Milton Keynes Green Infrastructure Strategy

Milton Keynes Council

March 2018

Quality information

Prepared by	Checked by	Approved by
Emma van der Velde Landscape Architect	Michael Henderson Regional Director, Sustainable Development	

Revision History

Revision	Revision date	Details	Authorized	Name	Position

Distribution List

# Hard Copies	PDF Required	Association / Company Name

Prepared for:

Milton Keynes Council

Prepared by:

Michael Henderson
Regional Director, Sustainable Development

AECOM Limited
Aldgate Tower
2 Leman Street
London
E1 8FA
aecom.com

Table of Contents

Figures

1. Introduction

Milton Keynes (MK) has an extensive network of green (vegetated) and blue (water) infrastructure. These spaces and features provide a wealth of social, economic and environmental benefits to our borough. Our extensive areas retain many historic landscape features and support numerous natural systems, agriculture and outdoor pursuits. Within the city, green infrastructure (GI) was embedded from the outset and has created an almost unique modern urban landscape character. Initially much of our strategic green and blue infrastructure network was designed to mitigate flood risk and enable the building of the city. These spaces now provides an extensive recreation resource, fundamental to our communities' health and wellbeing as well as creating an attractive setting that attracts investment, supports community cohesion and provides a space for biodiversity.

We refer to these green and blue spaces as 'infrastructure' to recognise the important services that they provide us with. This also highlights that like any infrastructure, our green and blue infrastructure requires ongoing management and investment to ensure that benefits continue to be maximised. This strategy sets out a longer term framework for protecting and enhancing our GI. It provides an overarching appraisal of the existing GI assets in MK and builds on the Vision and Principles for GI developed by the Buckinghamshire and Milton Keynes Natural Environment Partnership's (BMK NEP)[1] to identify strategic priorities for MK's GI to be fit for the future.

As such, it takes into consideration the proposed growth for MK Borough set out in Plan:MK and lays the foundation for strategic green infrastructure given the significant longer term growth proposed throughout the Oxford-Milton Keynes-Cambridge Arc. It also considers other long term environmental challenges such as climate change and future demographic change. Throughout the strategy there are a number of call our boxes. Boxes of ***'Key Considerations for this Milton Keynes GI Strategy'*** summarises key evidence and policy direction that has helped form the bases of proposals and ***'Meeting the Need'*** boxes set out the key policy direction, commitments and expectations on developers and partners in developing the GI network.

A number of key stakeholders have contributed to the development of this strategy by attending two workshops and through several separate meetings. It draws together spatial information on the network of green infrastructure across the borough and how this network links into neighbouring areas to help establish an interconnected system of strategic, landscape scale green corridors, as well as more granular opportunities to enhance green space management across the city.

Although this strategy provides the ground work, MK Council recognises that this is very much to be a continued effort and will not be achieved without close partnership with stakeholders from both the public and private sectors. We will continue to develop the details of this strategy to ensure that evidence based green infrastructure is delivered as a critical element within the future growth of MK alongside traditional grey infrastructure such as transport and utilities.

[1] httphttp://www.bucksmknep.co.uk/wp-content/uploads/2016/09/NEP-GI-Vision-and-Principles-FINAL.pdf

2. Green Space Planning in Milton Keynes – a Brief History

MK has always planned early and strategically for GI. It was built as part of the New Town Movement, a model of urban residential development brought into concept by the 1946 New Towns Act, in response to meeting the post war housing needs. The New Town Movement originated from the Garden City Movement founded by Ebenezer Howard in the 1800s, which looked to combine the amenities of urban life with the access to nature more readily available in rural environments.

The area around the north of Buckinghamshire including Bletchley, had been used as overspill housing for London since the 1950s. Following on from studies proposing the construction of a large New Town (informally to be referred to as a 'new city'), MK was designated in 1967 with a target population of 250,000 in an area of 21,850 acres. The Milton Keynes Development Corporation led development looking to achieve goals of: opportunity and freedom of choice, easy movement and access, good communications, balance and variety, an attractive city, public awareness and participation, as well as efficient and imaginative use of resources. There was the intention to focus more on Garden City principles with MK compared with other New Towns, in part due to the high quality of its landscape.

MK was planned and developed in a particularly innovative way, including a network of GI integrated throughout the City. The 'new city design' has 'a *distinctive grid plan, modern architecture, linear parks and landscaping; but one which also retains much of its earlier heritage of historic towns, villages and woodland*'[2]. Of particular importance was the creation of balancing lakes, for example at Willen and Caldecotte to provide city scale water management and areas of green space to act as flood risk buffers which created a network of linear parks. The linear park system creates an almost continuous network of urban parks, rural green spaces, river valleys, ancient woodlands and nature reserves around the city and '*significantly contributes to a green character, effective flood management, and abundant leisure and recreation opportunities for residents*'[3].The clear framework of grid roads, an important feature of the urban landscape with mainly national speed limit roads which run in between districts, also have significant areas of green space lining them.

The new city of MK was '*laid out over a rural "planned" landscape of small towns, villages and regular fields, elements of which survive within the city and in the rural areas to the north*'[4]. The urban grid pattern contrasts the historical road patterns found in the rural areas of the district which have '*a mixture of mainly irregular pre-18th century fields, regular parliamentary enclosure fields and modern arable "prairie fields*'[5] and historic such as Bletchley and Wolverton, as well as former 'farm clusters', have a clearly identifiable local character. Fragments of medieval hunting forests, such as around the Whaddon Chase on the southern fringes of the city, also remain. The relationship between the modern landscape character and these important historic areas will need to be considered sensitively as the city continues to expand.

More recently there was design ambition to make MK a 'forest city' with the widespread planting of trees from its own nursery in Newlands, which has come to fruition with 20 million trees having been planted along the grid roads and parks by 2006. The grid system together with the linear park system has provided a strong landscape framework upon which the residential and employment growth has been structured.

Following the dismantlement up of the Milton Keynes Development Corporation in 1992, much of the public green space is now managed by the Milton Keynes Parks Trust. The Trust is an independent charitable organisation which was endowed with a substantial property portfolio the income from which pays for green space maintenance. Many developers also endower the green spaces within their developments once complete to the Parks Trust for long term management[6]. This is a fairly unique method of management that allows safeguarding of spaces without competing for funds, as would be the case in many local authority ownership.

[2] English Heritage (2004) Milton Keynes Urban Expansion, Historic Environment Assessment
[3] MKC (2014) Plan: MK Topic Paper - Issues Consultation, Open Space and the Natural Environment
[4] Buckinghamshire County Council (2006) Buckinghamshire and Milton Keynes, Historic Landscape Characterisation Report
[5] Buckinghamshire County Council (2006) Buckinghamshire and Milton Keynes, Historic Landscape Characterisation Report
[6] Parks Trust http://www.theparkstrust.com/about-us-about-us/about-us

Key Considerations for Milton Keynes' Green Infrastructure Strategy

The new town of Milton Keynes developed a **culturally significant post war landscape** character, with the strong identity reinforced by the system of green grid roads and extensive linear park networks.

The new town character contrasts with the **historic character of the rural landscape** which includes numerous pre- eighteen century field patterns and traces of medieval hunting chases.

As Milton Keynes continues to grow and develop, the interface between the historic landscape and the culturally significant grid needs to be **sensitively** considered to ensure new development has appropriate character.

3. The Current GI network

Natural England defines GI as a '*strategically planned and delivered network comprising the broadest range of high quality green spaces and other environmental features*'[7]. The BMK NEP builds on this definition to highlight that GI cover a wide range of spaces from small areas of amenity space right through large swathes of natural and semi-natural space in the countryside. These spaces can be both private and public, but work together to comprise a network of spaces that support functional ecosystems that provide many benefits.

'Green Infrastructure provides a vital life-support system, encompassing a network of green spaces, access routes, landscapes and natural and historic elements that intersperse and connect Buckinghamshire's urban and rural settlements with each other and the surrounding countryside. Operating at all spatial scales, it enables a holistic overview of the natural and historic environment, acknowledging its multi-functional benefits for economy, wildlife and health and wellbeing of local people and communities'.

Figure 1 below illustrates the extent of the MK GI network. This comprises areas of strategically planned open spaces, which include a variety of land cover, as well as specific areas of habitat, including:

75.6% of MK is rural – although much of this area is productive farmland, for this strategy GI focuses on specific green spaces and assets

24.6% of MK is urban – within this urban area around 13.2% of land cover falls within the publicly accessible GI network.

A further 7.5% of land cover is made up of gardens – if vegetated these spaces can provide important GI functions.

Open Spaces

- **Parks**
  - **Linear Parks** - Key structural component of MK, usually but not always following the water bodies across the city, they have an important green infrastructure role: mitigating flood events; preserving archaeology; as pedestrian and cycle corridors; ecological corridors for wildlife; and space for informal outdoor recreation. The character of the linear parks changes across the city, more formal in urban area and more agricultural on the periphery. They are often multi-functional and incorporate other types of open space such as playing fields, play areas, paddocks and allotments. *Catchment 3200m.*
  - **Country Parks / District Parks** - These are spaces that actively attract visitors from a wide catchment, typically further than 10 kilometres. They offer unique or novel experiences that extend visiting time. *Catchment 1200m*.
  - **Local Parks** - Urban parks, rural parks and formal gardens, open to the general public that provide opportunities for various informal recreation and community events. A local park may include children's play, sitting out areas, landscaped environment, community events area, kickabout area and playing fields if the park is large enough. Local Parks will vary in size, but will be expected to be a minimum of 1-2ha. *Catchment 600m*.
  - **Pocket Parks** - Includes small areas of inviting public space that has an overall coherent landscape design approach and tend to be well integrated into and have a positive relationship with the surrounding development. Provides for informal play and passive recreation. Should include seating. Can include play areas but they should not take up more than 50% of the park and must be of a type and scale that has been appraised against the potential noise impact on nearby residential properties. *Catchment 300-400m.*
- **Playing Fields and Outdoor Sports Facilities** - A wide ranging category of open space, including both natural and artificial surfaces for sport and recreation that are either publicly or privately owned, they include playing pitches, athletics tracks, bowling greens and golf courses with the primary purpose of participation in outdoor sports.
- **Grid Road Curtilage** – A key structural element of Milton Keynes are the grid roads. These have been planned with generous green curtilage. In addition to efficient movement, this provides a visual and noise barrier to the roads but also acts as important wildlife corridors. Provision must be made for the maintenance of the landscaping in the corridor to ensure consistency with the established management of the grid road landscaping.

[7] Natural England *Green(2009) Infrastructure Guidance*

- **Amenity Green Spaces** – Including village greens and pockets of green space within development. Although these spaces are often small, they provide an important mosaic of spaces that break up the urban form for informal recreation, aesthetic value and wildlife.
- **Churchyards and Cemeteries** –Areas for quite reflection are often ecologically diverse.
- **Growing Spaces** – Including allotments and orchards, some of which have historic value.
- **Gardens** – Although private and not considered further throughout this strategy, gardens make up a significant area of greenspace across the city. Opportunities to enhance biodiversity and green gardens for drainage benefits should be encouraged.

Areas of Habitat and Wildlife Interest

- **Woodland** –Overall woodland cover is low compared to neighbouring authorities. About half of the woodland is particularly important ancient woodland with remnants of medieval hunting forest 'chases' still clearly recognisable. The remaining woodland is secondary woodland or coniferous plantations. Many areas of woodland are in relatively large blocks Most lies to the north of the city around Salcey Forest and to the southeast on the Brickhill Ridge. Much of this land is not accessible to the public.
- **Grassland** – There are a number of pockets of meadow and improved grassland running through the city, particularly associated with the Linear parks, and frequently grazed and managed using more traditional approaches these spaces often follow historic patterns and are of archaeological interest.
- **Waterways / Water Bodies** - There are a number of significant waterways and their tributaries that cross the borough, including the Grand Union Canal, and the Great Ouse and Ouzel rivers and provide in part accessible linear routes. There are also a number of lakes, frequently the product of mineral extraction and storm water balancing in and around the city, such as Linford Lakes and Willen Lake. These areas have several functions including recreation as well as biodiversity, but many of these spaces are private or restrict access. Also many ponds and urban wetland areas designed to provide areas of rich biodiversity.

