to reduce the potential for overheating include changing occupant behaviour, purge ventilation, thermal mass, window design, secure ventilation, solar shading and shading devices.

12.4.6 Consideration should be given to the following measures:

- Orientation:
  - Energy demand for heating can be reduced by locating the façade of the main living rooms within 30° of South and minimise or make smaller windows on the northern elevation to reduce potential heat loss.
  - Overheating in commercial and public buildings that are in continuous use throughout the day can be reduced by avoiding the design of rooms with south or west facing windows.
- Shading or other solar control measures:
  - Shading and other solar control measures should be considered in the design to avoid summer overheating. This will avoid the solar gain adding to the internal heat gain throughout the day, which makes it more difficult to keep the space at a comfortable temperature without mechanical air conditioning.
  - Ensure that sufficient shading or other solar control measures are considered in the design to avoid summer overheating. This could include overhanging eaves and canopies, external blinds, and shutters, brise soleil (sunbreakers which project above glazing), solar control glazing with heat reflecting films, deciduous trees, bushes or creepers.
- Thermal mass:
  - Overheating in summer months and heating requirement in winter months can be reduced by including building materials with thermal mass. The thermal mass of materials absorbs heat during hot days and dissipates heat during cold days.
  - Thermal mass can also help with balancing temperatures between day and night, particularly when used with night-time purge ventilation.
  - Development should be designed in accordance with the Chartered Institute of Building Services Engineers TM52 and TM59.
- Natural light
  - Designing living rooms with an open floor plan, and making use of skylights, sun pipes and catchers on southern elevations to bring natural daylight into darker areas, can reduce need for artificial lighting.
  - Specify fabric with high energy efficiency and avoid thermal bridges. Ensure that walls, floors, roofs, water tanks, ducts and pipes, and external doors are insulated. Also ensure that windows are double or triple glazed and have excellent energy rating.

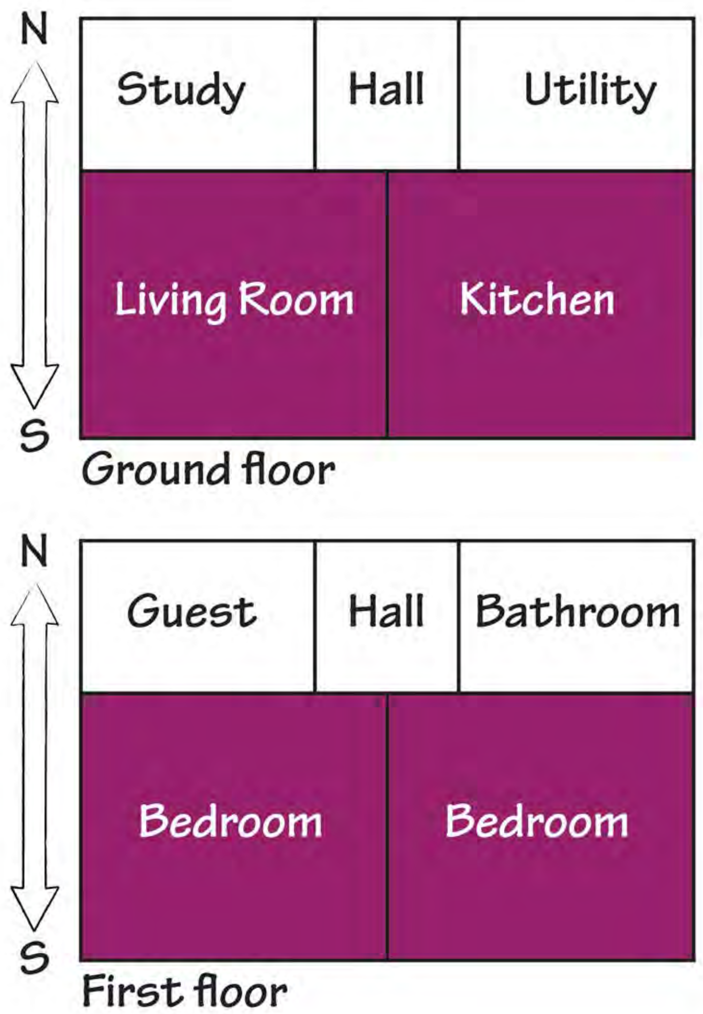

Figure 319: Internal layout designed to suit solar orientation

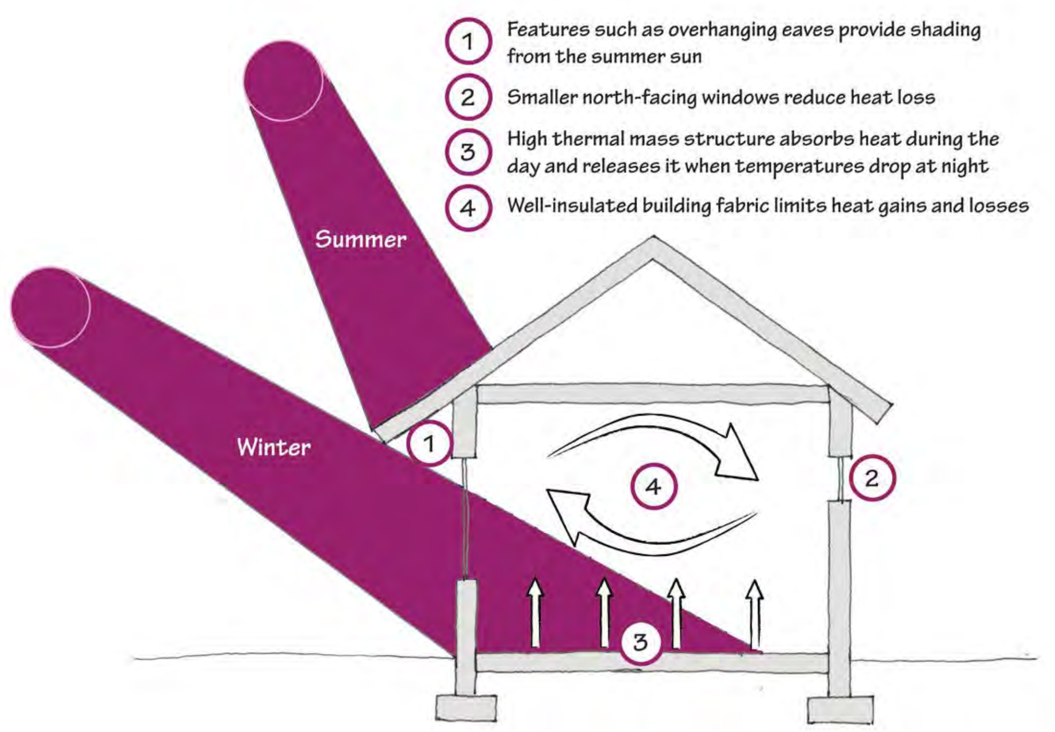

Figure 320: Passive design principles including shading, thermal mass and insulation help to reduce overheating during the summer and heat loss during the winter

12.5 Larger mixed-use buildings

12.5.1 Whilst the Local Plan sets a requirement for a BREEAM 'very good' standard for non-residential developments for water efficiency, those that are larger than 1000 square metres could aspire to be BREEAM Excellent or the equivalent nationally recognised standard (if introduced) for all elements. In addition, buildings should be designed to enable net zero carbon standard.

12.5.2 Larger buildings have a greater impact on the landscape and a Landscape and Visual Impact Assessment is often required. The use of roof profiles, orientation, graded colour banding and appropriate lighting can reduce landscape and visual impact. Green, grey and blue roofs and PV are all encouraged on larger footprint buildings.

12.5.3 The footprint and form of proposed buildings should be designed to optimise daylighting and natural ventilation. New buildings should maximise the use of sustainable construction in terms of structure, locally sourced building materials, the use of renewable energy, water and drainage efficiency, and waste management.

12.5.4 Larger footprint buildings are often located in unsustainable locations, away from regular public transport routes and within ease of connectivity to a range of services. The development proposals must demonstrate accessibility by forms of movement other than the car, encouraging cycle and pedestrian movements. This should influence the location, siting, layout, mix of uses and provision of facilities for the development. All parking generated by the development must be accommodated on site. The design team should fully consider the provision of measures to improve accessibility outside of the development site boundary, connecting and/or improving key desire lines.

12.5.5 Biodiversity, landscaping and amenity space should also be considered to enhance users experience of the site.

12.6 Extending and Retrofitting Existing Buildings

12.6.1 When designing an extension to or retrofitting an existing building, consideration should be given to how the original building can be improved in terms of energy and water use. Measures which should be considered are broadly the same as those examples given for a new build (above). There might however be some constraints such as the original building construction (e.g. solid wall), designation (e.g. listed building) or setting (e.g. conservation area). These issues require careful consideration and the Council's Conservation officer, ecologist, and structural engineer should be engaged early in the design process. Sympathetic upgrades should be supported. There will be a legal requirement for improvements in Energy Performance Certificates in the domestic and commercial sector, therefore this should be encouraged as much as possible. Buildings with poor EPCs cannot be rented or let see further information on landlord guidance.

12.7 Design Accreditation

12.7.1 Design accreditation schemes such as BREEAM and Passivhaus can act as a drive for more sustainable buildings as well as demonstrate the sustainability credentials of the development.

BREEAM

12.7.2 BREEAM assesses development against several categories including management, health and wellbeing, energy, transport, water, materials, waste, land use and ecology, and pollution. To create net zero carbon and a sustainable built environment, the Council encourage new development to be of a very good or excellent BREEAM rating.

