# OPDC Biodiversity and Urban Greening Strategy

## Executive Summary

Old Oak and Park Royal (OPDC) is defined by its townscape and buildings yet amongst this dense urban fabric, is a historic and diverse natural landscape that offers significant opportunity for public realm improvements alongside wider regeneration proposals.

High quality buildings and public realm are essential to ensuring good growth and a distinctive, well connected landscape that supports green infrastructure assets, attracts investment and creates an exemplar place for people to live, work and visit.

This Biodiversity and Urban Greening Strategy explains how biodiversity and green infrastructure should inform the design of new buildings and public realm improvements in OPDC to enhance, protect and maximise opportunities to create a living natural network.

## Context

The supplementary planning guidance is aimed at informing developers and their professional consultants on best practice techniques and design guidance for developments in OPDC.

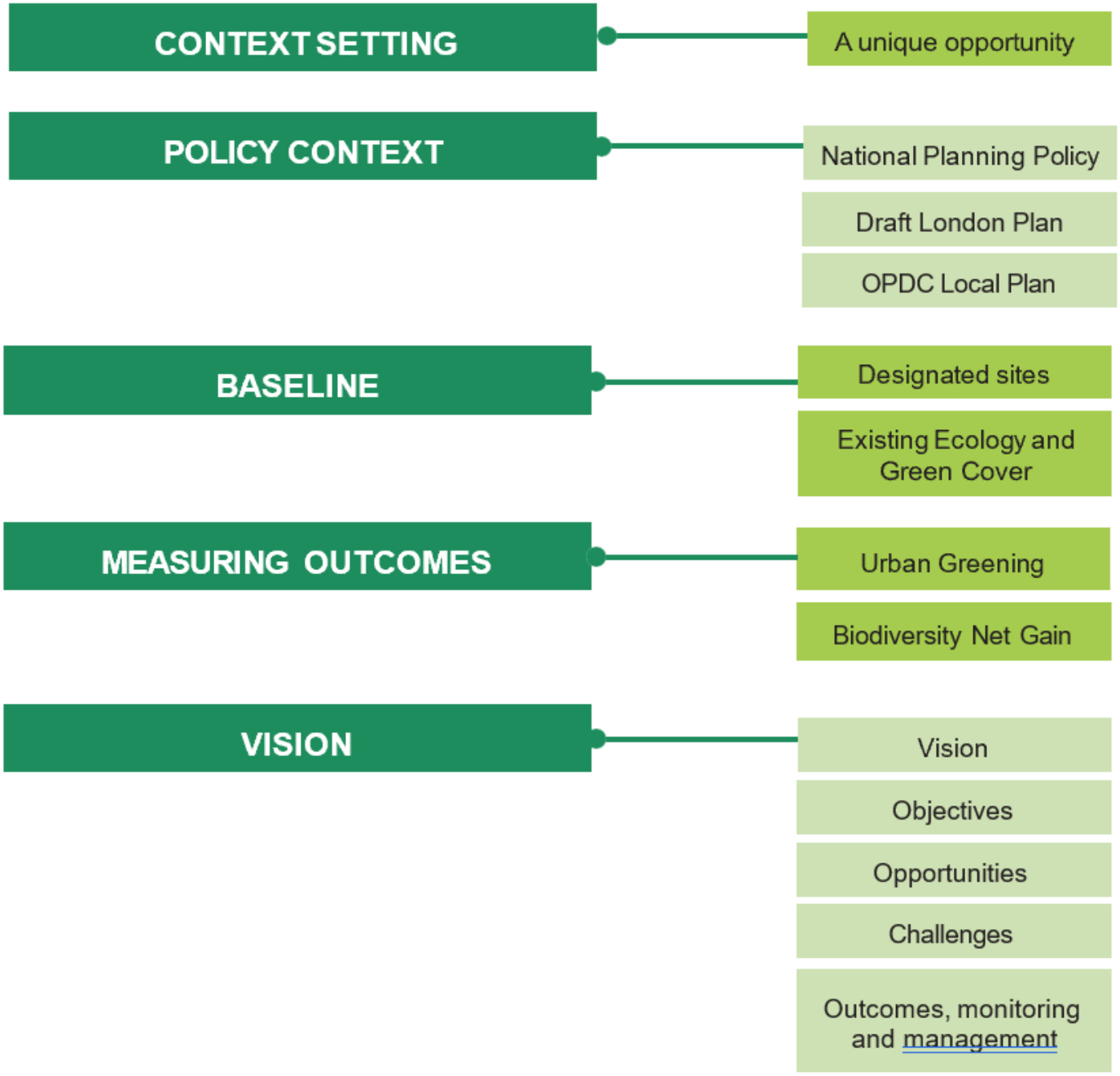
This includes an holistic approach to wider regeneration in OPDC and the surrounds; the preservation and enhancement of existing and historic
ecological habitats; and, strategic environmental goals on biodiversity net gain, urban greening and climate change adaptation.