In addition to the areas described above, there are a wide variety of other habitats that have not been specifically illustrated on the plan below because either spatial data is not available, they are captured within other typologies or their area is not great enough to show on the plan. These features, including hedgerows, scrub, reed beds, water margins etc. all play and important part of establishing a biodiverse GI network and need ongoing enhancement and management.

Designations

A number of Milton Keynes's GI assets have been given additional protection due to the special characteristics that they exhibit. This includes:

- National ecological designations, which have statutory protection including two Sites of Special Scientific Interest,
- County-level ecological designations, which have county-level, non-statutory protection through planning including Local Wildlife Sites and Biological Notification Sites,
- Local-level ecological designations which have Borough-level protection through planning including Milton Keynes Wildlife Corridors and a local nature reserve.
- Historic value, including historic parkland at Gayhust and Great Linford are historic parklands and numerous Scheduled Ancient Monuments (SAMs) marking historically important sites including medieval 'lost' villages and former fish ponds.

The Buckinghamshire and Milton Keynes Biodiversity Partnership have also identified a series of Biodiversity Opportunity Areas. These are broad areas that contain the most important areas for biodiversity in Buckinghamshire and Milton Keynes and will provide the basis for delivering the ambition of the Buckinghamshire and Milton Keynes Biodiversity Action Plan[8] targeting a landscape-scale approach to conserving biodiversity and the basis for an ecological network.

[8] Buckinghamshire and Milton Keynes Biodiversity Action Plan http://www.bucksmknep.co.uk/wp-content/uploads/2014/11/Bucks-BAP-Forward-to-2020.pdf

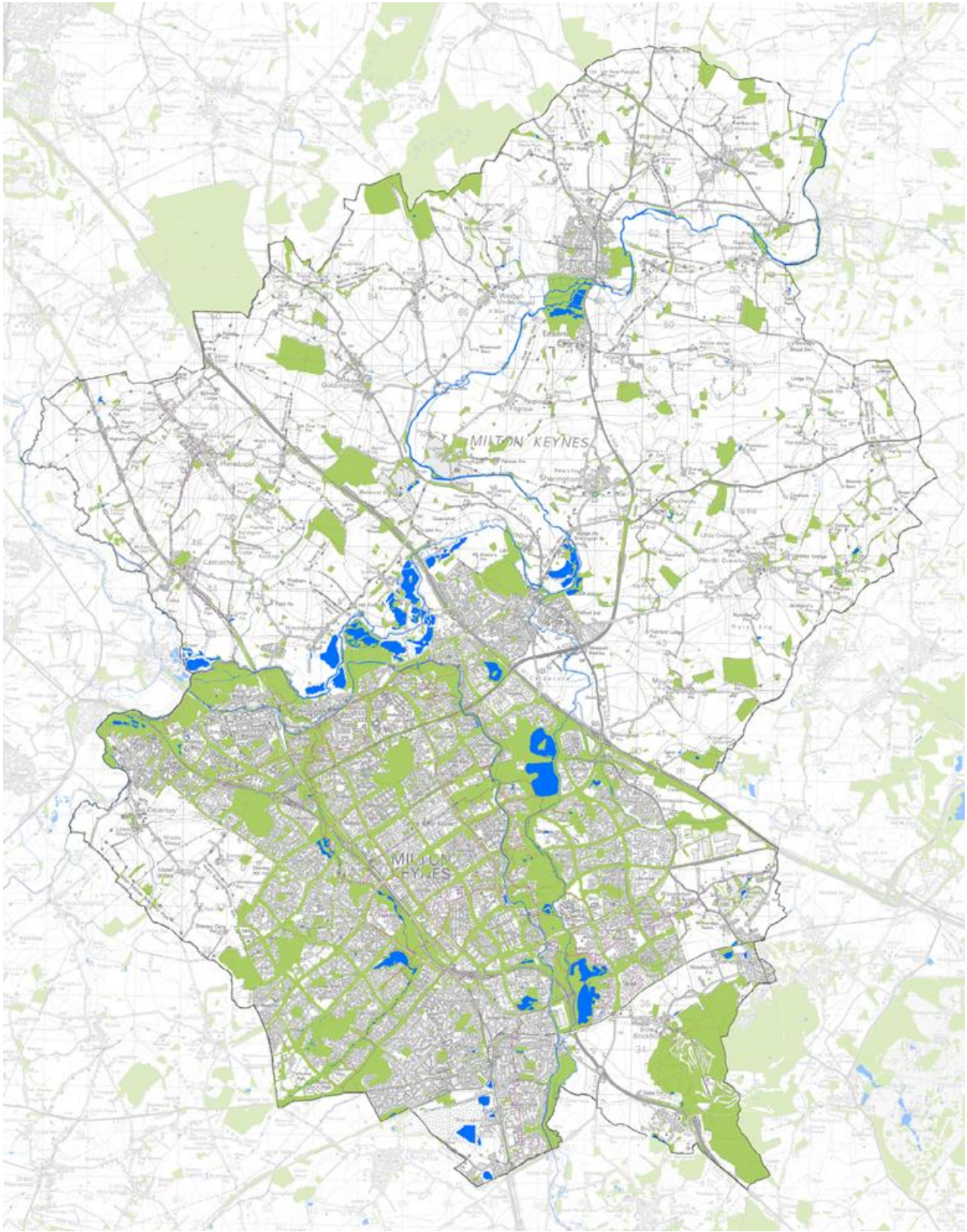


Figure 1: Milton Keynes' Green and Blue Infrastructure Network

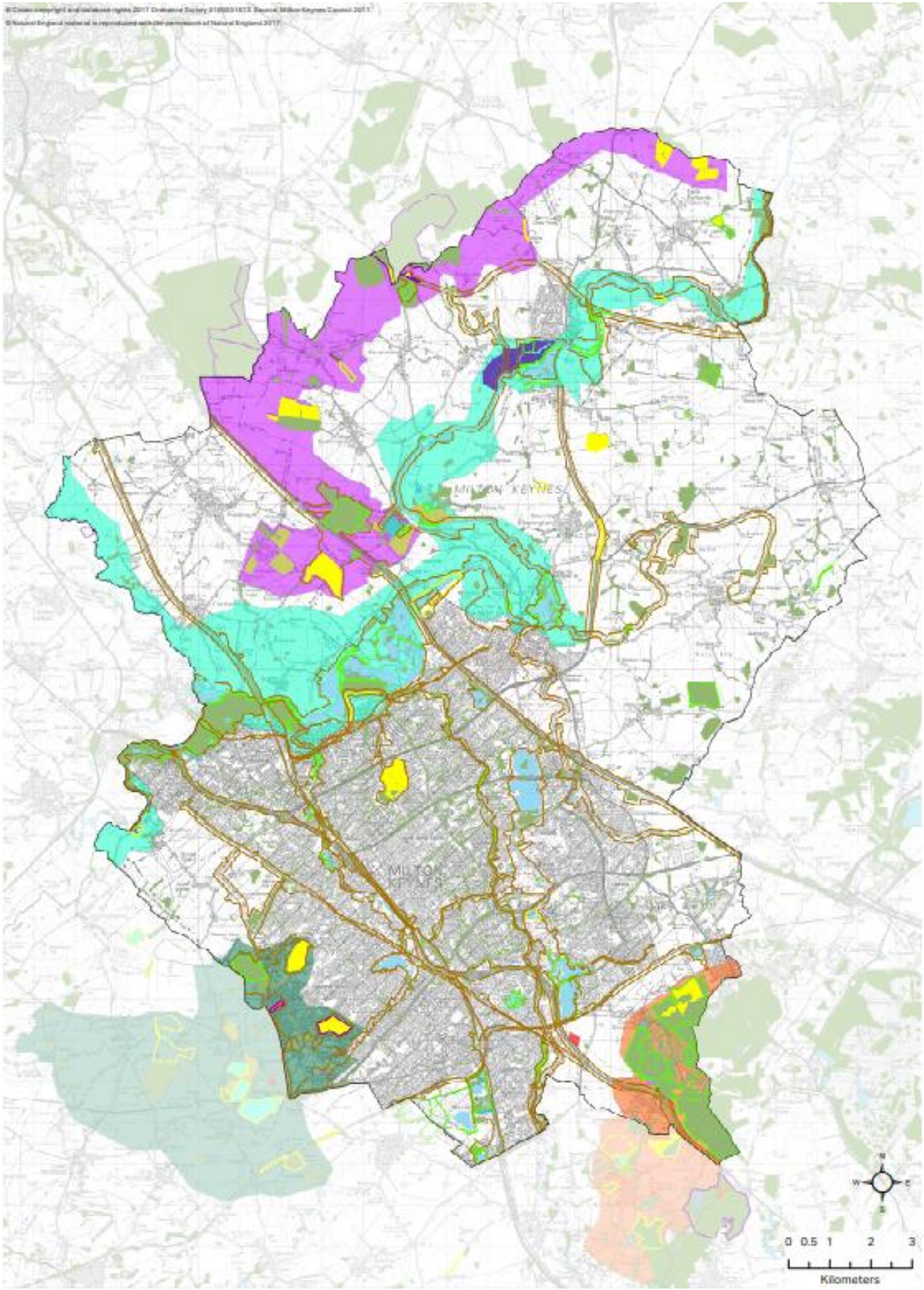
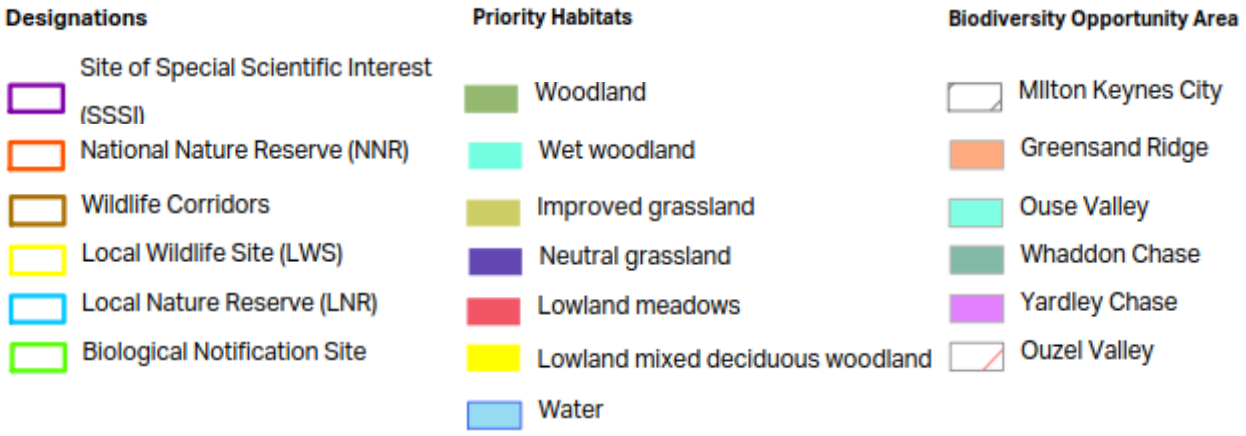


Figure 2: Ecological Designations and Biodiversity Opportunity Areas



Key Considerations for this Green Infrastructure Strategy

The green infrastructure network should be **strategically planned**.

There is a significant amount of publicly accessible urban green infrastructure throughout Milton Keynes. It is made up of a **variety of different types of** spaces that provide a range of beneficial functions to the Borough's resident.

Planning for future green infrastructure provision should include large scale ecology services provision areas such as the Biodiversity Opportunity Areas which give a particular focus for ecological enhancement extending outside the current urban area

4. Making the case for Green Infrastructure

The term GI includes traditional green space, features such as green roofs, green walls, street trees and sustainable urban drainage, as well as the 'blue' water network including rivers, canals and lakes. It is helpful to highlight that green and natural spaces are as important for the functionality and well-being of our communities as other hard or 'grey' infrastructure like transport corridors, electricity supply and waste water treatment. The functions that our green infrastructure can deliver are known as eco-system services.