Passivhaus

12.7.3 Passivhaus standard helps to reduce energy demand of the building primarily through specification of fabric with high energy efficiency and optimal solar orientation. Such orientation maximises solar gain in winter to reduce need for heating whilst limiting solar gain in summer months to avoid overheating. Passivhaus standard introduces principal requirements that are additional to the UK Building Regulations. These are presented in the following list:

- Insulation
- U-values of walls, floors, and roofs. 0.15 W/m2K
- Glazing
- Triple-pane windows with insulated frames U-values (including doors). 0.8 W/m2K
- Solar orientation
- Windows south facing
- Thermal bridging
- Minimal (ideally non-existent) psi-(ƒµ) values. 0.01 W/mK
- Ventilation

- High-efficiency MVHR system Heat recovery efficiency. 75%, specific fan power. 1.62 W/(l/s)
- Appliances
- Low-energy lights and appliances throughout
- Overheating
- Special care to avoid summertime overheating

12.8 Careful Selection of Materials and Construction Techniques

12.8.1 In accordance with the National Design Guide, the selection of materials and the type of construction influence how energy efficient a building or place can be and how much embodied carbon it contains. Well-designed proposals for new development use materials carefully to reduce their environmental impact. This may be achieved in many different ways, for instance through materials that are locally sourced, high thermal or solar performance; or designs based on the typical dimensions of materials to reduce waste.

12.8.2 A well-designed place is durable and adaptable, so that it works well over time and reduces long-term resource needs. The re-use and adaptation of existing buildings reduces the consumption of resources and contributes to local character and context.

12.8.3 New construction techniques may contribute towards improving efficiency, productivity and the quality of new homes and buildings. These include the off-site manufacture of buildings and components using innovative and smart technologies, supported by digital infrastructure. They offer the potential to reduce whole life costs and for users to customise the products. Careful consideration needs to be given to placemaking, local distinctiveness and the character of new homes and buildings.

12.9 Maximising Resilience, Resource Efficiency and Climate Adaption

12.9.1 In accordance with the National Design Guide well-designed places are robust and take account of local environmental conditions, both prevailing and forecast. They contribute to community resilience and climate adaption by addressing the potential effects of temperature extremes in summer and winter, increased flood risk, and more intense weather such as rainfall.

Climate Change Resilience

12.9.2 The Council's Climate Change Risk Assessment identified several climate change impacts affecting the Central Bedfordshire area: flooding, drought and water shortages, overheating and the urban heat island effect, subsidence, and severe weather events. The future risk of climate change impacts affecting the proposed development should be assessed and mitigation measures designed into site layout and individual buildings to minimise the risk and provide a higher degree of 'future proofing'.

Climate Change Resilience Measures

12.9.3 If a building is at risk of being affected by climatic factors, careful consideration should be given to design in measures which will increase building resilience. For example, in case of flood risk, the air bricks of a building can have removable covers and electric sockets can be positioned above potential flooding level to minimise damage.

Mitigating Climate Change Impact

12.9.4 The urban heat island effect can be reduced within and beyond the development site through integration and inclusion of:

- Trees to provide summer shading for buildings and transport/movement networks such as streets, walking and cycle paths (please refer to the Nature section of this Design Guide for more information on species selection; and the Movement section and the Highways Construction Standards and Specification Guidance Guide for trees that are suitable to be planted in adopted public highway).
- Green open spaces should be maximised to provide urban cooling through evapotranspiration.
- Water features such as ponds, fountains and well-designed Sustainable Drainage Systems (SuDS) can provide summer cooling (please see SuDS section in this chapter for more information).
- Materials with low heat retention properties should be prioritised within the building design. Pavements and road surfaces should use appropriate higher solar reflectivity materials to reduce the effect of urban heat islands.

12.9.5 Good site design which integrates passive solar layout and green (trees and open spaces) and blue (SuDS and water features) infrastructure is key to avoid summer overheating and provide future adaptation for a rising temperature.

12.9.6 Flood risk can be reduced through good design of SUDS, minimising hard impermeable surfaces, and increasing permeable, preferably green spaces in the development.

12.9.7 Risk of subsidence due to soil shrink-swell can be reduced through designing foundations that are strong and deep enough to withstand seasonal variation in moisture content (considering predicted climatic changes in precipitation patterns over the expected lifespan of the development) or through use of pile foundations.

Resource Efficiency and Climate Change Adaption

12.9.8 All new development should use resources such as energy and water efficiently and future proof against climatic impacts such as flooding, drought, subsidence, and the urban heat island effect. Such development will provide comfortable and healthy accommodation with low running costs that are resilient to energy price inflation for both the residential and commercial market.

12.9.9 Resource efficiency and climate change adaptation measures should be considered at the earliest possible stage of development design (at the masterplanning, development brief or site layout) to ensure that they can be achieved in the most cost-effective way. For example:

- Good solar orientation and application of passive design principles can reduce energy demand of buildings and need for technological solutions (e.g. renewable energy) to create net zero buildings.
- Well located and designed green infrastructure can compensate for future changes in climate by providing urban shading and cooling, integrating SuDS and increasing biodiversity.

Carbon Emission Reduction

12.9.10 Carbon compliance measures which reduce carbon dioxide emissions are:

- Efficient heating/cooling systems and appliances - From 2025 gas boilers will not be permitted in new properties and low carbon heating systems, such as heat pumps, should be prioritised. Any white goods being installed must be AA or A+++ rated.
- Efficient lighting - All internal and external lights should have low energy bulbs fixtures and controls.
- Efficient ventilation system - Ensure that sufficient natural or mechanical ventilation is designed in to how the building will operate. The simplest form of natural ventilation is cross ventilation which requires openable windows on opposite sides of the building.
- Renewable energy technologies such as solar PV, solar hot water, biomass boilers, air source and ground source heat pumps are suitable for use in individual dwellings and commercial buildings. Combined Heat and Power units are less suitable for domestic settings due to disparity between periods of heat and electricity demand. In domestic settings biomass boilers and stoves are usually better suited.

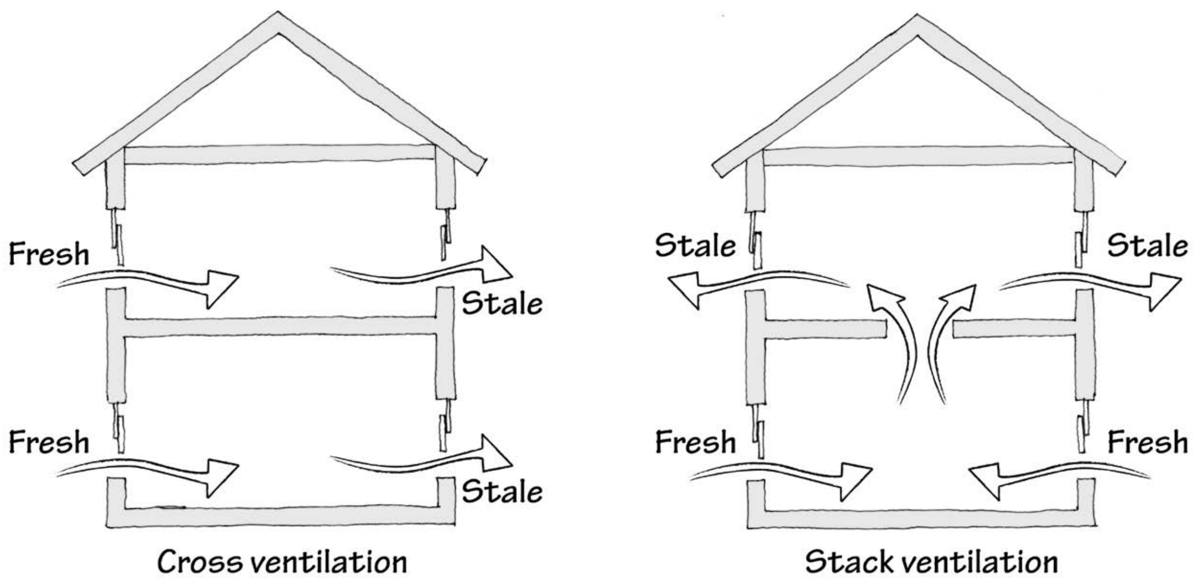

Figure 321: Cross and stack ventilation - the simplest forms of ventilation not requiring a mechanical solution

Energy and Water Efficiency

12.9.11 Water efficiency in individual buildings can be achieved through following measures:

- Water efficient fittings and appliances such as low flow taps, dual/low volume flush toilets, water efficient aerated showerheads, water efficient washing machines and dishwashers
- Rainwater collection and grey water recycling systems replace the use of mains fed, potable water with collected from the roof rainwater or recycled grey water that has been already used, e.g. for bathing. Harvested rainwater is filtered and then stored for use in the garden, flushing WCs and washing clothes. Collected greywater is filtered, treated, and disinfected to remove pathogens and used for flushing toilets.

12.9.12 All planning applications for extensions are to include information on what measures would be installed to improve energy and water efficiency of the existing part of the building. Energy efficiency can be achieved through:

- Installation of loft insulation,
- Cavity or solid wall insulation,
- Draught proofing,
- Efficient heating and hot water system including renewable technologies,
- Energy efficient windows and doors.

12.10 Sustainable Water Management

12.10.1 Sustainable water management requires the management of water resources while considering the needs of present and future users. Water must be managed holistically and with the understanding that:

- Clean water is a finite resource.
- Treated water contains embedded carbon and energy costs.
- Water itself is not a waste material and is a ‘friend not an enemy’.
- Water provides a host of vital benefits and defines landscape character.
- The life-supporting benefits to people and the environment which natural resources provide are known as ecosystem services; for water these include:
    - Flood attenuation
    - Food production
    - Habitat provision
    - Waste management
    - Clean drinking water
    - Provision of amenity & sense of place

Figure 322: Water is key to natural and managed landscapes

12.11 Water Sensitive Urban Design (WSUD)

12.11.1 Water sensitive urban design (WSUD) is a way of integrating sustainable water management into the built environment through consideration, from master-planning through to construction, of all aspects of water, from watercourse resource quality to supply and demand of clean water and rainfall, wastewater, and flood management.

12.11.2 Increased energy efficiency, resource security and resilience to climate change, floods and drought can all be achieved through water sensitive urban design, for example by the provision of grey water reuse features, rainwater harvesting, green, brown, or blue roofs and sustainable drainage (SuDS).