This Biodiversity and Urban Greening Strategy provides the robust baseline study to support the development of a Public realm and green infrastructure Supplementary Planning Document (SPD). Both documents will support decision makers on ensuring the design quality of new development.

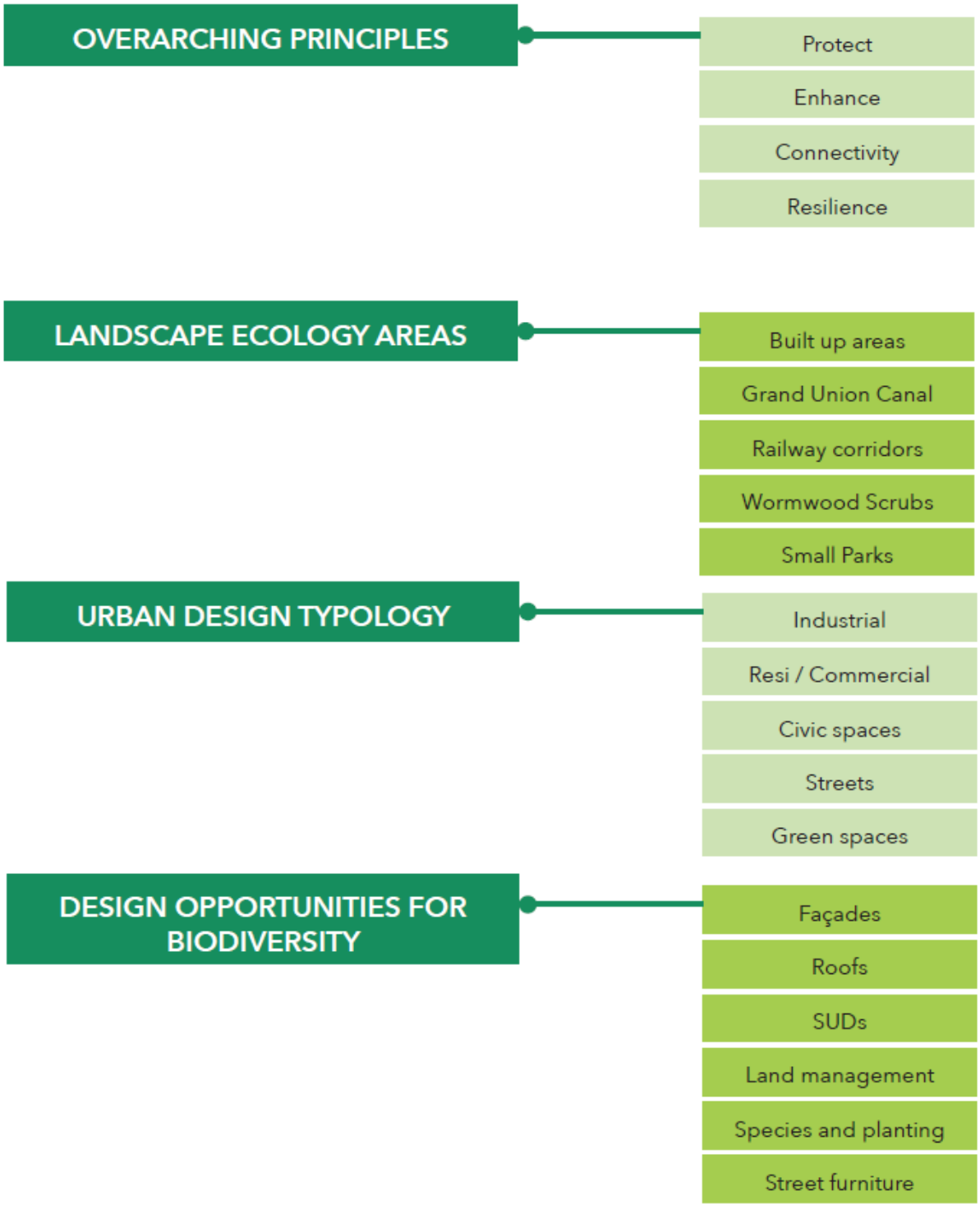
# How To Use This Document

## Contents

Section One sets out the vision and objectives to ensuring biodiversity is integrated into new developments within OPDC, and recognises the challenges in delivering and maximising opportunities for biodiversity protection and enhancement. It also sets the ecological context for OPDC with information on current biodiversity and vegetation cover and explain the metrics and targets that will be used to measure outcomes.



**Section Two:** identifies a series of overarching design principles that underpin the aims and objectives of the Biodiversity and Urban Greening Strategy and how good design will be measured. This is followed by five Landscape Ecology Areas (LEAs) illustrating the baseline character, conditions and opportunities for integrating biodiversity. The urban design typologies and opportunities set out how developers should be successfully integrating biodiversity into their developments.



## A Unique Opportunity

Plans for redevelopment in OPDC offer a unique opportunity to undertake a comprehensive programme of regeneration across the environment, and secure an overall increase in green cover through appropriate protection of existing habitats and the creation of new green networks.