Table 1: Green Infrastructure Benefits and Evidence

Environmental Benefits	The Evidence
Supports Biodiversity	Healthy ecosystems and the services they provide are underpinned by rich ecosystems. However, not all green and blue spaces have the same ecological significance. Urban and farmed environments fragment natural habitats as a result of heavily manicured monocultures of grassland, disturbance and pollution. This can create barriers for many species, limiting feeding and breeding opportunities, and ultimately reducing the carrying capacity of the remaining habitat to support viable populations, including ultimately humans. Furthermore, species adapted to urban and other man-made environments can become increasingly dominant at the expense of other species. The challenge is, therefore, to create a network of connected habitats that enable urban and rural areas to be more permeable to wildlife, and support a more diverse population of species, for example creating habitat suitable for pollinators and providing forage for invertebrates through built up areas.
Productive	Healthy ecosystems are regenerative and productive. Healthy ecosystems improve the condition of soils helping vegetation, including food to grow, with less reliance on artificial fertilization. This vegetation helps provide habitat to support a range of insects and birds which are still responsible for the pollination on many of our crops. In addition to food, the natural environment provides water as well as many fibres and fuels.
Protects from Flood Risk and Improves Water Quality	Large areas of GI, such as linear parks, enable the more natural function of flood plains. Smaller green spaces and features such as rain gardens, green roofs and swales are additionally important especially in urban areas as they help to slow the flow of surface water into our sewers. As most of our sewers are combined foul water and surface water sewers, this helps create additional headroom and reduces the risk of sewer flooding. These green features can also be very effective at improving water quality by removing dust and particulates. As such, green spaces help infiltrate, store and clean surface water meaning it enters waterways at a slower rate or remains in the natural environment in a cleaner state. This will be increasingly important as growth in Milton Keynes places more pressure on the sewer network and climate change is predicted to create more unseasonal weather conditions for example, National planning regulations now requires local governments to anticipate a peak rainfall intensity allowance for small and urban catchments. This applies across all England from 2015 to 2115 and ranges from a 5% to 40% increase.[9] GI, such as wet woodland and permanent wet grassland can also help store water which can be released in times of drought to help retain the ecological health of waterways.
Climate Resilience	Within urban areas, hard surfaces such as tarmac roads absorb more radiation than light surfaces, retain more of the suns radiant heat energy and in combination with the production of heat from human activities create areas that can be warmer than the surrounding countryside. This is known as the urban heat island (UHI) effect. It can be problematic in the summer when temperatures, and particularly night-time temperatures, remain high, causing vulnerable people to suffer and infrastructure such as utilities to breakdown. Green spaces absorb less heat and trees provide

[9]GOV UK (2017) Flood Risk assessments: climate change allowances. Available at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#types-of-allowances

	shading cover, reducing the effect of the UHI. The UHI effect will be exacerbated by climate change when mean maximum summer temperatures could be around 5°c[10] warmer in Milton Keynes than now by 2028. However, it has been estimated that 10% increase in green space cover can mitigate this predicted increase in temperature and the effect of climate change[11]. Carbon dioxide is one of the main contributing gases to climate change. As plants grow, they take carbon dioxide out of the atmosphere and store it in their biomass and within the soil that they are growing in. This process is known as carbon sequestration. Although vegetation will release carbon dioxide as they die, decompose or are burnt, the stored carbon in the soils remains beneficial unless they are disturbed. Native species are thought to do this process more effectively[12].
Social Benefits	
Healthy Lifestyles and Well-Being Reflection	According to the Landscape Institute paper '*Public Health and Landscape'* (2013) investing in Green Infrastructure results in positive benefits for the health and wellbeing of communities. Research by Natural England suggests that *when people have good access to greenspace (perceived or actual) they are 24% more likely to be physically active*[13]. The UK Public Health White Paper 2010 notes that *green spaces can improve mental health and the quality of community life*[14]. Furthermore, In terms of mental health *walkable local environments that promote physical activity in daily life can increase opportunities for social engagement, thus encouraging social wellbeing and increasing people's sense of security (Landscape Institute, 2013).* A report by Natural England, *Health and Natural Environment* (2012), states that urban life has many factors that contribute to stress and poor health. This includes traffic noise, fear of crime and limited access to open space. The report provides opportunities where Green Infrastructure can positively influence health and wellbeing particularly when accessed close to where people live and work, including parks, gardens, tree-lined streets, communal squares and allotments. GI can also contribute to improving air quality within urban environments. An iTree Eco Assessment in London demonstrated that approximately eight million trees provide at least £133m of benefits a year by removing pollution, storing carbon and reducing surface water flooding[15].
Place Making and Satisfaction	Green spaces and water have strong place making qualities, helping to make places have a distinct and interesting identity, particularly relevant in the expanding City. Perception of place has been shown to be a 'virtuous circle', where people perceive green space to be high quality, they are more satisfied with their area, and in turn more likely to feel safer and be more active[16]. This reinforces sense of place and with extra surveillance through more active use, improve community cohesion and helps to reduce crime levels.
Community Cohesion	Closely related to place-making, it has been shown that people are more likely to engage in social activities in green areas as opposed to those which more sparsely vegetated[17]. They create spaces for socialising, interaction and events with more opportunities and places for children to play. Parks and areas of green space on neighbourhood boundaries can be the border for inter-community tension and positive design can result in parks being active in promoting inter-community relations.
Economic Benefits	
Encourages Inward Investment	High quality green infrastructure has been shown to have a direct relationship with gross value added (GVA). As highlighted above, green infrastructure is associated with improving a place's image which, in turn helps to attract and retain high quality industries, entrepreneurs and workers. Research by Eftec and Sheffield Hallam University found that 95% of real estate development

[10] UKCP09, *2050 50% probability level: central estimate*
[11] Adaptation Strategies for Climate Change in the Urban Environment (ASCCUE), University of Manchester
[12] Natural England Research Report NERR043 Carbon storage by habitat (2012)
[13] Natural England (2012) Health and Natural Environments
[14] Houses of Parliament (2013) Urban Green Infrastructure (POSTNOTE Number 448)
[15] Greater London Authority (2017) London Environment Strategy
[16] CABE Space and DCMS, Community green (2010)
[17] Forest Research, Social interaction, inclusion and community cohesion Evidence Note (2009)

	consultants surveyed believed that green space adds a premium to commercial development of around 3% (although estimates vary from 1-9%). As more people are attracted to an area businesses find it easier to attract motivated and skilled work forces[18]. This is also true for the residential market, and although rising house prices can make affordable housing delivery a challenge, a buoyant housing marking is needed to enable the private sector to contribute to delivering social housing.
Increase Labour Productivity	As well as attracting more jobs, green infrastructure can improve productivity. There is evidence to suggest that simply views of green space can improve productivity in the workplace[19] and access to green spaces increases workplace satisfaction. This is in addition to the reduce risk of employees taking sick leave and a demonstrated increase in the rate of recovery illness and hospital discharge rates from being in proximity to green space[20].
Increases Visitor Spending	The South East Midlands Local Enterprise Partnership highlights the attractiveness of the natural environment in underpinning the natural environment, with a wealth of historic and environmental attractions, from historic buildings, parks and gardens, to country parks, rivers, forests and canals, and outdoor activities that are 'integral to the success and development of the visitor economy'[21]. Similarly, there is a growing body of evidence that shows that incidental green spaces in urban areas also help to increase visitor spending, both from locals and those coming from further afield. Providing attractive green places increases retail footfall and providing opportunities rest and socialise, including in high quality outdoor space (particularly in the summer) help retain visitors for longer[22]. Green infrastructure is a crucial part of the amenity mix for visitors when looking for destinations[23].

Given these benefits, we are starting to think of our green infrastructure as assets of natural capital. Capital is recognised in several forms including financial, manufactured, social, human, intellectual and natural capital. Natural capital provides the foundations to support the other types of capital, *'it provides the resources with which we build our societies, economies, and institutions, and ultimately regulates the environmental conditions that enable human life*' [24]. As with all capital and infrastructure, investing in natural capital can deliver real benefits for both the public and private sectors and generate large economic and social returns. '*The pressure on ecosystems can be exacerbated if development takes place in the wrong places or if not considered holistically in terms of maximizing the economic, social and environmental benefits*'[25]. As we can track the 'flow' of the ecosystem services to different users, we are also now able to quantify the benefits and even put a monetary value on them. This is known as natural capital accounting.

Population growth, increased pressure on transport networks and dependence on grey infrastructure can make urban populations vulnerable to disturbances, such as flooding and poor public health. The management and restoration of ecosystems within and around urban areas help to buffer against many of these disturbances, alongside the management of larger landscapes outside of the city boundary, such as the natural protection of wetlands and forests. In the early days of planning for open space, parks and playgrounds these places were designed to provide a single function. Land-use changes due to development did not consider the *'impact on the extent and ability of green infrastructure and ecosystems to provide ecosystem services such as space for recreation, the mitigation of flooding events and air quality regulation*[26]*;* furthermore, their associated health and wellbeing benefits were not considered.

Innovative approaches towards land-use planning have multidisciplinary and community-based foundations; green infrastructure principles are required to be an integral part of new development to

[18] South East LEP *Economy Naturally Report* quoting Eftec and Sheffield Hallam University for Defra and Natural England, *Green Infrastructure's contribution to economic growth: a review* (2013)
[19] Natural Economy Northwest *The Economic Value of Green Infrastructure* (2008)
[20] CABE Space and DCMS, *Community green* (2010)
[21] South East LEP *Economy Naturally Report* (2016)
[22] Forest Research for Defra and CLG, *Benefits of Green Infrastructure* (2010)
[23] Eftec and Sheffield Hallam University for Defra and Natural England, *Green Infrastructure's contribution to economic growth: a review* (2013)
[24] Natural Capital Coalition (2016) Natural Capital Protocol
[25] (RICS) Royal Institute of Chartered Surveyors (2015) Planning for Sustainable Land-Use: The Natural Capital Planning Tool (NCPT) Project
[26] (RICS) Royal Institute of Chartered Surveyors (2015) Planning for Sustainable Land-Use: The Natural Capital Planning Tool (NCPT) Project

provide environmental, social and economic benefits and opportunity for community involvement. Green Infrastructure corridors can be used as public parks and recreation space at the same time as providing movement for wildlife in built-up areas. Cycle routes, for instance, can be coordinated along green infrastructure corridors that provide an opportunity for tree planting and help mitigate the effects of flooding. It is possible to design communities that provide for the needs of people whilst implementing and managing healthy and diverse ecosystems. Development can be an opportunity to facilitate improved landscapes and their ecosystem services.

Key Considerations for this Green Infrastructure Strategy

Green infrastructure can provide multiple economic, social and environmental benefits and should be seen as important as grey infrastructure in the value they provide society. Many of these benefits are derived from natural processes and are known as 'ecosystem services'.

Urban areas can present barriers for the movement of species and development in the wrong places can undermine the effectiveness of ecosystems to perform.

To be effective and robust, ecosystem services need to be underpinned by a healthy network of **connected** and **biodiverse** spaces.

Green infrastructure needs **continued investment** and **management** to ensure that the benefits are maximised.

5. Planning for Green Infrastructure

5.1 National Policy

The importance of green infrastructure is enshrined in policy. The Government's recently published 25 Year Environment Plan incorporates a key principle of *'Greening our Towns and Cities'.* Furthermore, the National Planning Policy Framework (NPPF), which sets out the Government's planning policies for England and how these should be applied, and provides a framework for the preparation of Local and Neighbourhood Plans includes Paragraph 114 which states that, '*Local Plans should plan positively for the creation, protection, enhancement and management of GI networks*' and Paragraph 99 highlights that '*sets requirements for Local Plans to meet the challenge of climate change, flooding and coastal change by planning to avoid development risks through suitable adaptation measures including GI*'[27].