12.12 Sustainable Urban Drainage Systems (SuDS)

12.12.1 SuDS components are designed to work together at the site scale to mimic natural hydrological processes as close to source and surface as possible and can replace traditional sub-surface piping systems for the storage, conveyance and treatment of water, bringing multiple benefits to many stakeholders.

12.12.2 Typical piped urban drainage systems can cause problems of flooding, pollution or damage to the environment by funnelling surface water away from the site as quickly as possible. With large rainfall events this results in greater quantities of surface water downstream, putting pressure on the limited capacities of drainage systems and results in flooding. There is no treatment of pollutants before this surface water enters the sewerage system.

12.12.3 All drainage schemes need to be designed to allow for the impacts of climate change. A well-designed SuDS system can help meet climate change targets through their ability to improve water quality while managing and mitigating both flood risk and surface water runoff created as a result of new development.

12.12.4 SuDS must be considered early, at the masterplanning stage, to ensure drainage is integrated into the scheme from the beginning to design and utilise them in a collaborative way. It allows for SuDS to be aligned with a wide range of other development objectives to bring multifunctional benefits, such as, biodiversity improvements and amenity value.

12.12.5 SuDS interventions are a series of management practices, control structure, strategies, and design solutions to drain surface water both efficiently and sustainably from development sites.

12.12.6 The main principle lies in the treatment and management of rainwater, and technical solutions for transporting surface water, slowing down the runoff before it enters watercourses, storing or reusing water at the source, or allowing water to fall on permeable surface and soak into the ground. Slowing water down also allows for natural processes such as evaporation and infiltration, reducing the need for water management.

12.12.7 There are numerous types of SuDS features and some examples include, attenuation basins, swales, green roofs, wetlands, rain gardens, and permeable paving. These features should be strategically located within a site to create a network of SuDS features that store, slow, reuse and treat surface water before discharging it into the ground, a nearby watercourse or surface water sewer.

12.12.8 Naturalistic SuDS features, such as attenuation basins and swales, mimic the hydrological cycle and should be designed into sites. Poorly integrated SuDS features that do not contribute to the wider biodiversity or amenity value of the scheme are discouraged

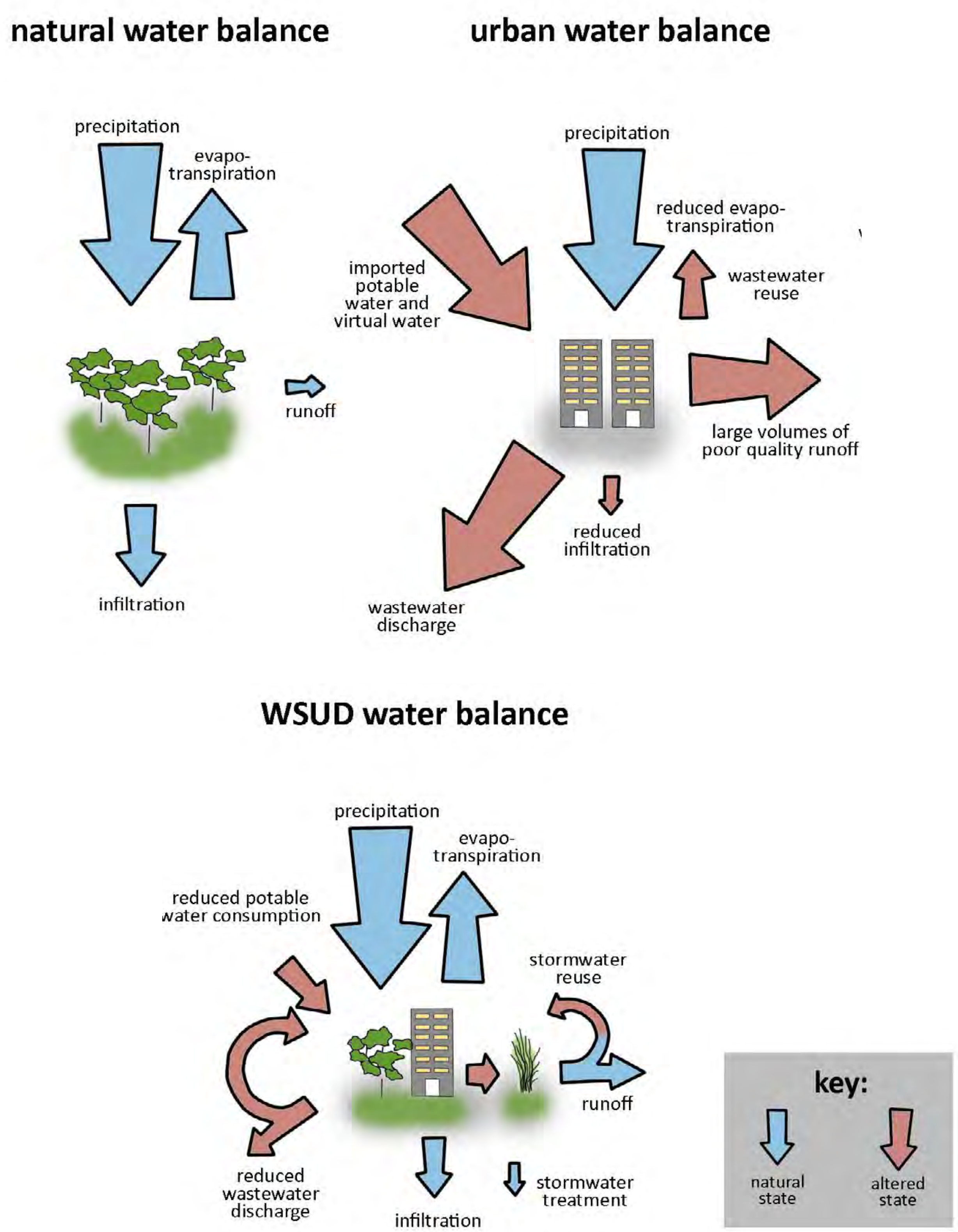

Figure 323: Water sensitive urban design reduces rates of 'altered' (polluted or waste) water and increases infiltration

Figure 324: Examples of SuDs providing a multitude of environmental and visual benefits, Linmere

12.13 Components of SuDS

Living Walls

12.13.1 Living walls will need greater provision of supported watering and nutrition systems based on harvested rainwater or grey water. Planting should be aspect specific and can include creeping herbaceous perennials, ferns, grasses, sedums, small shrubs and even food plants. Living walls should be outside of the public highway.

12.13.2 Additional ledges and bat or bird boxes will add to the cover provision for wildlife and native species such as ivy, interspersed with flowering plants, will attract pollinators and insects. Noise reduction and airborne pollution control can also be achieved. Both components can provide informal amenity, green space, and educational benefits, as places to gather and meet, or even harvest food produce.

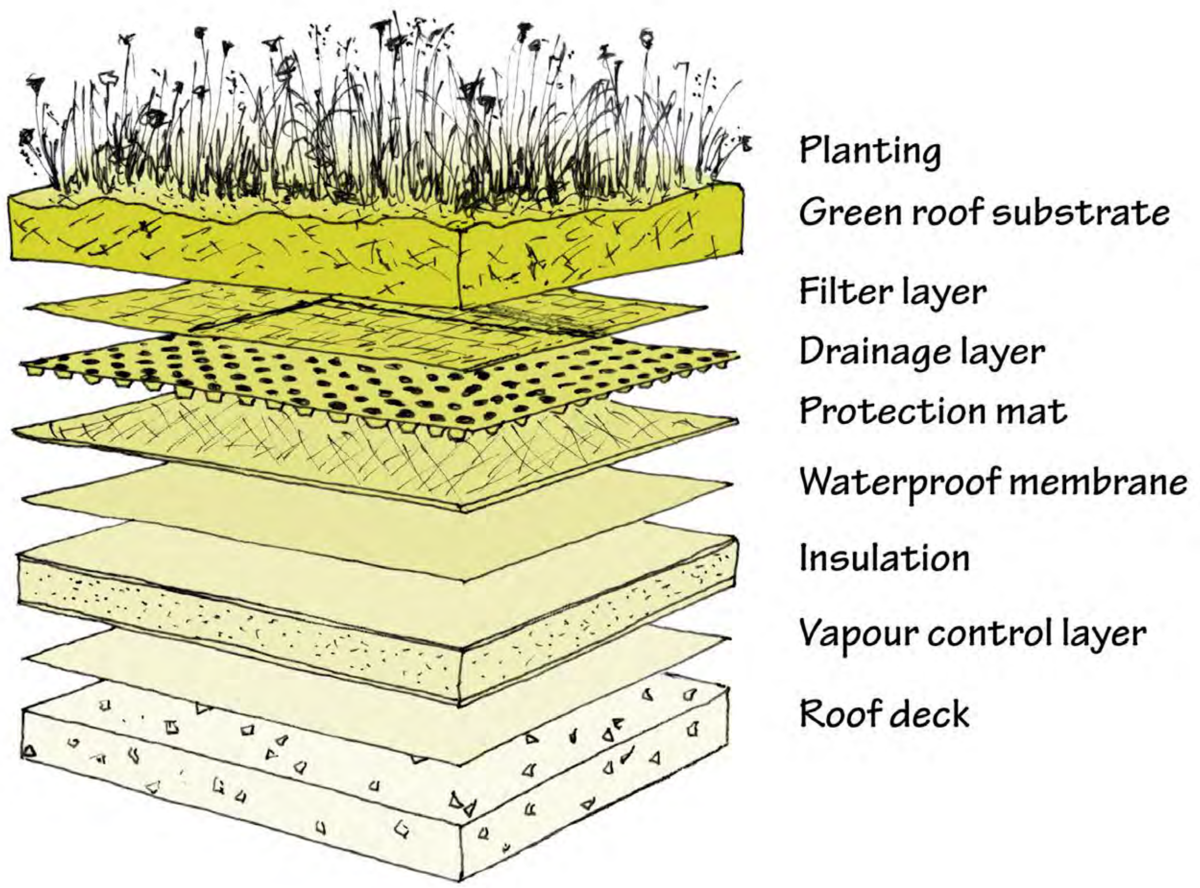

Figure 325: Green roof construction

Rain Gardens

12.13.3 These shallow depressions in free-draining soils should be planted with inundation-resistant species; they can be engineered where soils do not naturally suit them and integrated into hard-standing areas. Flowering plants and 'insect hotels' can provide good 'stepping stone' habitats. Located near dwellings, these features can provide aesthetically pleasing green space for relaxation and enjoyment and connect fragmented habitats while providing food for birds.

Figure 326: Rain Garden, Queensway

Figure 327: Rain Garden, Dunstable Town centre, winner of the Sustainable Gardening Award at the Britain in Bloom Awards 2022

Figure 328: Rain Garden, Dunstable Town centre, winner of the Sustainable Gardening Award at the Britain in Bloom Awards 2022

Permeable Paving

12.13.4 Surfaces which allow water to drain through gaps between blocks can either permit infiltration or collect water in a chamber. This dual use reduces land take and ensures useful, dry amenity ground after storm events. The space between blocks should be filled with a fine gravel of appropriate technical specification and seeded with resilient, fragrant pollinator species.

Case Study: Lamb Drove, Cambourne, Cambs.

12.13.5 Lamb Drove, Cambourne uses source control including permeable paving and under-drained swales within the development envelope to ensure a flow of clean water to surface SuDS featuring wildflower seeding and plug planting which have established slowly over time. Structural diversity within the grassed areas is encouraging colonisation by local native plants and animals and is being fully monitored.

Filter Strips

12.13.6 Filter strips consist of vegetated gentle slopes which intercept sheet flow run-off and direct it into another SuDS unit such as a swale. These can be seeded with wildflower meadow species and sculpted with earth tussocks for significant biodiversity gains. Strips can be attractive green spaces for informal recreation and picnics etc, with scope for educational boards, benches and tables. Mowing schedules must be assured with a 100 millimetre minimum sward in a 3-year mosaic rotation pattern preferred.

Bio-retention Areas

12.13.7 Bio-retention areas are landscaped shallow depressions adjacent to hardstanding which are under-engineered with sands and can be planted with both natives and non-invasive ornamentals at agreed densities. Good for green space urban areas, these features can be planted with pollen-rich natives or ornamentals and provide food and cover for insects and foraging birds.

Swales/Rills

12.13.8 These conveyance features are typical SuDS components that link Source and Site Control measures. Swales are wide, shallow grassed channels that slow water and can allow for infiltration; or be 'under-drain' engineered if necessary to form a dry swale. Small check dams can create shallow pools for mini-wetland environments and limit erosion.

12.13.9 Architectural hard landscaping can also be integrated in urban areas to form a rill, or otherwise associated with raingarden basins and public open space.

12.13.10 Both features can afford good amenity such with seating, interpretation boards or more formal recreation provision. Slopes must be no greater than 1:3 and can be asymmetric. Commercial pre-seeded wildflower turf can allow near-immediate water treatment but plug planting of native plants with grass and flower seeding is cheaper; either way a closed sward must be ensured before connection. To allow free flow from hard surfaces and avoid silting, turf must be designed to be 20-25 millimetres below adjacent kerbs at final levels. Wildflower planting needs specific maintenance and cutting times, along with thrashing to allow the seeds to fall back onto the land.

Ponds, Detention Basins & Retention Basins with associated wetlands

12.13.11 These site Control measures include Urban Ponds which can be naturalistic or form part of hard landscaping. Appropriate planting can attract wildlife in a community setting. In terms of amenity and community engagement, research suggests that residents value ponds more greatly than swales, particularly where ponds are attractive to wildlife. Ponds and wet basins should therefore be prioritised where appropriate.

Detention Basins

12.13.12 Detention basins are vegetated depressions which can hold water for different periods of time and multiples with varying profiles are preferred. Often very adaptable, these can be planted with trees or used for play or interpretative nature walks. Shelves and shallow gradients with convoluted edges are best for wildlife, as is planting with species rich grass and wildflowers. Log piles and spoil heaps can help with varied topography and refugia.

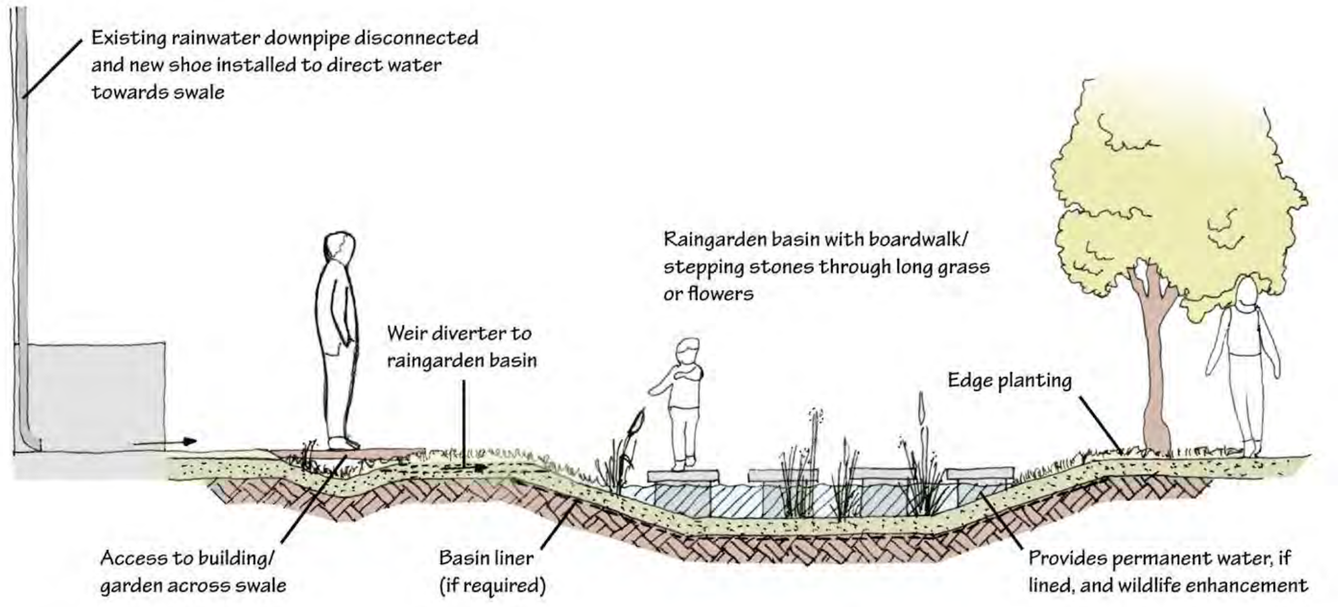

Figure 329: Swale and rain garden in public open space

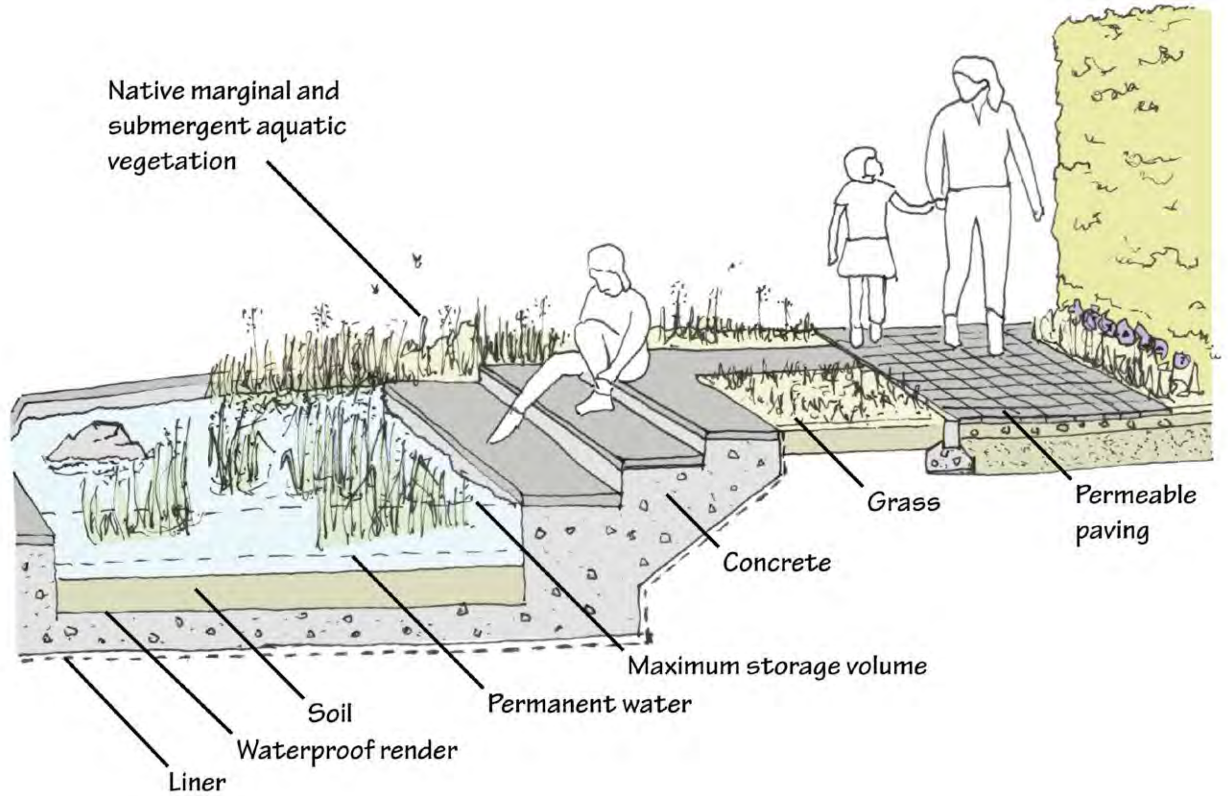

Figure 330: Urban Pond diagram

Retention Basins and Wetlands

12.13.13 These final storage/treatment features are permanently wet so true wetland habitats can be considered, including planted wet woodlands. Excellent amenity can be ensured with hides, trails, ephemeral pools, dipping platforms and interpretive boards, along with potential for grazing animals or log pile refugia where a full complement of invertebrate and vertebrate species can be supported and integrated into local and regional strategies etc. Shallow undulating sides should be ensured, with flower-rich grass buffers and filter strips. Natural succession of local flora and fauna should be prioritised in wetland habitats, though some ornamental planting can be acceptable with the appropriate density and management options in place.