The National Planning Practice Guidance (NPPG) for the Natural Environment, which supports the policies contained in the National Planning Policy Framework, provides more guidance on planning for GI, highlighting the role of strategies like this one in providing an assessment of the current green infrastructure, identifying gaps and opportunities for enhancement to inform local and neighbourhood plans, infrastructure delivery plans and Community Infrastructure Levy (CIL) schedules.

The Milton Keynes Core Strategy, adopted in July 2013, sets out the objectives and strategy for the development of the Borough and identifies the major areas where growth and change will take place. Through policy CS19 it requires that '*Green infrastructure will be protected and enhanced. Open space will be provided in line with the Council's standards. The existing linear parks system along the Broughton, Caldecotte and Loughton Brooks will be extended into the urban extensions and along the Ouse and Ouzel Valleys to the north to provide multi-purpose green infrastructure'.* This green infrastructure strategy provides more guidance on green infrastructure in Milton Keynes and will in turn; help to inform the next iteration of the local plan. Plan:MK will need to take account of future growth in Milton Keynes where the population is expected to increase to over 300,000 by 2031 and the creation of around 26,500 new homes within the planning period. .

The MK Futures 2050 Commission has been tasked to deliver a potential future vision for MK for consideration by MKC in the development of their medium and long-term policy framework. An engagement programme with key stakeholders and the community resulted in three Commission Working Papers demonstrating key findings. Paper 1 'What Makes a Great City?' provides an overview of engagement with the public and stakeholders. A great city is described as working for people and includes '*Beautiful places, busy and tranquil, including attractive parks and open green spaces'*.

Looking further ahead, Government proposals for the development of around a million new homes across the Cambridge-Milton Keynes-Oxford Arc will put a lot of pressure on the natural environment. The National Infrastructure Commission's *Preparing for Prosperity* highlights the need to use this as a catalyst for collaborative efforts to deliver a net-gain in biodiversity and natural capital across the arc.

Key Considerations for Milton Keynes' Green Infrastructure Strategy

Future population growth in Milton Keynes is likely to increase pressure on infrastructure, including green infrastructure and drainage infrastructure.

New development needs to integrate in a way that connects to the existing network, respects the historic ecological and culturally important landscape and provides sufficient space for people and wildlife.

Over the longer term there is significant planned growth across the region. We need to plan early for cross boundary strategic green infrastructure at a landscape scale and ensure new development delivers a net gain in biodiversity and natural capital.

[27] Note that at the time of developing this strategy, the Government released a draft revised NPPF for consultation. It highlights that plans should '*take a strategic approach to maintaining and strengthening networks of habitat and green infrastructure'.*

6. Setting the vision

This strategy does not stand alone. Considerable work has already been completed in and around Milton Keynes which will shape our approach to managing green infrastructure.

Buckinghamshire and Milton Keynes Natural Environment Partnership

The **Natural Environment Partnership** (NEP) is Buckinghamshire and Milton Keynes' Local Nature Partnership. It brings together a diverse range of individuals, businesses and organisations to drive positive change for the local natural environment. As a refresh to the 2009 GI Strategy for Buckinghamshire, the NEP has approved a new *'Vision and Principles for the Improvement of Green Infrastructure in Buckinghamshire and Milton Keynes'* (2016). The Partnership's Vision is to provide, connect, improve and protect green infrastructure assets and their multiple functions for the long-term; and the document sets out the following nine Principles which should be followed to achieve the Vision by 2030.

These principles have both informed the development of this strategy and are important considerations for partners to consider in the design, delivery and ongoing management of GI across MK. The NEP principles highlight that:

1. 'GI is as important and necessary as grey (man-made, constructed) infrastructure and social infrastructure for the health and wellbeing of Buckinghamshire's economy, environment and society.
2. GI, its value and benefits are considered and planned for early and strategically at all spatial scales of development.
3. GI across Buckinghamshire should be planned to provide a range of benefits or "ecosystem services".
4. (Related to 3, above) GI creation and improvement is planned to contribute to the delivery of objectives and targets, good practice actions and activities for Buckinghamshire's environment, health and economy.
5. GI is managed into the long-term.
6. Connected networks of green infrastructure are necessary - at both the landscape and local scale - to maximise the benefits.
7. GI creation and improvement is coordinated with activities cross-border.
8. GI protection, improvement and creation is prioritised in locations where GI can deliver most benefits. Opportunities to maximise the benefits of GI should be explored both strategically, when planning for GI provision ahead of growth and development, and when mitigating the impacts of development.
9. Linked and relevant to, informed by and coordinated with, other policy areas, strategies, activities and reviews'.

Stakeholder engagement in preparation for developing this strategy sought to build on these principles, with particular emphasis to:

10. Reinforce the importance of good design for new green infrastructure.
11. Capture and monitor the natural capital value/economic benefits of green infrastructure.
12. Promote the health and wellbeing, including mental health, benefits of green infrastructure.
13. Continue ongoing data / monitoring collection of habitat and wildlife.

7. Neighbouring Strategies

Recognising the importance of connectivity of green infrastructure at the landscape scale, it is valuable to understand the strategic priorities of neighbouring boroughs. Although a number of these studies are several years old, the principles largely remain.

Aylesbury Vale

The district of Aylesbury Vale in Buckinghamshire borders the urban extent of Milton Keynes to the south and extending south-south west. The Submission Draft Vale of Aylesbury Local Plan identifies Salden Chase, directly adjacent to the urban fringe of Milton Keynes at Snelshall West and Tatternhoe Park and north of Newton Longville as a strategic housing and employment site. It will be important that this new development is stitched into the surrounding green infrastructure network, and in particular accommodate green links around the west and south of Milton Keynes.

The two-part Aylesbury Vale Green Infrastructure Strategy sets out the vision, key aims and principles for the creation and management of GI in Aylesbury Vale. Strategic principles are to '*be adopted by all stakeholders to deliver 'liveability' for new and existing communities and to create an attractive area for new economic and social investment*[28]*.* The second part of the strategy is focused on delivery and provides examples of flagship projects which will showcase the range of potential GI projects and the benefits that they will offer. *They will contribute to the GI required for the new housing developments and help address deficits in Green infrastructure.*

One of the strategic projects pertinent to Milton Keynes is focused on access and heritage restoration across the former royal hunting forest of Whaddon Chase to the west of the city. This project is partnered with Milton Keynes Council, Parks Trust, Milton Keynes Development Partnership and Parish Councils. The project is within a distinctive historic landscape and aims to improve links between existing settlements and new communities and provide a multifunctional GI network for existing residents.

Bedfordshire

The county of Bedfordshire borders Milton Keynes to the east. The Bedfordshire Local Nature Partnership is the custodian of the Bedford and Luton Strategic Green Infrastructure Plan (Feb 2007), which sets a strategic framework for GI across the county with more detailed plans set out within three associated strategies for Bedfordshire, Mid Bedfordshire and Luton and South Bedfordshire[29]. It highlights the protected areas of greenbelt around Leighton Buzzard, Flitwick and Luton which extends right up to the Milton Keynes south eastern boundary.

The plan describes a Strategic Green Infrastructure Network, included are a number of broad corridors that connect to Milton Keynes:

- 1. Milton Keynes to Grafham Water Corridor – *this connects existing strategic green infrastructure assets in a broad corridor extending from the countryside north-east of Milton Keynes, across the northwest corner of Bedfordshire and into Cambridgeshire to link with Grafham Water.* GI opportunities include woodland, neutral grassland and hedgerow linkage, enhancement and creation; a proposed Harrold Odell Country Park off road cycle route; historic environment enhancement; landscape conservation; enhancement of the landscape of the A6 route; and an identified deficit in strategic accessible greenspace to the south of Rushden.
- 2. Upper Great Ouse River Valley Corridor – this corridor extends from Bedford north along the Great Ouse River Valley, connecting with the Milton Keynes to Grafham Water Corridor. Green infrastructure opportunities include landscape conservation; enhancement of the landscape of the A6 route; and enhancement and conservation of the historic environment including the medieval churches and settlements of Oakley, Clapham, Bromham, Biddenham, Stevington and Stagsden.
- 3. Lower Great Ouse River Valley Corridor – this broad corridor extends through the centre of Bedford east along the Great Ouse River Valley, connecting with the Greensand Ridge Corridor and the Bedford-Milton Keynes Corridor to the south of Bedford. GI opportunities include an

[28] Aylesbury Vale District Council (2011) Aylesbury Vale Green Infrastructure Strategy
[29] Note that in 2009 Mid-Bedfordshire was combined with South Bedfordshire to become the Central Bedfordshire Unitary Authority

identified deficit in strategic accessible greenspace to the south of St Neots, which development of the Bedford River Valley Park has the potential to address; landscape enhancement and conservation opportunities including enhancement of the A421 and A1 routes; and the proposed Great North Cycle Route.

- 5. Bedford to Milton Keynes Corridor – *this broad corridor extends east from Milton Keynes, across the M1 motorway to the Marston Vale Millennium Country Park, then north to link with the southern edge of Bedford connecting with the Lower Great Ouse River Valley Corridor south-east of the town.* Green infrastructure opportunities include continued development of the Forest of Marston Vale, the BMK Waterways Park and the Wixhams discussed above; further landscape enhancement and enhancement of the landscape of the A6 and A421 routes; woodland, wetland, grassland and hedgerow enhancement; an aspiration to create an access route link between Bedford and Ampthill; and enhancement of historic environment assets including the industrial heritage and architecture of the brick making industry at Stewartby.
- 6. Greensand Ridge Corridor – this wide corridor extends from the Ouzel River Valley Corridor north of Leighton Linslade on the Bedfordshire/Buckinghamshire border, north-east through mid-Bedfordshire via Woburn and Ampthill to connect with the Ivel River Valley Corridor before continuing to the Cambridgeshire border via Sandy and Potton. Green infrastructure opportunities include proposals for the Greensand Ridge Cycle Ride route; historic environment enhancement to the area around Swiss Garden; landscape conservation; and enhancements to the existing accessible greenspace for woodland and acid grassland/heathland linkages and landscape protection.
- 7. Ouzel River Valley Corridor - this broad corridor extends north along the Ouzel River Valley through the centre of Leighton Linslade, linking the town with the southern edge of Milton Keynes to the north. Green infrastructure opportunities for this corridor include enhancement of existing historic assets and the need to address a deficit in strategic accessible greenspace around the south of Leighton Linslade.

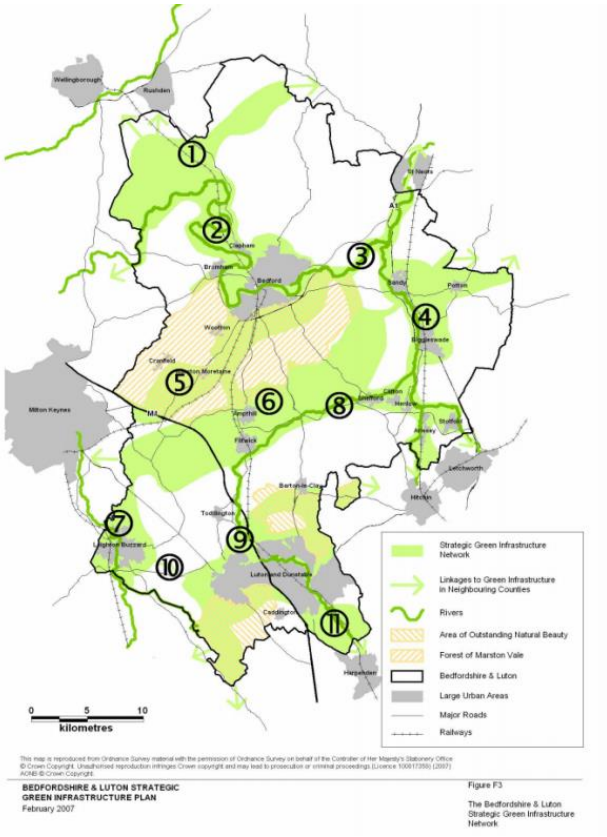


Figure 3 Bedford and Luton Strategic Green Infrastructure Plan

The Bedford Green Infrastructure Plan (2009) adds further detail to the county wide strategy, also introducing:

- Enhancement and extension of the Forest of Marston Vale - Linking and extending existing woodland sites in the Forest of Marston Vale with the aim increasing woodland cover of the Vale to 30%. Extending the 'Green Gateway' concept will increase woodland cover and provide green space for new and existing communities and buffer new development.
- Creating the Bedford to Milton Keynes Waterway - Supported by the Bedford and Milton Keynes Waterways Trust, this waterway park will complete a missing link in the waterway network, by linking the Grand Union Canal to the River Great Ouse, to forming a direct connection with the waterways of East Anglia and a longer circular canal loop. The opportunity involves creating the waterway, and also a multi-functional green corridor that includes waterfront development, access routes and links to adjacent green spaces.

Northamptonshire

The county of Northamptonshire borders Milton Keynes to the north west. The Northamptonshire Environmental Character and Green Infrastructure Suite highlight key GI links from the county extending into Milton Keyes from Northampton to Salcey (Milton Keynes Link) – a short but strategically important link between the Nene and the (4) Yardley, Salcey and Whittlewood Ridge corridors, and also connects the urban centres of Northampton and Milton Keynes. Priorities include conserving and enhancing the ancient woodland habitats and extending the recreational facilities.

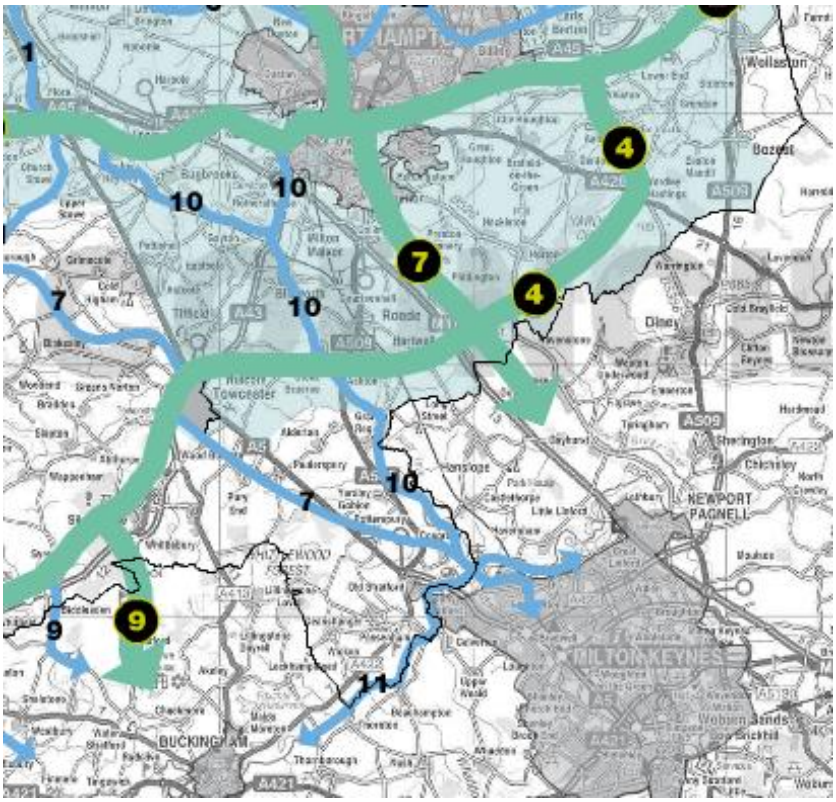


Figure 4 Northamptonshire Environmental Character and Green Infrastructure Adapted from Interactive Map Suite

Key Considerations for Milton Keynes' Green Infrastructure Strategy

- New development at Salden Chase needs to be integrated into the wider urban GI network.
- Protecting and enhancing the historic landscape of Whaddon Chase to the west of Milton Keynes and extending into Aylesbury Vale.
- Maintaining strategic GI corridors connecting into Northamptonshire and Bedfordshire.
- The Bedford to Milton Keynes Waterway Park – Supported by the Bedford and Milton Keynes Waterways Trust, this waterway park will complete a missing link in the waterway network by linking the Grand Union Canal to the River Ouse. The opportunity involves creating the waterway, and also a multi-functional green corridor that includes access routes and links to adjacent green spaces.
- New development gives an opportunity for creativity and innovation in delivering integrated GI.

8. Meeting Green Infrastructure Needs in Milton Keynes

There are a number of issues facing GI in Milton Keynes that need to be taken into consideration in planning for future enhancement and provision. This sections sets out the key issues affecting GI in MK and, building on the principles and supporting evidence above, sets out the policy direction for meeting the GI needs across the borough.

8.1 Planned Growth

MK Council has set an ambitious growth target of at least 26,500 new homes by 2031. Land to accommodate the majority of this growth has already been identified through the completion of the city grid squares, the Eastern and Western Expansion areas and land South East of Milton Keynes. In conjunction with this housing growth, there will also be the need to accommodate around 30,000 new jobs. Much of this will be accommodated within the Central Business District (CBD) and existing urban area, with a new strategic employment allocation at South Caldecotte.

Meeting the need:

All new development of 11 homes or more will be required to provide open space in line with the Fields in Trust population benchmarks. This space should be designed as multifunctional green infrastructure in line with the open space typologies outlined in Plan:MK (included in section 3 of this strategy). Where development cannot provide GI on site, an equivalent contribution will be required to help create, enhance and manage other spaces to demonstrate that the additional pressure on GI from the growth can be sustained.

Future growth should protect existing GI assets and each of the strategic growth locations should be supported by local approaches to GI provision that demonstrate that there is sufficient multifunctional space for the future population and that it is connected in to the existing GI network.

In addition, development should deliver a net gain in biodiversity. Any unavoidable loss biodiversity should be compensated for on-site wherever possible, and as a last resort through biodiversity offsetting.

8.2 Longer term growth

In 2016 the Government announced the intention to develop the Cambridge-Milton Keynes-Oxford growth corridor. The National Infrastructure Commission's *Partnering for Prosperity: a new deal for the Cambridge – Milton Keynes – Oxford Arc* identified opportunities to create well-designed, well-connected new communities and deliver one million new homes and jobs in the area by 2050 to create a single, knowledge-intensive cluster that competes on a global stage. It recognises that central to this will be protecting the area's high quality environment, and securing the homes and jobs that the area needs.

Meeting the need:

Over the longer term, the Borough of Milton Keynes can expect to see investment into a significant scale of growth. To accommodate this level of growth, strategic, landscape scale GI corridors need to be identified, protected and enhanced to ensure that natural systems continue to function and that residents and visitors continue to have access to high quality natural and semi-natural green space.

Large scale infrastructure such as rail and road schemes will require strategic and cross boundary planning with the aim of integrating within and expanding the GI network as opposed to creating barriers and forming severe artificial boundaries.

8.3 Enhancing biodiversity

Biodiversity underpins robust provision of ecosystem services. Buckinghamshire and Milton Keynes falls behind other English counties in terms of biodiversity resources with a low percentage of land designated as SSSI at *1.4%, compared to a national figure of 7.7% (England)*[30]; only two of these are within MK. There are a number of Local Wildlife Sites and Biological Notification Sites, although these are not afforded the same level of protection. The NPPF also highlights that development should avoid impacting on other priority habitats, such as the areas of unimproved grasslands and ancient woodlands that are scattered across the borough.

Development pressures, lack of appropriate management and the change of use of natural landscapes such as grassland and heathlands, results in a decline in their biological value. Similarly, the loss of species particularly larger animals in woodland areas has had detrimental impacts on these ecosystems including the natural management of rivers and wetlands and the population sizes of dependant species. Farmland birds and arable weeds species are in significant decline due to changes in farming practice and the removal of hedgerows to increase field sizes.

Human influence on rivers including straightening and dredging, has left many disconnected from their floodplains and losses in natural areas of wetland and reed bed, as well as '*significantly reducing the area of lowland wet meadows (nationally) by 97% since the 1930s*'[31]. Habitat fragmentation as a result of development is another key issue; ecological communities become isolated resulting in habitat and species decline.

Additionally, pollinators such as bees, beetles and butterflies are essential for the sexual reproduction of plants including oilseed rape and many wild plants; these species are at risk from 'pesticides, *pests and disease, invasive species, land-use intensification, habitat loss, fragmentation and climate change. In the last 40 years we have seen a significant decline in honeybee abundance (most estimates are above 50%)*'[32].

Although there is considerable green space throughout the city, the planned nature of the GI means that much of it is of similar age and frequently of limited diversity of more ornamental species. Vegetation is now well established in a number of areas, and priorities are shifting from the initial planting and establishment phases into one of thinning and creating a more biodiverse understory; such as creating new woodlands rather than just plantations of trees. Section 9.2 below provides more details. Similarly, hedgerows and hedgerow trees in rural areas also require protecting and enhancing. The borough lost a lot of hedgerow trees due to Dutch Elm disease and the remaining dominant Ash is susceptible to Ash Dieback.

Furthermore, despite the extent of natural and semi-natural areas, stakeholders have raised concerns about the limited level of recorded data associated with biological recording. Understanding the existing resource is a key component to being able to effectively plan for its future. Limited diversity and projected climate change, presents a risk to the existing species which could become threatened by changing weather patterns and potentially invasive species.

[30] Natural Environment Partnership (2014) Buckinghamshire and Milton Keynes Biodiversity Action Plan
[31] Natural Environment Partnership (2014) Buckinghamshire and Milton Keynes Biodiversity Action Plan
[32] Natural Environment Partnership (2014) Buckinghamshire and Milton Keynes Biodiversity Action Plan

Meeting the need:

Existing sites identified for their ecological importance, including national and local designations and important habitats such as unimproved grasslands and ancient woodlands should be protected from development and human interference and should be appropriately managed.

Develop a greater understanding of ecological resources through increased survey and monitoring.

Work with landowners to manage hedgerows and hedgerow trees to support biodiversity.

Protect the riparian corridors by providing buffer areas within urban areas and work with the agriculture sector to improve riparian margins, potentially though a payment for ecosystem services or a biodiversity offsetting mechanism.

Establish strategic management and renewal of the urban GI, particularly along the grid roads, with the strategic objective of improving biodiversity by prioritising native species, active thinning and understory management.

The aspiration of significant growth across the Cambridge-Milton Keynes-Oxford Arc needs to be matched with ambitious plans for the creation of a strategic, large scale natural area to ensure that development is balanced with green infrastructure enhancement. This could also be a major eco-tourism destination with economic benefits for the area.

8.4 Protecting Landscape Value

Aligned with the above, there is a need to protect the qualities that contribute to the rural landscape character in MK. The Milton Keynes Landscape Character Assessment[33] highlights the extensive views over the valleys from the clay plateau farmland in the north, the tranquil character of the rural river valley, to the open agricultural landscape of the clay lowland farmland to the south east that provides a 'visually important setting for the Greensand Ridge'.

Across the landscape there are also remnants of historically important and culturally significant landscape including the medieval royal hunting chases. These areas and their setting need to be sensitively managed.

Meeting the need:

Protect the tranquil and open nature of the rural landscape. Identify opportunities for historic restoration and GI enhancement.

Improve access to the countryside and maintain the existing paths, cycle and bridle ways, as well as identifying potential for strategic open spaces.

8.5 Improving Health

According to the Milton Keynes Joint Health and Wellbeing Strategy (2015-2018), poor lifestyle choices such as smoking and excessive drinking, unhealthy eating and lack of physical activity have a negative impact of the life expectancy of the MK population; this is more prevalent in disadvantaged communities. Mental health is also a key issue for MK; '*approximately 26,000 residents have reported mental health disorders and over 11,000 have two or more. Additionally, it is estimated that almost 4,000 children aged between 5-15 years of age and 30% of older people have mental health concerns*'[34]. The council recognises that there are opportunities to improve the health and wellbeing of its residents through improvements to the city's environment including a strategy to decrease car usage and to encourage cycling as an alternative and healthier option.