Figure 331: Features of a typical wetland

Naturalistic Ponds

12.13.14 Depths of 25 centimetres, 10 centimetres or even 5 centimetres are very valuable for wildlife, and ensure high oxygen levels for pollution breakdown. Anything deeper than 0.6 metres is sub-optimal for diversity as well as risk management. Very shallow gradients at pond edges are good for seasonally inundated plant species which are more tolerant of pollutants.

Figure 332: Eventual natural succession is the ideal; note the clarity of the water in this pond (courtesy of Andre Douglas)

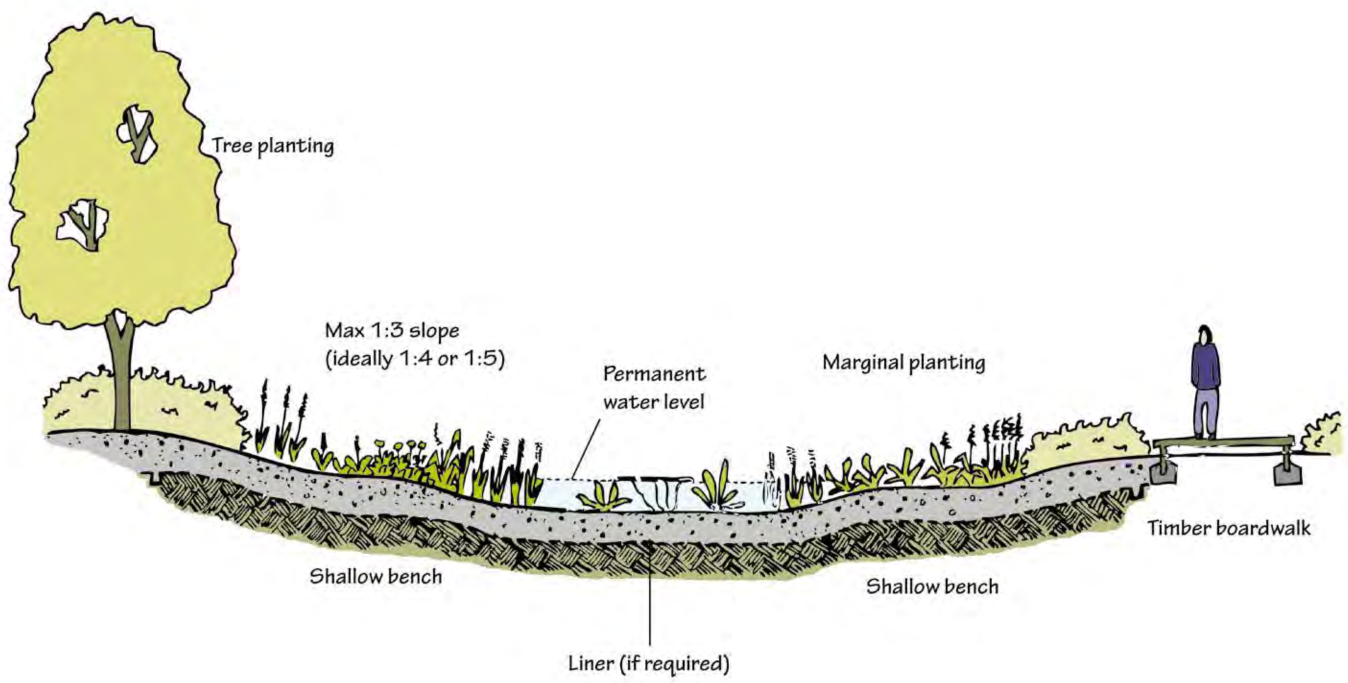

Figure 333: Section through a naturalistic pond

12.13.15 A shallow 'wet bench', along with a 'dry bench' should be designed into pond profiles for safety, with a 1:3 gradient an absolute maximum. Toddler fences of some 40 centimetres height can be considered in vulnerable cases, but access and visibility should be assured, with benches and trails between connected ponds maximising amenity. A 5–10-year maintenance programme is essential.

12.13.16 Pond floors should also be 'hummocky', layered with some dead wood and generally, an over-tidy appearance for ponds should be avoided. Surrounding trees and wet woodlands/scrub provide tannins which suppress algal blooms, which are inevitable in the first year of most pond's lives. A mosaic of margin plant species should be encouraged at the margins, and partial clearance of surface vegetation in a rotating pattern should be agreed in advance, with dewatered material piled up nearby as refugia for e.g. grass snakes.

12.14 Design Considerations

Masterplan Scale

12.14.1 Consider water demand/efficiency, space provision, river corridors, habitats, soils/geology, landscape, constraints, and opportunities e.g. Environment Agency, Internal Drainage Boards, Water & Sewerage Companies, local Flood Strategies, River Basin Management Plans and Biodiversity/Habitat Action Plans etc.

On Site

12.14.2 Consider existing natural drainage patterns, runoff rates and a storm-water train of features sensitive to amenity needs, 'place-making' and landscape character. Multi-functional use areas should be identified, and constraints explored. Making space for SuDS at the design stage is key as it can determine the volume (m³) of attenuation and equivalent area (m²) for open SuDS (above ground). If space is not allocated at an early stage, it will be hard to retrofit SuDS into the layout and will result in a more complicated application process. SuDS are an important factor in determining acceptable densities of housing.

12.14.3 The drainage pattern of the site should be assessed based on the sites topography and geology, surface water management trains should be employed to inform designs for development at the masterplanning stages and form a key framework within the development proposals.

12.14.4 Refer to section 3 of the Central Bedfordshire Sustainable Drainage Guidance (2015), and the Council's surface water advice note (2021) for further guidance.

Water Cleansing

12.14.5 As the stormwater management train progresses, each component should incrementally reduce the pollutant load of the water it carries, by the settlement of silt particles and the action of biological agents and UV light; potential for integration into the landscape and enhancement of habitat and biodiversity provision thereby increases.

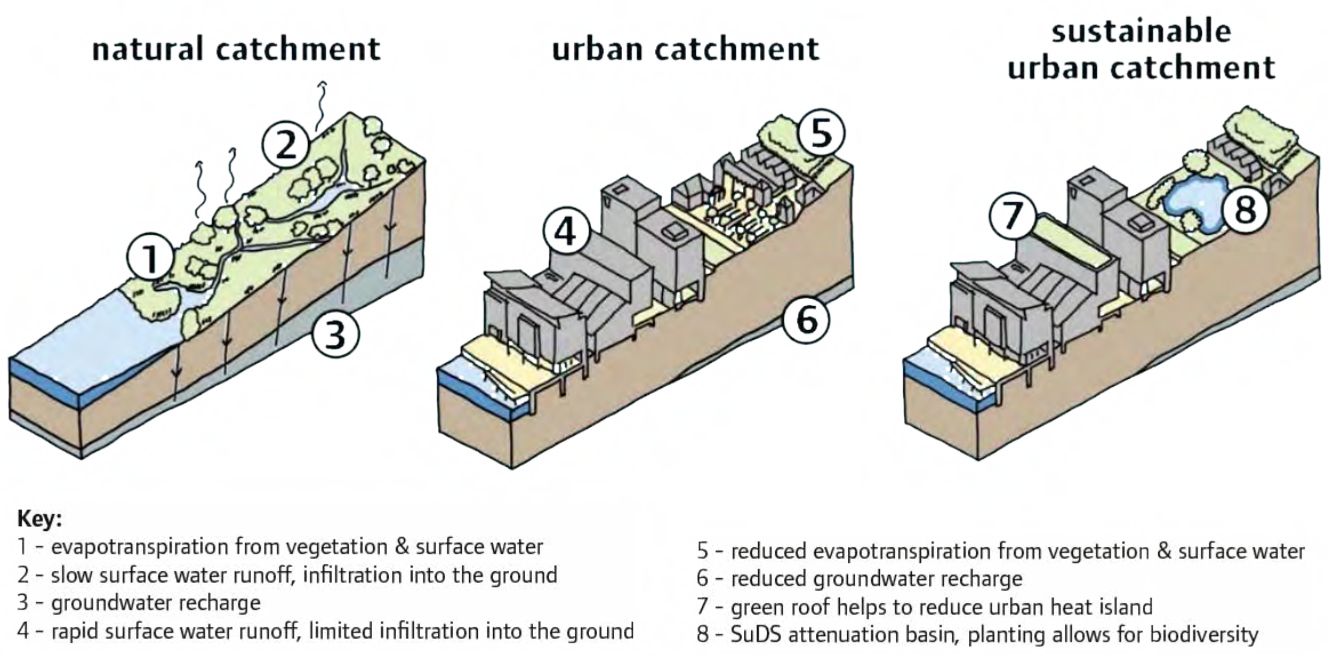

Figure 334: The typical urban relationship with water is to view it as a nuisance or vehicle for waste