[33] Milton Keynes Landscape Character Assessment, MKC (2016)
[34] Milton Keynes Council (2015) Milton Keynes Joint Health and Wellbeing Strategy 2015 – 2018

MK Council recognises that health inequality is also reflected in areas of deprivation. Therefore, by providing communities with access to green space across all areas of social class life expectancy will likely rise, particularly if older people have access to open space for walking within close proximity to their homes. Children's physical activity will also increase if they have access to playgrounds, parks and recreation areas close to where they live. There is opportunity for green and blue infrastructure in facilitating better community cohesion. They create spaces for socialising, interaction and events with more opportunities and places for children to play. Research suggests that people are more inclined to engage in social activities in green areas as opposed to sparsely vegetated or concrete areas. By providing additional GI the NHS has the opportunity to create efficiency savings by encouraging innovation and supporting preventative interventions. *Greenspace plays an important role in delivering a cost effective and joined up service providing underlying support for fundamental determinants of health*[35]. Improved access to green space, and even green views, has also been shown to improve labour productivity, reduce the number of sick days and help increase patient recovery times[36].

Meeting the need:

Providing a healthy environment and wildlife rich green spaces for local residents will result in individual and community health benefits including potentially healthier air from tree planting, reduction in noise pollution through the buffering of sound with vegetation and a lower risk of the emotional stresses caused by flood risk if additional green space is allocated.

Proving a healthy environment in the workplace employees and opportunities for physical activity will provide economic benefits through increased productivity and a decrease in absences.

8.6 Managing Flood Risk, Water Resources and Water Quality

MK designed an integrated drainage system within their original, strategic level masterplan, to reduce the potential of additional flood risk through new development and future growth, containing one of the first examples of a city wide sustainable urban drainage system (SuDS). Development within areas of flood risk has largely been avoided and watercourses are buffered with a strategic system of linear parks. Compensation for the increased run-off generated from new development is provided in the form of large balancing lakes, such as Willen Lake, and smaller features along the River Ouzel and the Loughton and Broughton Brooks. '*By designing the balancing lakes not just with individual sites of development in mind, but on a strategic level with a view to the future development potential of Milton Keynes, the flood control measures have ensured that the risk of flooding has been reduced*'[37].

There are still, however, areas of potential flood risk across MK originating from various sources including surface water runoff; sewer and highway networks; groundwater; fluvial (main river and ordinary watercourse) and artificial sources (canals and reservoirs). The Milton Keynes, Flood Risk Management Strategy (2016) recommended that '*when considering risks from flooding and how to manage them, the whole system is considered rather than single sources in isolation*'[38].

GI led approaches to flood risk, including buffer zones and areas for infiltration/attenuation can help reduce high winter run-off rates into the drainage network and increase them in the summer. This can help maintain headroom in the sewer systems, particularly in the light of future development. The South East Midlands LEP *Economy Naturally* highlights that there are also economic benefits of SuDS as '*capital costs of traditional drainage are more than double the capital costs of SUDS, annual maintenance costs are 20-25% cheaper for SUDS, and SUDS cost around half of what a traditional drainage system would cost over a 60 year life span'.*

Water resources are also currently under pressure. The South East Midlands gets 25% less than national average rainfall. There is nowhere in the South East Midlands where more water is available

[35] Natural England (2012) Natural England, Health and Natural Environments
[36] Natural England (2012) Natural England, Health and Natural Environments
[37] MKC (2014) Plan:MK Topic Paper - Issues Consultation Climate Change and Sustainability
[38] AECOM (2016) Milton Keynes Local Flood Risk Management Strategy

for further abstraction, and some areas, including the only water resources available in Milton Keynes are actively over-abstracted. This pressure is likely to be exacerbated by the increased growth and climate change, which is likely to lead to longer drier summers. Holding back winter rainfall in woodland and wet permanent grassland habitats will mitigate the longer dry summer's effect regarding crop growing and the concentration of pollution in water by increasing summer water flows.

Meeting the need:

Development should take a strategic, integrated approach to managing water that makes best use of GI led SuDS and identified opportunities for water reuse.

We will undertake further work to identify where spatial opportunities for utilising GI led SuDS have the greatest potential to deliver multiple benefits.

GI in urban areas can improve water quality by reducing diffuse pollution through enhanced sediment retention. Additionally, vegetation can intercept aerial drift of pesticides. For example, biodiverse SuDs, including reedbeds and green/brown roofs can improve water quality and reduce pollution.

Measures to manage water should be designed to maximise biodiversity benefits.

Urban trees can provide significant water quality benefits including storage and interception of rainfall, filtering of pollutants in the canopy and infiltration at the root zone.

8.7 Long term management of assets

As with any infrastructure asset, effective ongoing and long term management, including incremental renewal, is needed to ensure that it functions effectively. The same is true for blue and green infrastructure. To ensure that it maximises the social, environmental and economic benefits there needs to be a long term strategy for actively managing the borough's GI. The city of Milton Keynes is fortunate that the city founders had this foresight, and in 1992 the independent Parks Trust was established. The Trust owns and manages most of the cities green spaces, using the return from a substantial property and investment portfolio endowment. This has meant that the GI can, to a large extent, be managed without having to compete for funds against other council priorities as with most other places. It also facilitates the management of green spaces as a network rather than individual sites.

Previously, all new developments in Milton Keynes were required to enter into agreements with the Parks Trust regarding the design and long term management of green spaces. It was common practice that all new developments in Milton Keynes were required to enter into agreements with the Parks Trust regarding the design and long term management of green spaces. Developers are no longer required to enter into this agreement; however, the Parks Trust still remains a suggested land management contractor by the council. This approach potentially presents some challenges to continue to manage the GI as a network as more parties, with differing priorities, might be involved.

Across the rest of Milton Keynes it is also clear that MKC are going to have to work with more stakeholders, including private land owners, environmental charities and other public sector partners to provide long term stewardship of the natural environment at a landscape scale.

Meeting the need:

Where and when appropriate the Council will seek a GI management plan demonstrating how GI connects into, and managed in line with, the wider GI network as well as the principles outlined in this strategy.

Developers are encouraged to work closely with the MK Council and the Parks Trust early in the design process to identify GI needs and design, as well as enabling the long term management of the green spaces to be taken over by the Parks Trust, as part of developer contributions.

We will work with partners to enhance the wider landscape value, habitat provision and biodiversity across MK, with particular emphases on the Biodiversity Opportunity Areas.

8.8 Economic sustainability

Although Milton Keynes benefits from the Parks Trust investments, the continued management and investment into GI will increasingly require greater financial support. Opportunities to capitalise on the natural environment and diversify income generation will make the future of GI more robust. The South East Midlands *Economy Naturally* highlights that despite a wide range of natural and historic attractions, data mapping spent by visitors to the natural environment shows comparatively low spend levels for this area compared to other areas of England. This suggests that there is considerable potential to make more of what we have.

Meeting the need:

We will work with partners to identify opportunities to diversify revenue streams from the natural environment. This could include projects to enhance the outdoor tourism offer, developing outdoor pursuit centres such as for mountain biking in woodlands or promoting local produce more readily within the city such as through farmers markets selling local produce.

We will also work to develop an effective system of biodiversity accounting to be taken into consideration within new build developments.

9. Strategic Green Infrastructure Priorities

This section sets out the strategic green infrastructure priorities for the borough over the course of Plan:MK to 2031, as illustrated in Figure 5.

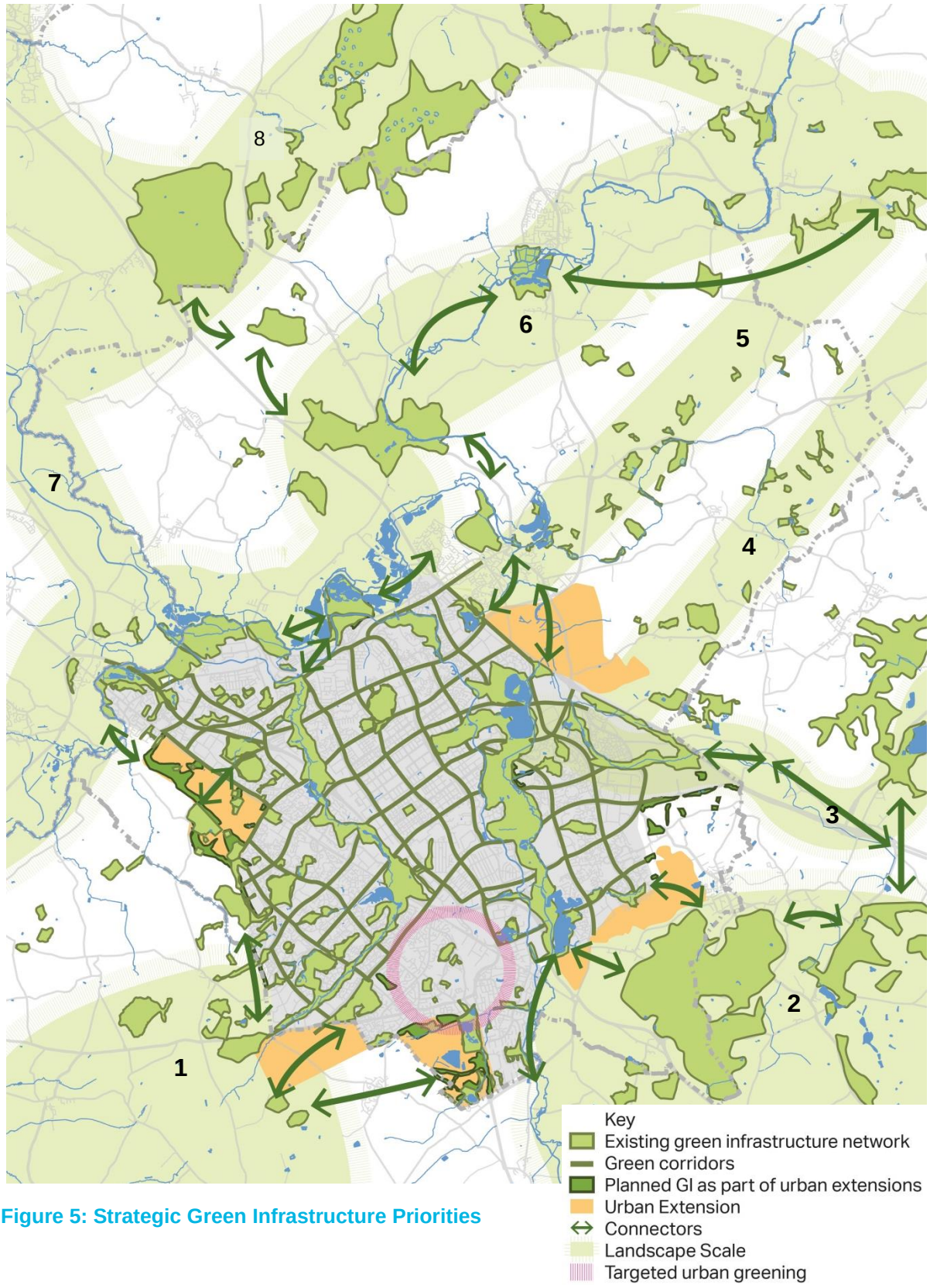


Figure 5: Strategic Green Infrastructure Priorities

9.1 Integrating Green Infrastructure into Development

Planned Growth

In addition to the growth planned to complete the current city centre grid, there are a number of proposed urban extensions. Some of these, such as the Western Extension already have GI opportunities proposed. These are highlighted in Figure 5 as '*planned GI as part of urban extensions'*. Most of the other urban extensions are not yet developed enough to have indicative GI proposals developed. In these areas, new development should deliver GI to accommodate the demand from future populations in line with the standards set out by Fields in Trust as below and with the catchments and use standards set out for each typology in section 3. Were space cannot be accommodated on site, developer contributions should be made to create, enhance and manage space elsewhere in order to be able to accommodate the additional pressure from the growing population.

Type	Area ha per 1,000 population
Playing Pitches	**1.2**
All outdoor sports	**1.6**
Parks	**0.80**
Amenity Green Space	**0.60**
Natural and Semi-natural space	**1.8**

All new development in MK should also demonstrate how it provides a net gain in green infrastructure to support a net gain in biodiversity, manage drainage and improve movement. Furthermore GI in the urban extensions will have an important role to play in transitioning from the strong post-war urban GI character of the city into the rural and frequently historic countryside beyond. They will also provide opportunities for enhancing connections between existing GI assets.

New development should clearly demonstrate how GI is to be delivered and managed through the Design and Access Statements accompanying planning applications.

New development though the Biodiversity Impact Assessment Metric should provide opportunities for strategic scale Green infrastructure that will enhance ecosystems services in the 'landscape scale' priority zones, based on the BOAs and identified in Figure 5.

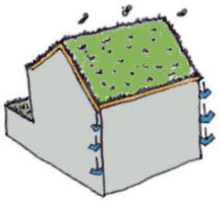
All built up areas

There are numerous ways of integrating GI into the built environment. Although space is often at a premium, smaller scale opportunities can provide a significant collective benefit. Opportunities should be sought to integrate GI into building design and all development should prioritise the use of SuDS in managing surface water. Further work will be undertake to identify where SuDS can be retrofitted into the public realm to help reduce surface water flood risks and improve water quality

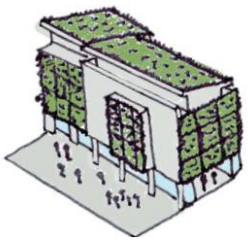
Building Integrated GI

As urban densities increase, there is increasing interest in integrating green infrastructure into buildings. This can have great benefits including providing out door space for residents, enhanced biodiversity, improved insulation and surface water management (and potentially non-potable water reuse). There are a number of different types of building integrated green infrastructure:

- Intensive green roofs – These spaces are more akin to roof gardens. They include substrate of a depth between 150 and 450mm to support a range of lawns, perennials, shrubs and trees. As the most intensive areas, they are heavy at around 180-500kg/m2 and will require the most irrigation, however they are also likely to provide the greatest community and environmental benefit.

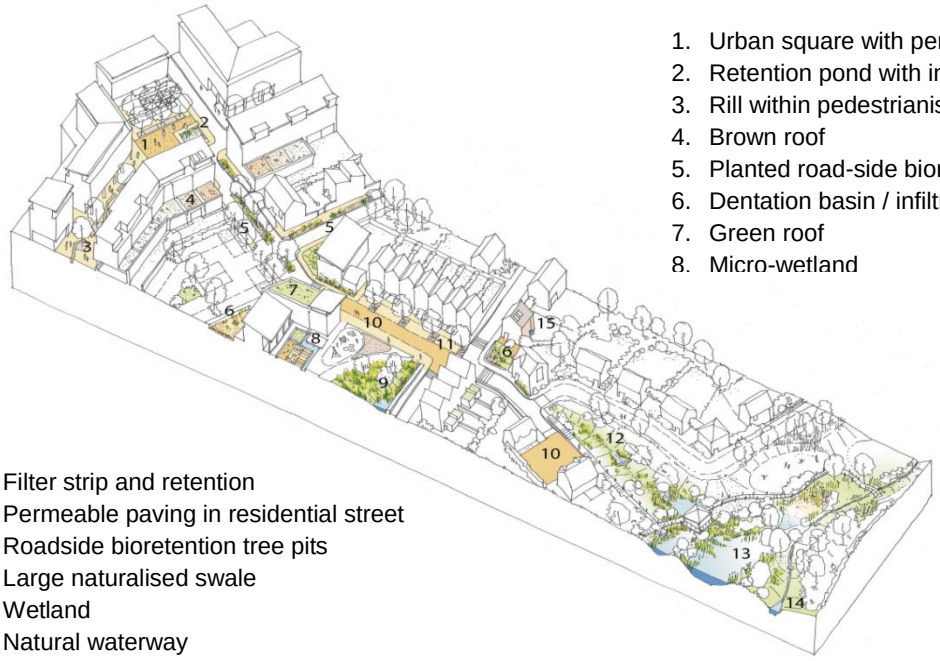


- Semi-intensive green roofs – These roofs have less substrate, up to around 200mm and are really designed as ecological green roofs rather than for people. With grasses, herbs and shrubs they still require some access and maintenance with periodic irrigation.
- Extensive green roofs – The lowest cost green roofs have as little as 60mm of substrate and generally support mosses, sedum and grasses. They require little maintenance or irrigation.[39]
- Brown roofs – another low cost option, brown roof are predominantly designed for invertebrates these are stony / rock covered areas. They are useful in attracting a number of bird species.
- Blue roofs – These are green roofs that are specifically designed to hold back surface water. Water can be held in the roof structure itself or channelled to tanks where it could be treated for reuse to flush toilets or for irrigation.
- Green / living walls – These incorporate either modular soil or hydroponic systems to create vertical gardens with a rich variety of plants. There are also a number of other smaller devices, such as bird/bat boxes and insect hotels that can increase the opportunities for biodiversity within developments.



SuDS in the Public Realm

One of the biggest drivers for increasing GI in the public realm is to support the sustainable management of surface water, by slowing the flow of water to the sewer network and cleaning the surface water before discharging into the natural environment through SuDS. There are a wide variety of different types of SuDS including those that promote infiltration into groundwater, attenuation to slow the flow of movement and conveyance in order to move water around. SuDS can also be delivered on almost all sites through careful design, including steep or shallow gradient sites and even contaminated sites. Ideally SuDS should be used in conjunction with each other. This is known as the 'SuDS train' and improves the performance of the overall network. The illustration below from CIRIA's '*Planning for SuDS'* highlights how SuDS can be integrated into the urban environment. Appendix A also provides more details about the application of different type of SuDS. Delivering SuDS is particularly important for Milton Keynes to increase surface water management and increase capacity in the sewer network in order to enable growth.



1. Urban square with permeable paving
2. Retention pond with integrated seating
3. Rill within pedestrianised street
4. Brown roof
5. Planted road-side bioretention strips
6. Dentation basin / infiltration trench
7. Green roof
8. Micro-wetland
9. Filter strip and retention
10. Permeable paving in residential street
11. Roadside bioretention tree pits
12. Large naturalised swale
13. Wetland
14. Natural waterway
15. Water butt

Figure 6: Integrating SuDS into urban areas (adapted from Planning for SUDS (CIRIA 2010))

[39] Adapted from the International Green Roof Association http://www.igra-world.com

9.2 Grid Roads

Urban areas can often be a barrier for the movement of flora and fauna, limiting their ability to forage and find mates. Milton Keynes' unique grid road network have, however, been identified as wildlife corridors. These highly vegetated areas provide excellent opportunities to enable wildlife, as well as people, to move around the city and from and too the countryside. As many of these routes were planted at the same time, much of the vegetation is reaching maturity together, reducing the biodiversity value of these corridors. Similarly they are also frequently made up of a limited pallet of plants, many of which are more ornamental, reducing their biodiversity value.

The Parks Trust, which manages the vegetated curtilages of the Grid Roads, is embarking on plans to improve the biodiversity of these routes through increased active management of thinning and restoration of the understorey in more wooded areas and improving the species mix of ground floras. Actions to improve the biodiversity of the grid roads could including actions including-:

- Thinning or selective coppicing to allow climax species to reach maturity or to provide a more open structure to stimulate growth and increased species diversity within the shrub and field layer;
- Selected clearance within overcrowded planting and woodland blocks creating new ecotones such as glades along with opportunities for new tree planting;
- Clearance of ornamental shrub beds with the aim to provide more natural ecotones from tall to low canopy woodland and woodland edge. The woodland edges will contain a higher percentage of shrub layer species, creating greater diversity within the planting mix along with complementary ecological benefits to the higher canopy woodland;
- Replanting with new stock selected to ensure that the future age and species diversity is able to fulfil the ecosystem services required and provide the grid roads with the resilience to deal with future climate change and future threats from pests and disease; and
- Installation of species-rich grasslands and wildflower plantings linking the woodland blocks, increasing habitats for important pollinators such as insects and invertebrates. Appendix B sets an example species rich grassland mix.

9.3 Connect missing links

Figure 5 highlights a series of important green infrastructure connections that are needed to complete missing links. This links highlight the shorter term priorities for delivering GI initiatives to help connect existing areas of GI and GI assets together, provides a continuous network of accessible GI around MK and important links out into the wider countryside. They include:

- North – To the north of the city there are a number of historic assets and areas of improved grass land that are not currently connected into the overarching green infrastructure network. There are also a number of lakes. Completing the links with an extension of the Linear Park network into the area around Lindford Lakes would improve the connecting across the north and down into the centre of the city.
- West – Green infrastructure along the western flank of the city is currently fragmented. There is potential to improve the links between the fragments of ancient wood land and extending out towards Whaddon Chase.
- South – It is important that development within Aylesbury Vale, but adjacent to the city, connects into the overarching green infrastructure network and linking around to the Blue Lagoon nature reserve. We will work with partners at AVDV and through the NEP with the ambition of continuing the liner park network into this area.
- South east – The urban extension to the south east of the city can play an important role providing links from the city into the extensive areas of woodland and green belt around Woburn.
- East – The River Ouzel flows through the proposed eastern urban extension. It will be important for all development to respect this corridor, providing a buffer from any flood risk and using green space to reduce the risk of pollutant run off into the river. This provides a opportunity to further extend the Linear Park network.

9.4 Preparing for longer term growth

Figure 5 also identifies broad areas of 'landscape scale' opportunities areas. Although there is a presumption against large scale development in across the rural areas of Milton Keynes, delivering the million homes across the Cambridge-Milton Keynes-Oxford Arc is likely to require significant greenfield development. The scale and ambition of development needs to be met with equally ambitious plans for enhancing green infrastructure, including the creation of strategic scale natural and semi-natural habitats that are primarily for biodiversity, as well as continued efforts to strengthen the broader landscape value through smaller interventions.

The 'landscape scale' opportunities presented here are broad areas of search that identified taking into consideration the Buckinghamshire and Milton Keynes Biodiversity Opportunity Areas as well as connecting with key links from neighbouring authorities. As the area is targeted for growth in the future, these areas will provide access to high quality greenspace and protect important historical assets. To a large extent, they form a matrix following the major water courses and woodland networks on the ridges, these include:

1. Whaddon Chase – Extending into Aylesbury Vale this distinctive historic landscape, once a royal hunting forest, provides major wildlife, access and heritage restoration and creation opportunities. There are also opportunities to improve the existing links between settlements and new communities. We will work with colleagues at AVDC and with the NEP to continue to restore this habitat and ensure that development on the southwestern edge of the City incorporates GI that respectfully transitions into this historic countryside.

2. Greensand Ridge and River Ousel – Enhancements across the Greensand Ridge will help strengthen the cross boundary GI network into Bedfordshire. This is area is already a very popular for outdoor recreation. The high numbers of visitors is putting a pressure on the exiting woodland, reducing its ecological value. Opportunities for woodland habitat creation and enhancement would provide alternative spaces to reduce pressure and include more restricted areas primarily for biodiversity. There is also a network of acid grassland which could be extended and with the underlying geology, improve the biodiversity of some of the agricultural areas with health and sandy grassland habitats. The River Ousel flows south from the city along the edge of the Greensand Ridge. This area is likely to be developed over the longer term and is likely to be crossed by a proposed Expressway Road connecting the Cambridge-Milton Keynes-Oxford arc. It will be important to maintain connectivity along this route, with habitat enhancement providing opportunities for improved flood water retention.

3. Waterway Park - The project will connect the Grand Union Canal at Milton Keynes with the Great Ouse River at Bedford. This will create Britain's first major waterway in a century and providing a cross-country link that connects east and west, opens up the Marston Vale region, and linking amenities and opportunities for communities in the rapidly-developing Milton Keynes South Midlands area. In addition to creating canal-side habitats, there are many opportunities for economic development and developing an enhanced tourism offer for the Borough.

4/5. These smaller corridors link several smaller patches of woodland and contain a dense network of brooks and drainage channels. Opportunities to link these areas.