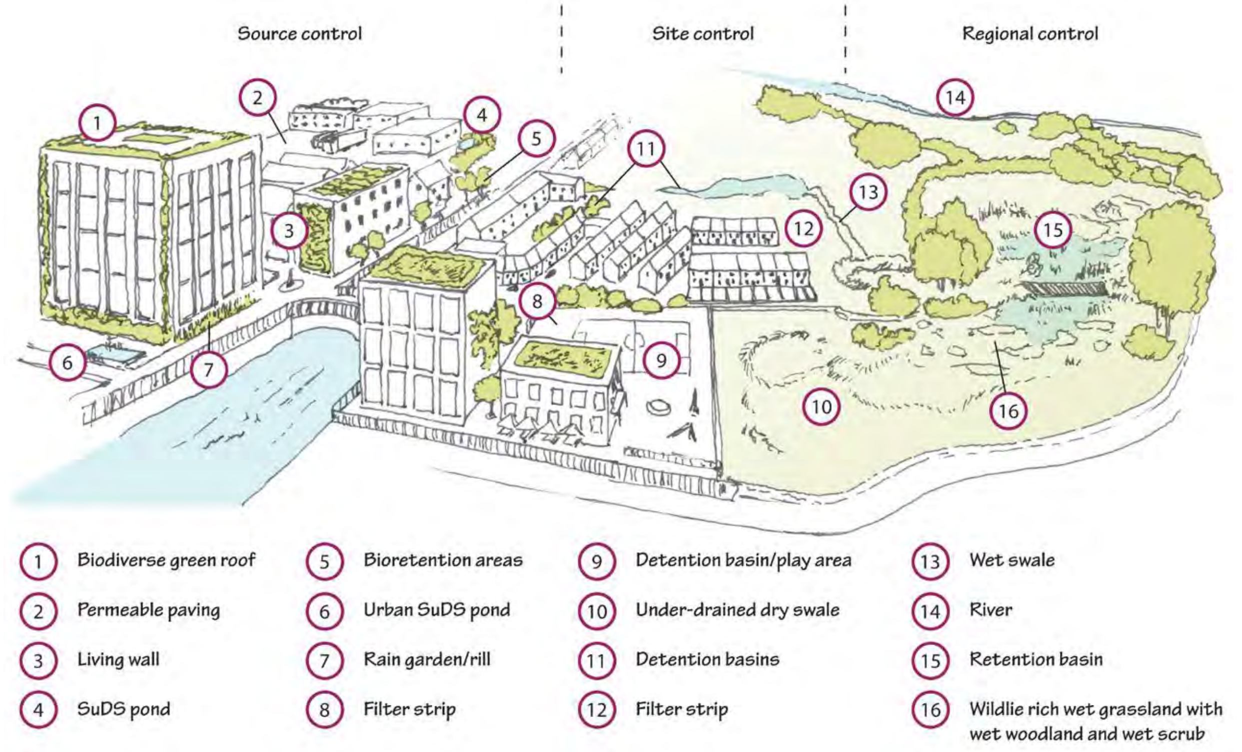

Figure 335: Components of a SuDS system - features are highly adaptable to the urban environment

12.15 SuDS: Step-by-step

12.15.1 **Step 1:** For Greenfield sites SuDS should be designed to mimic natural 'greenfield' site runoff rates. For Brownfield sites, SuDS should also ideally be designed to mimic the greenfield rates, or at minimum the existing rate, plus a 40% additional climate change factor.

12.15.2 **Step 2:** All run-off rates must be calculated according to overall site area, area of impermeable surfaces, rainfall rates and geology type. Predicted storm durations and scale, up to 1 in 100-year probability (including anticipated climate change adjustments over a system's lifetime), must be considered as well as the permeability of the ground and the height of the water table. Infiltration SuDS must maintain the quality and utility of controlled waters and not present a pathway for contamination.

12.15.3 **Step 3:** Following Source Control SuDS should allow water to filter into, or infiltrate, the ground where possible. Impermeable clay or high-water table constraints should be designed around existing drainage patterns or 'blue and green corridors' identified.

12.15.4 **Step 4:** Species rich green roofs, living walls and permeable pavements should replace traditional hard surfaces to significantly assist in achieving greenfield run-off rates and ecological gains, which should refer to the Biodiversity Action Plan and Opportunity Areas.

12.15.5 **Step 5:** Where infiltration is insufficient to reduce run-off rates sufficiently Site Control is required, swales/rills allow conveyance to 'Final Treatment' ponds, detention/retention basins/wetlands for Regional Control. Consider landscape character of water corridors.

12.15.6 **Step 6:** At surface SuDS such as swales or rain gardens must be designed for habitat creation and amenity provision, with 'place-making' and locally responsive visual attractiveness ensured. Maintenance, safety and integrity design and provisions should be considered for the lifetime of a system and negotiated with the Local Authority and others as part of a costed and documented handover.

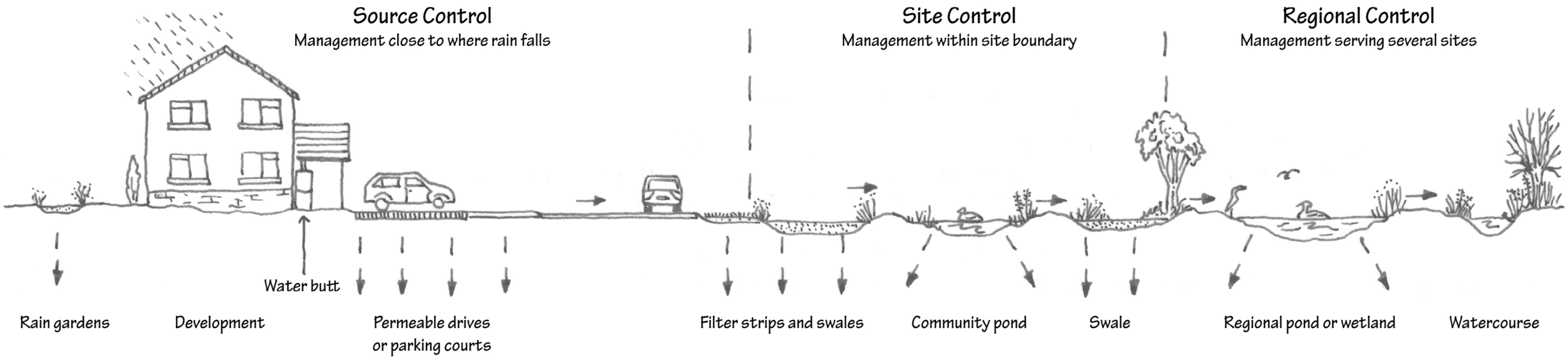

Figure 336: SUDS management train/conveyance gradient

12.16 Habitat and Species Considerations

12.16.1 Bedfordshire Biodiversity Action Plan (BAP) priority habitats which SuDS can enhance include:

- Hedgerows
- Wet woodland
- Reedbeds
- Ponds
- Lowland meadows
- Floodplain grazing marsh

12.16.2 The support and establishment of the above may provide opportunities for Bedfordshire's many endangered species of plants including Stoneworts, Sphagnum and Listed/Priority species such as Crested Cow-wheat, Fly Orchid, Tubular Water dropwort and Greater Water-parsnip.

12.16.3 Protected mammals like the otter and water vole, reptiles like the adder, grass snake, common lizard, slow worm, and amphibians such as the great crested newt and common toad may in time colonise SuDS which will be a major contribution to enhancing the ecology of the area.

12.16.4 Established sedges and reeds may also attract birds of a protected status such as the sedge warbler and reed bunting, but many other desirable creatures will utilise SuDS in some way.

Figure 337: (top) SuDS Pond at Stratton, Central Bedfordshire, hosting good bird and invertebrate populations
Figure 338: (bottom left) Sedge Warbler
Figure 339: (bottom right) Reed Bunting

12.17 Designing SuDS - Dealing Confidently with Risks

12.17.1 Risks are associated with all activities in the home, workplace, or public domain. Many are unavoidable, such as hazards from road traffic, but are deemed socially acceptable because of the benefits that arise from the activity. Effective safety is about mitigating significant risks. It is not about avoidance of all risks. Attempting to avoid all risks is now recognised as counter-productive for the environment and our enjoyment of it. The multiple benefits from SuDS make the very small residual risks after key design considerations worthwhile to society.

12.17.2 The biodiversity and amenity goals of SuDS are completely compatible with creating safe and easily managed wet features using:

- A series of earth 'benches' on the approach to a pond provide safe vantage points and opportunities to stop and consider safety.
- Gentle (less than 1:3) sloping edges and dry and wet benches which allow for safe entry and exit of shallow pools and other wet features.
- Maximum depths designed to be under 1 metre.
- 40 centimetre 'toddler fences' where very young children may access standing open water.

12.17.3 Any hard surfaces or engineered control points should be assessed for safety, particularly slips and trips, with the latter positioned at least 1 metre back from the water edge to reduce risk from falls near open water.

12.17.4 Sustainable drainage (SuDS) should not be sited near to children's play areas due to safety concerns. Play areas should be at least 30 metres from water features, including SuDS schemes. Where separation cannot be achieved, developers will be responsible for providing an independent risk assessment at Pre-Application, Full Application, or Outline Application stage (by RoSPA or other independent inspection company) to inform the design of the play area and its environs.

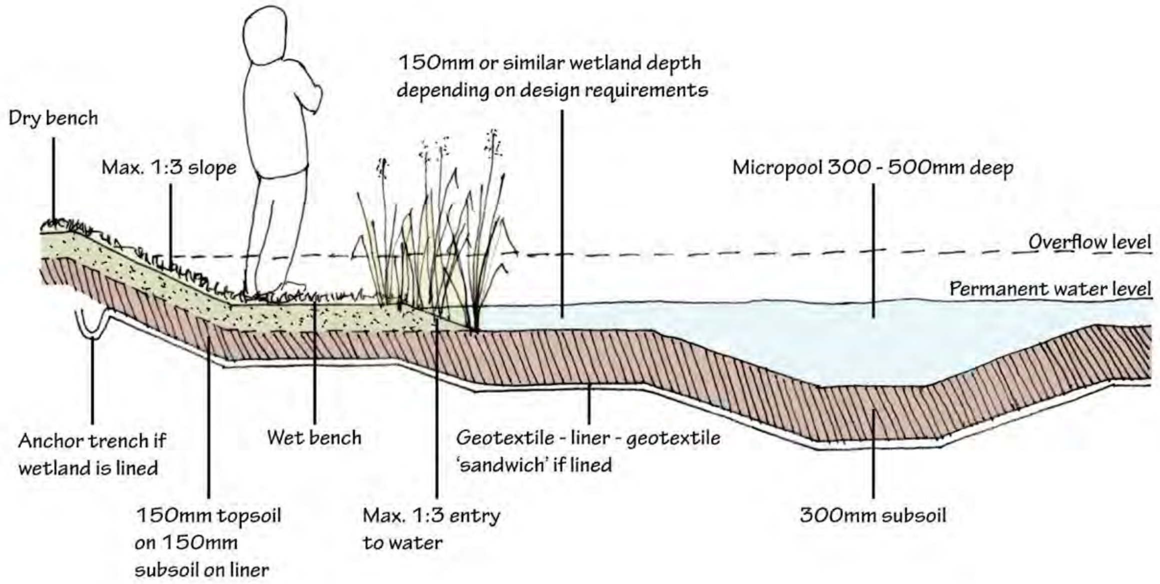

Figure 340: Mitigating the risks associated with SuDS

12.18 Safeguarding the Environment and Development from Pollution

12.18.1 Pollution can cause adverse health risks, damage the environment, and interfere with amenity. It can also adversely affect neighbouring land uses, cause long term contamination, and hinder regeneration. The aim is that acceptable balances are reached in terms of pollution to achieve more sustainable workplaces, homes, and recreation areas. Trade-offs and balances might be agreed to achieve acceptable targets across the following pollution types:

- Noise and Vibration
- Contaminated Land
- Air Quality
- Light Pollution
- Water Pollution

12.18.2 All proposals for new development must have regard to current national guidance as well as the Council's Design Guide, Contaminated Land Strategy, Air Quality and Emissions Planning Guidance and Air Quality Action Plans in accordance with Policy CC8 Pollution and Land Instability of the CBC Local Plan (2015-2035).

12.19 Noise and Vibration

Noise Policy Statement for England

12.19.1 The overarching framework for national noise policy is the Noise Policy Statement for England (NPSE). The vision identified in the policy is to:

'Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.'

12.19.2 The aims of the policy are:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life.
- Mitigate and minimise adverse impacts on health and quality of life.
- Where possible, contribute to the improvement of health and quality of life.

12.19.3 The NPSE introduces the concept of 'adverse effects' to the assessment of noise impacts:

- NOEL – No Observed Effect Level: This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL – Lowest Observed Adverse Effect Level: This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level: This is the level above which significant adverse effects on health and quality of life occur.

12.19.4 Noise effect levels are not set at fixed figures but vary depending on the context and character of the noise and site-specific factors which may impact on the severity of the effect. The NPSE states:

'It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.'

How can we Limit Noise Pollution in new development?

12.19.5 In terms of limiting noise from external sources the primary approach is to physically separate conflicting land uses. However, this is not always possible, nor is the ability to maximise the layout and orientation of the design to avoid further pollution. Therefore, the applicant team should focus on mitigating the noise pollution on site through a number of methods which include (but are not limited to), glazing solutions and ventilation solutions.

12.19.6 The layout and placement of rooms within the building should be considered at an early stage in the design process to limit the impact of noise on sensitive rooms such as bedrooms and living rooms. (i.e. limit the transmission of airborne and impact sound from common areas, place bedrooms next to and above bedrooms and finally ensure that walls between bedrooms and the living room and WCs provide adequate resistance to the passage of sound).

12.19.7 New builds should exceed the minimum standards set out in Building Regulations Part E.

When is a Noise Impact Assessment Required?

12.19.8 A Noise Impact Assessment is to be undertaken and provided before an application can be determined if the proposed development is noise sensitive and is close to any existing noise source such as:

- Transportation, e.g. major roads, railways and airports;
- Commercial & Leisure premises;
- Industrial Premises; or
- Culturally significant premises.

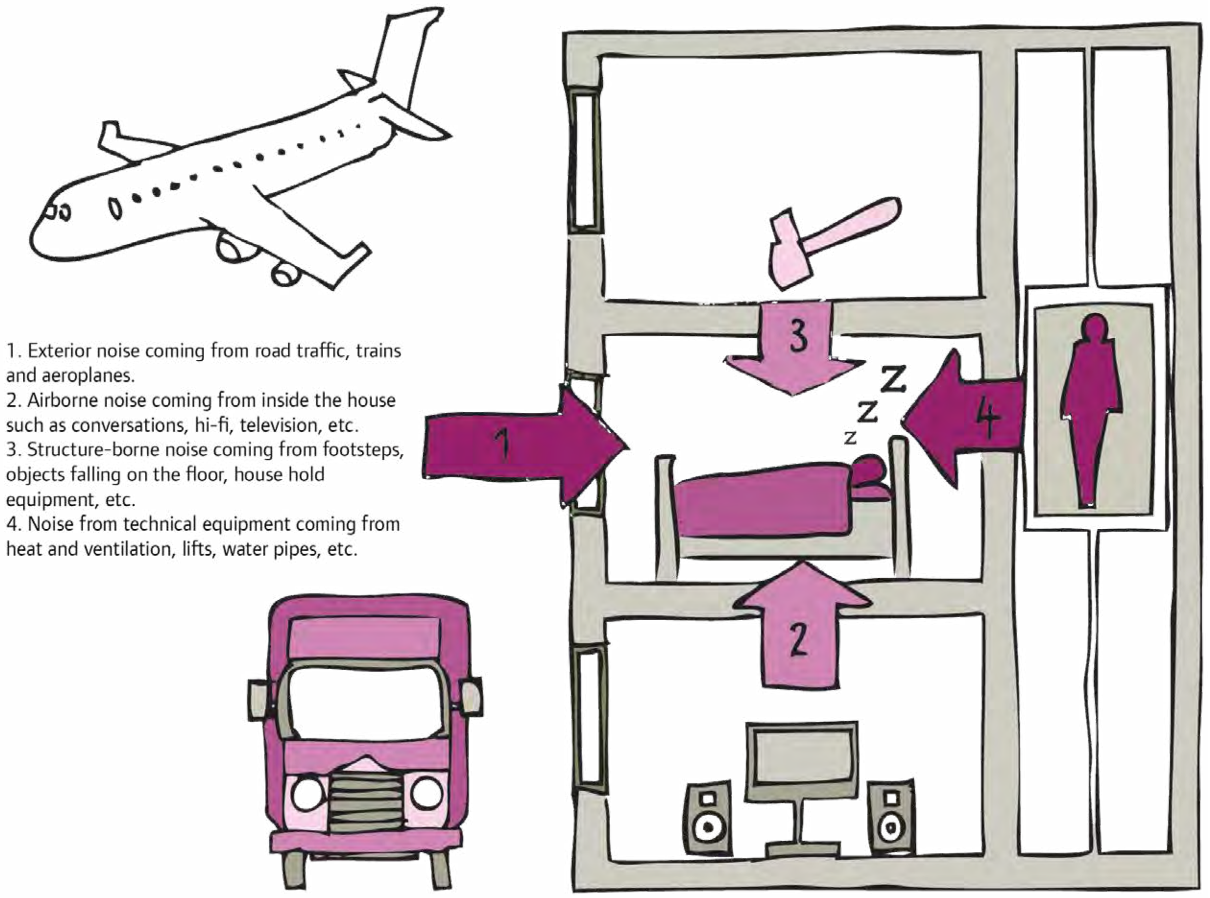

Figure 341: Noise Impact Assessment noise considerations

12.19.9 Noise impact assessments will also be necessary if the proposed development is noise creating and is located close to existing (or committed) noise sensitive receptors. Any applications are also looked at in terms of the cumulative impact in the context of committed developments. Noise creating developments include, but are not limited to:

- Transportation, major roads, railways and airports;
- Industrial Premises, including site operations and associated plant;
- Commercial and agricultural premises;
- Entertainment and licensed Premises with regulated and entertainment and any associated plant;
- Educational establishments;
- Construction sites that are large and are expected to continue for many months;
- Mineral Extraction sites;
- Outdoor sports and recreation facilities e.g. Multi-Use Games areas (MUGAs), shooting ranges/ sites, motor sport sites etc;
- Waste sites;
- Wind Turbines.

Acoustic Report Requirements

12.19.10 A noise impact assessment needs to be written by or signed off by a suitably qualified professional. The noise impact assessment should include the following:

- Details of the proposed development including details of any nearby receptors;
- Details of any nearby land uses, in particular any noise sources;
- These details should include type and times of work;
- Details of the equipment employed in the assessment;
- Details of the methodology used, which should include reference to appropriate planning guidance, appropriate British Standards and other relevant National Guidance or codes of practice;
- Details of any assumptions made;
- Details of the results of the assessment; and
- Details of any mitigation measures recommended that would result in any noise impacts being acceptable.

12.19.11 Where the impact of the noise may be significant and/or where the effectiveness of the mitigation may be in doubt, post completion testing may be required to demonstrate the effectiveness of any proposed mitigation. Any applications are also looked at in terms of the cumulative impact in the context of committed developments.

12.19.12 Details of British Standards and national guidance or codes of practice should be used in any acoustic assessment along with Central Bedfordshire Council standards. The Council must be satisfied that the applicant has considered the issue of noise appropriately and early consultation with the authority is strongly recommended. The table below sets out the noise standards and thresholds by development type.

Table 15: Noise standards and thresholds by development type

Development Category	Type of Development	Relevant Standards	Recommended noise thresholds (dB) at Sensitive receptors
All types of development	This standard is relevant to all categories of noise assessment for any development.	ISO 9613:1996 Parts 1, 2 & 3	N/A
Residential	Residential: A range of standards/ guidance etc. may be required depending on nearby land uses.	The standards/guidance used for noise reports will depend on neighbouring land uses (or proposed if a mixed scheme). For transportation noise PropPG:2017 and BS8233:2014 would be applicable. Other sources would require assessment using the documents referred to in the categories below.	Please see relevant Development category.

Development Category	Type of Development	Relevant Standards	Recommended noise thresholds (dB) at Sensitive receptors
Construction sites	All construction sites	BS5228-1: 2009+A1: 2014 BS6472 2008: Part 1 & 2 BS7385	Apply a methodology described in Annex E of BS5228-1:2009+A1: 2014.
Industrial & and commercial sites and plant	Factories, industrial premises, fixed installations, or sources of an industrial nature in commercial premises	BS4142: 2014 BS8233: 2014 WHO (2009) DMRB EMAQ: 2022	The rating level of the plant shall not exceed existing background levels. Where background levels are very low (i.e., less than 30dB LA90) or best available techniques are to be applied to mitigate the noise a more permissive rating level may be applied, on a case-by-case basis, subject to discussions with and approval by the LPA.
Mineral sites	All mineral extraction sites	PPG Minerals: 2014	Daytime (07.00 – 19.00): <10dB above background, up to a maximum of 55 dB LAeq, 1h (freefield). Daytime (07.00 – 19.00): < 70 dB LAeq, 1h (freefield) up to 8 weeks per year. Exceptional circumstances: Night (19.00 – 07.00): 42 dB LAeq,1h (freefield).
Residential development & Residential Care Homes	New houses, extensions, flats and house conversions that require planning permission	BS8233:2014 WHO (2009) Approved Document E: 2003	Apply the indoor ambient noise levels in Table 4 of BS8233: 2014. External areas <50dB LAeq, T, with <55dB LAeq, T acceptable in noisier environments. >55dB LAeq, T would only be considered as acceptable in exceptional circumstances subject to the development having been designed to achieve lowest practical levels. Note: It will be expected that the external areas will achieve <50 dB LAeq, T. Any deviation from this requirement may be applied, on a case-by-case basis, subject to discussions with and approval by the LPA
Schools	New build or extensions/ refurbishments that require planning permission	BB93 (2015)	Apply Performance Standards found in Section 1 of BB93 (2015).
Outdoor sports & recreation facilities	Multi-use games areas, all weather pitches, stadia, leisure centres, clay target shooting, skateparks & off-road motorcycle sports	BS 8233:2014 WHO (2009)	Apply specific Code of Practice for the activity in question. If no Code of Practice is suitable, apply the indoor ambient noise levels in Table 4 of BS8233: 2014 and <50dB LAeq, T for External Areas.
Transport	Rail (new & altered) Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996	CRN 1995 BS6472 2008: Parts 1 & 2 BS7385 WHO (2009)	Apply the requirements of the Regulations & WHOs night noise guideline (NNG) of 40 dBL night, outside.
Transport	Airports	BS8233:2014 WHO (2009)	Apply the indoor ambient noise levels in Table 4 of BS8233: 2014 and <50dB LAeq, T for External Areas.
Waste Sites	All waste sites, including waste-water treatment sites	BS 4142:2014 IPPC H3 (Part 2)	The rating level of the plant shall not exceed existing background levels. Where background levels are very low (i.e., less than 30dB LA90) or best available techniques are to be applied to mitigate the noise a more permissive rating level may be applied, on a case-by-case basis, subject to discussions with and approval by the LPA.
Wind turbines (NB: due to concerns with ETSU-R-97 please discuss the appropriate thresholds with the LPA as early as possible)	Single Turbines	ETSU-R-97 WHO (2009)	35dB L90, 10 mins (freefield)
Wind turbines (NB: due to concerns with ETSU-R-97 please discuss the appropriate thresholds with the LPA as early as possible)	Wind Farms	ETSU-R-97 WHO (2009)	Daytime (07.00 – 23.00): <5dB above background. Daytime (07.00 – 23.00) in low noise environments (<30 dB L90, 10mins (freefield)): 35dB L90, 10mins (freefield). Night (23.00 – 07.00): 43dB L90, 10mins (freefield).

12.20 Contaminated Land

12.20.1 Central Bedfordshire has a varied industrial history, and many sites now pose a threat to the environment and the health of humans, animals, water resources and plants. However, there is a growing need to reclaim and redevelop these sites.

Land Contamination and The Planning Process

12.20.2 The developer and Environmental Consultant will need to assess the potential risks from contamination based on local circumstances, the historical and current use of a site relative to any proposed change of use. This should normally be done before formal planning permission is given for the development. In some circumstances planning permission may be granted without the submission of a contaminated land investigation; however, the planning permission may stipulate certain conditions that have to be discharged prior to any work taking place.

12.20.3 The Council's standard Contaminated Land condition requires an investigation of whether there is any land contamination and, if necessary, requires the development of a strategy to deal with it. If potential risks are identified prior to any demolition or excavation works, a Phase 1 desk study, Phase 2 Site Investigation and Phase 3 Remediation strategy must be submitted to the Council for agreement. The remediation strategy should demonstrate the proposal based on the end use (i.e., commercial, residential, hardstanding, communal garden, food growing area etc.) is sufficient to mitigate risks to human health and the environment.

12.20.4 Upon completion of the development, the submission and approval of a validation report will be required, confirming the agreed remediation strategy has been implemented and how any unidentified issues were addressed during the course of the work.

12.20.5 All investigations should be in accordance with relevant guidance including: BS10175:2011+ A1:2013 Code of Practice for the Investigation of Potentially Contaminated Sites and The Environment Agency Land Contamination Risk Management (LCRM) Land contamination risk management (LCRM).

12.20.6 Reference should be made to the Environment Agency's technical guidance on how to investigate, assess and manage the risks of contaminated land.

Soils and Contaminated Land

12.20.7 A soil management plan is an important part of ensuring soil sustainability during construction projects. Without a soil management plan there is a risk of losing, damaging or contaminating valuable soil resources, whether the soil will be retained for future landscaping on-site, or used or sold off-site. The Construction Code of Practice for the Sustainable Use of Soils on Construction Sites provides relevant advice on the use of soil in construction projects.

12.21 Air Quality

12.21.1 Air Quality is a material planning consideration, and the Council will expect developers to demonstrate measures put in place to protect local air quality as part of any sustainability strategy for a proposed development. The Council has declared 3 Air Quality Management Areas (AQMAs) at the following locations:

- Dunstable town centre
- Ampthill town centre
- Sandy adjacent to A1

12.21.2 Further information on our AQMAs and related AIR Quality Reports can be found on the Council's website.

12.21.3 Some development proposals will require an Air Quality Impact Assessment (AQIA) to be submitted with the formal planning application. The Council have produced a guidance document to assist developers in determining whether their development will require an AQIA to be undertaken.

12.21.4 Modelling scenarios need to present a realistic assessment of the future air quality situation in the locality of the development, considering the cumulative effect of all developments where relevant.

Key Aims for Air Quality Assessments

12.21.5 The key aims for air quality assessments are:

- To prevent people from being exposed to unacceptable levels of air pollution
- To prevent the need to designate new Air Quality Management Areas (AQMAs)
- To prevent an increase in pollution, particularly within AQMAs

12.21.6 Where an assessment indicates a development is likely to have a significant impact on local air quality, the Council will seek to secure mitigation to reduce the impact of the development and the significance of air quality impacts. Examples of mitigation measures which might be considered include (but are not limited to):

- Redesign to eliminate / reduce exposure
- Traffic reduction / management measures
- Car parking and traffic management
- Incentives for low emission vehicles
- Robust Travel Plans aimed at encouraging modal shift to low carbon transport modes
- Financial contributions to Air Quality Action Planning and monitoring of emissions or Low Emission Strategy Implementation secured through s.106 agreements

12.21.7 Air Quality considerations are not only isolated to those prescribed in the Governments' Air Quality Strategy which relate primarily to transport as prescribed above. Wider considerations need to be given to industrial and commercial processes and issues to be considered will include odour/fumes and gases emitted from these sources. The Council will also require appropriate assessments in accordance with the relevant technical guidance to be submitted with the application to demonstrate that amenity is protected.

12.22 Light Pollution

12.22.1 The problems and issues associated with the provision of outdoor lighting are becoming more widely recognised as a source of pollution. Obtrusive lighting can be damaging and be both an environmental and intrusive visual nuisance arising from glare and light spillage. Light pollution in the countryside can lead to a suburban feel, losing the sense of distinctiveness associated with the countryside.

12.22.2 Whilst the importance of artificial lighting for security, pedestrian, and traffic safety, in promoting access to sport and recreation and for enhancing historic and architecturally important buildings is recognised, lighting can have a marked impact on the night-time scene, significantly changing the character of the locality and altering wildlife and ecological patterns. On the widest scale, dark skies and views of the stars are now becoming a thing of the past except in the most remote areas.

12.22.3 For development proposals that involve the introduction of external artificial lighting (including external signage), the Council may require a Light Impact Assessment (LIA) to be provided before an application can be determined.

Key Aims for Light Assessments to prevent

12.22.4 The key aims for Light Assessments to prevent are:

- Sky glow -the orange glow visible around urban areas resulting from the scattering of artificial light by dust particles and water droplets in the sky
- Glare - the uncomfortable brightness of a light source when viewed against a dark sky
- Light trespass - light spillage beyond the boundary of the property on which a light is located

Key Considerations

12.22.5 The key considerations are:

- Light Direction and extent/levels of illumination (i.e. lux levels and contour maps)
- Hours of Use
- Design of Lighting
- Context (Historic for example)
- Purpose (enhancing buildings, for sport etc.)

12.22.6 Further guidance on controlling impacts from Artificial light sources can be found in Guidance Note 1 for the reduction of obtrusive light 2021 | Institution of Lighting Professionals (theilp.org.uk).

12.23 Water Pollution

12.23.1 Water pollution occurs when harmful substances, often chemicals or microorganisms, contaminate a stream, river, lake, ocean, aquifer, or other body of water, degrading water quality and rendering it toxic to people or the environment. The most effective way to prevent water pollution in new and existing developments it through well-designed drainage system.

12.23.2 The level of pollution found within surface water runoff will depend on the nature of the development from which it arises, the time since the last rainfall event, and the duration and intensity of rainfall. An appropriate 'train' of SuDS components should be installed to reduce the risk of pollutants entering watercourses and groundwater. The suitability of different SuDS components within a well-designed treatment train can be found within table 26.7 of The CIRIA SuDS Manual C753. This should incorporate treatment from all sources of pollution, including rooftops. A well planned, and designed SuDS network can be cost effective when the appropriate conveyance, infiltration, and attenuation work harmoniously with surface water treatment.