6. Great River Ouse Corridor – The Great River Ouse flows down from Bedfordshire and meanders through the Borough and past Emberton Country Park from which the river valley widens and flows into the city. This area includes some areas of high quality habitat including calcareous grassland and grazing marsh, although overall habitat diversity could be enhanced. Enhancement of the corridor could provide an important water management function, helping store water upstream to reduce downstream flood risk, and help reduce the nitrification resulting from surface water flowin off agricultural land. Although there are a number of riverside walks that can be accessed from Stoney Stratford access to the river for recreation could be improved. Linking existing habitats and restoring riverine habitats could provide the opportunity for the creation of a large scale ecological reserve of national significance. This area would be primarily for ecological benefit, but could also attract visitors to the area for eco-tourism.

7. Grand Union Canal and River Trove Corridor – Branches of the Grand Union Canal extend from Long Eaton near Nottingham and Birmingham and connect to Daventry before flowing to London through Milton Keynes. This has historically been an important trade route and continues to be an important recreation and tourist attraction. The River Trove tracks alongside the Canal, to the north of the city forming the boundary of MK Borough boundary. Again opportunities for riverine

habitat enhancement and measures to reduce nitrification are important as well as improving connectivity up to Yardley Chase.

8. Yardley Chase to Grafham Water – This wooded ridge extends into Northamptonshire and incudes the important Yardley Chase and Salcey SSSIs. The area has historic value as a former Norman hunting ground and more recent military activity and disused railway has created a patchwork of habitats with calcareous grassland glades and open pools within the forest areas. It extends along a ridge across north Milton Keynes into the north west of Bedfordshire and into Cambridgeshire linking a number of green infrastructure assets. There are large blocks of established woodland which provides a distinctive landscape feature on the ridge. Connecting the existing woodland through extensive woodland planting would enhance this feature, enabling new opportunities for outdoor recreation whilst protecting older areas of woodland where the biodiversity value is likely to be higher. This woodland creation, along with the establishment of permanent wet grassland will help reduce downstream flood risk and provide water storage that could be utilised in warmer weather. This could also provide the basis for a strategic scale ecological reserve.

10. Delivering the strategy

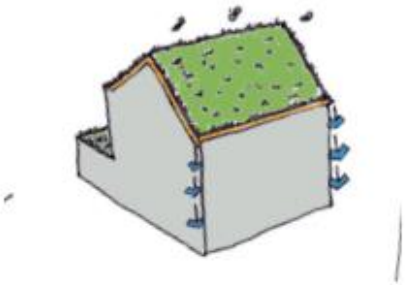
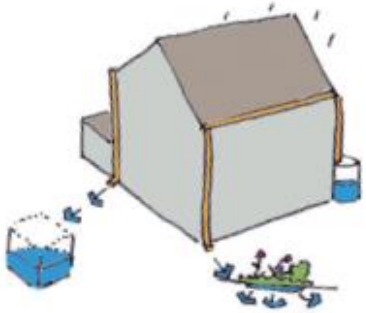
This strategy sets out the strategic priorities and needs for GI across our borough. It will be used to help inform the policies in Plan:MK and provides more details as to the principles by which GI should be delivered across the borough. It sets a strategic framework for targeting GI enhancement and sets out requirements for integrating GI into the urban areas through new development.

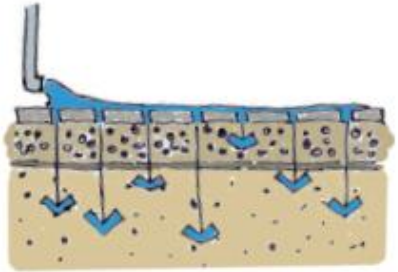
The guidance within this strategy will have a key role to play in development management. It provides a clear requirement that new development helps to provide a connected and integrated GI network that provides a net gain in biodiversity. This space should reflect the special character of the post-war city landscape but also help define the transition into rural areas where appropriate. Where developers cannot provide GI on site, then there is an imperative for developer contributions to help create, enhance and manage spaces elsewhere in the city to accommodate the increase in population pressure on these assets.

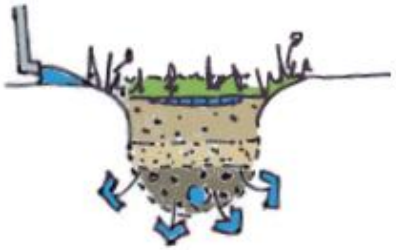
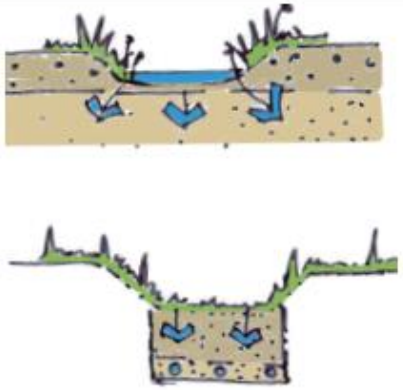
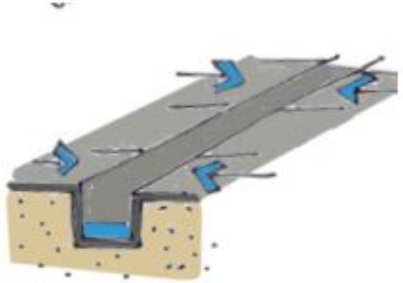
We recognise that delivering this strategy will require ongoing effort and collaboration across a wide range of stakeholders. This might include collaboration with:

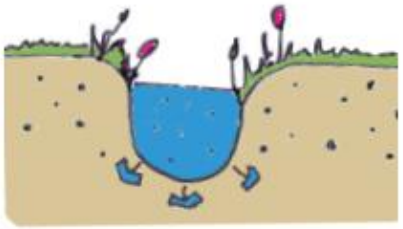
- The NEP, which MK Council support and are continuing to develop strategic GI opportunities;
- Parks Trust, who manage a significant proportion of GI in the city;
- Neighbouring authorities, which we will need to coordinate with to ensure cross boundary links are maintained and enhanced;
- Landowners and farming community, who can help play a significant role improving rural biodiversity and help connect GI assets;
- Developers, who through building new communities have a responsibility to provide high quality GI that connects into and enhances the existing network; and
- Local communities, who we encourage to help manage their local GI through volunteering and creation of habitat within their private spaces.

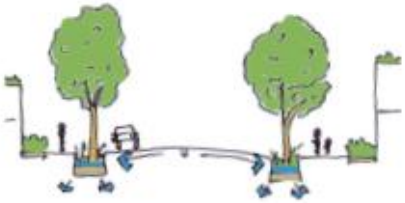
Appendix A: SuDS Typologies

Typology		Description	Required area
Green/Blue Roofs		Where it is structurally possible, replacing conventional roof coverings on sheds or building roofs will not only provide temporary water capture; slowing down how quickly rainwater reaches sewers, it also provides habitats to encourage biodiversity and is aesthetically pleasing. Green roofs also reduce energy costs throughout the year providing insulation in the winter and cooling in the summer.	Building integrated
Green Walls		Also known as living walls, can either be retrofitted onto existing façades, or for new builds actually form part of the external structure. The wall structure usually provides a substrate with an integrated irrigation system. Green walls often have high water demand, so for efficiency are often connected to rain water collection tanks. Some interlinked systems can use gravity fed irrigation. For longevity it is crucial that the plant species selection takes into consideration the location of the wall, but can be used in numerous situation both externally and internally.	Building integrated
Rainwater Harvesting		Water storage tanks such as water butts can be connected to downpipes to collect roof runoff during storm events which can then be used for non-potable purposes such as watering gardens or cleaning cars at a later time. Water bills are reduced through water savings made.	Water storage (underground or above ground).

Soakaways		A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	Dependant on runoff volumes and soils.
Filtration strips		Filtration strips are grassed or planted areas that runoff is allowed to run across to promote infiltration and cleansing.	Minimum length 5 metres.
Permeable paving		Replacing previously concreted or impermeable public spaces with paving which allows water to soak through gaps between solid blocks or through the use of porous paving materials which filter and slow down water as it passes through to the ground or to drains, Water can be stored beneath the surface and be allowed to slowly infiltrate the ground or into storage systems.	Can typically drain double its area.

Bioretention area		Vegetated areas with permeable layers such as sand or gravel which have been designed to channel, filter and clean water. Water is collected and passes down through these layers into the ground or drain below or can drain into a perforated pipe to be conveyed elsewhere. These can be connected to onstreet raingardens as part of a network resulting in the collection of less polluted water which otherwise impacts waterways and waterbodies.	Typically surface area is 5-10% of drained area with storage below.
Swale		Shallow channels or depressions in the ground which have been specifically designed to convey and filter water. Swales can be designed to be either wet, where water is temporarily stored above surface or dry, where water is allowed to infiltrate down to a gravel layer under the surface. Swales support biodiversity as well as provide attractive areas that bring multiple ecosystem benefits as well as flood risk reduction.	Account for width to allow safe maintenance typically 2-3 metres wide.
Hardscape storage		The use of rills in hard landscapes adds interest and design features as well as allowing for the conveyance of water. Includes hard edged channels designed to allow water to flow down them which can be connected to areas of planting or to other SuDS features.	Could be above or below ground and sized to storage need.

Pond/basin		Ponds can be used to store and treat water. 'Wet' ponds have a constant body of water and run-off is additional, while 'dry' ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration into the ground or to store water for a period of time before discharge.	Dependant on runoff volumes and soils.
Wetland		Shallow vegetated water bodies which can, depending on where they are implemented, have different water levels. It is important to plant the wetlands with plant species that are capable of water filtration as this is an important opportunity presented by a wetland. Water flows through the wetland, being treated as it passes through the vegetation until it is discharged. There are opportunities to integrate wetlands at varying scales into both natural and hard landscapes.	Typically 5-15% of drainage area to provide good treatment.
Underground storage		Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation. This feature, however, does not provide the wider benefits that other green SuDS do, and should be viewed as a secondary option.	Dependant on runoff volumes and soils.

Street trees (with bioretention areas)		Planting of more street trees will not only contribute to improved air quality, improved flood risk management but also make the street more aesthetically attractive. It will be important to ensure that new street trees planted have low VOCs and are not planted in a way that traps pollution.	Can be designed to fit the width and pavement.
Raingardens		Small temporary water storage tanks and ponds which support aquatic flora and fauna can be connected to disconnected downpipes or incorporated into onstreet tree pits. Raingardens collect and temporarily store water during storm events. Creating a network of raingardens allows for greater collection, filtration and redistribution opportunities. They are attractive features which can transform the look of a garden or entire street. In some cases, they can even be used as traffic calming measures.	Can be designed to fit the space available.

Appendix B: Example Species Rich Grassland

The biodiversity of areas of open grassland could be improved through the introduction of a species rich grassland mix. The following mix is provides as an example:

20% Wildflowers

%	Common name	Species
1	BIRDSFOOT TREFOIL	LOTUS CORNICULATUS
11	BLACK KNAPWEED	CENTAUREA NIGRA
6	BLACK MEDICK	MEDICAGO LUPILINA
1	COMMON VETCH	VICIA SATIVA
12	MEADOW BUTTERCUP	RANUNCULS ACRIS
1	MUSK MALLOW	MALVA MOSCHATA
12	OX-EYE DAISY	LEUCANTHEMUM VULGARE
5	RIBWORT PLANTAIN	PLANTAGO LANCEOLATA
11	RED CAMPION	SILENE DIOICA
5	SALAD BURNET	SANGUISORBA MINOR
15	SELF HEAL	PRUNELLA VULGARIS
12	WHITE CAMPION	SILENE ALBA
8	YARROW	ACHILLEA MILLIFOLIUM
100		

80% Grasses

%	Common name	Species
5	BROWNTOP BENT	AGROSTIS CAPILLARIS
25	RED FESCUE	FESTUCA RUBRA
20	CRESTED DOGSTAIL	CYNOSAURUS CRISTATUS
20	CHEWINGS FESCUE	FESTUCA COMMUTATA
20	HARD FESCUE	FESTUCA TRACHYPHYLLA
10	SMOOTH STALKED MEADOW GRASS	POA PRATENSIS
100		

Note: species mix is dependent on site specific soil type and nutrient value. Each site should be individually tested to make sure species mix is suitable.