Biodiversity should be integrated into the planning and design process from the outset rather than as an afterthought, and is crucial to creating diverse, multi-functional and climate resilient spaces that have their own distinct identity and sense of place.

*Figure 1: New marshland created on the edge of East Village, Stratford (credit: Rosie Whicheloe)*

# Policy Context

This Biodiversity and Urban Greening Strategy has been written in the context of existing and emerging legislation on biodiversity including the Environment Bill (2019), and expands on the policies in the draft New London Plan (2019) and emerging OPDC Local Plan (2018), adopted London Plan (2016) to ensure that opportunities to maximise environmental value are achieved.

| | |
|---|---|
| We **govern** development through legislation: | The Planning and Compulsory Purchase Act (2004) and the Environment Bill (2019) |
| We **guide** development through policy: | The adopted London Plan (2016), draft OPDC Local Plan (2018) and draft New London Plan (2019) |
| We **measure** the success through metrics: | The DEFRA Biodiversity Metric 2.0 (2018) and Urban Greening Factor (2019) |

## National planning policy

Under the National Planning Policy Framework (NPPF, 2019) environmental objectives are focused on protecting and enhancing our natural environment by helping to improve biodiversity, making effective use of land, minimise waste and pollution, mitigate and adapt to climate change and moving towards a low carbon economy (NPPF para 8).

New developments are expected to provide appropriate and effective landscaping; be sympathetic to the local character including landscape setting; establish or maintain a strong sense of place; optimise the potential of the site to accommodate and sustain an appropriate amount and mix of development including green and other public space; and create places that are safe, inclusive and accessible and promote health and well-being (NPPF para 127).

In delivering consistent and high quality design, policies and decisions will be expected to enhance the natural environment by minimising impacts on and providing for biodiversity net gain (NPPF para 170), and pursue opportunities to secure biodiversity net gain by promoting conservation restoration and enhancement of priority species (NPPF para 174). Biodiversity improvements in and around developments should be encouraged and developments that conserve or enhance biodiversity supported (NPPF para 175).

This Biodiversity and Urban Greening Strategy supports and provides further detail to OPDC Local Plan policies and wider London and Local Plan goals. It should be read in conjunction with these and other documents including:

- The 25 Year Environment Plan (2019)
- The London Environment Strategy (2018)
- Old Oak and Park Royal Opportunity Area Planning Framework (2015)

# Regional Polices

The following section draws out the main policies in the emerging strategic and local planning policy documents, and sets out the context within which this Biodiversity and Urban Greening Strategy study has been developed.

## Draft London Plan / Consolidated Version (July 2019)

Policy EU2 Urban Greening and Biodiversity
Proposals will secure the delivery of a high quality green infrastructure and open space network that enhances the overall quality of the environment.

Policy D1 London's Form and Characteristics:
Development proposals should respond to the existing character of a place by identifying the special and valued features and characteristics that are unique to the locality (Policy D1B.B.11). Developments that show a clear understanding of, and relationship with the distinctive features of a place are more likely to be successful (para 3.1B.7). Maximising urban greening and creating green open spaces provides attractive places for Londoners to relax and play, and helps make the city more resilient to the effects of climate change. Landscaping and urban greening should be designed to ecologically enhance and, where possible, physically connect, existing parks and open spaces (para 3.1B.13).

Policy D2 Delivering Good Design:
Master-plans and design codes should be used to help bring forward development and ensure it delivers high quality design and place-making based on the requirements set out in Policy D1B Part B Optimising site capacity through the design-led approach (Policy D2.A).

Policy G5 Urban Greening Factor:
The inclusion of urban greening measures in new development will result in an increase in green cover, and should be integral to planning the layout and design of new buildings and developments. This should be considered from the beginning of the design process (para 8.5.1). Borough's are expected to adapt the UGF to their local context.

Policy G6 Biodiversity and Access to Nature:
Boroughs, in developing Development Plans, should: use up-to-date information about the natural environment and the relevant procedures to identify SINCs and ecological corridors to identify coherent ecological networks (Policy G6.B.1).

## OPDC Local Plan

Policy SP2 Good Growth
Proposals should b) deliver a low carbon and environmentally resilient development, that is adaptive to and resilient to climate change; and c) deliver the highest standards of place making, urban design and architecture (Policy SP2.b&c). New development will need to consider and demonstrate how it can best address the substantial environmental challenges facing the planet (para 3.7).

Policy SP6 Places and Destinations
Proposals should a) support a coordinated and phased approach to place making that ) creates a series of high quality and distinctive places (Policy SP6.a.i)

Policy SP8 Green Infrastructure and Open Space
Proposals should deliver and/or positively contribute towards a varied, well-designed, integrated and high quality green infrastructure and open space network (Policy SP8).

Policy EU2 Urban Greening and Biodiversity
Proposals will secure the delivery of a high quality green infrastructure and open space network that enhances the overall quality of the environment.

## Designated Sites

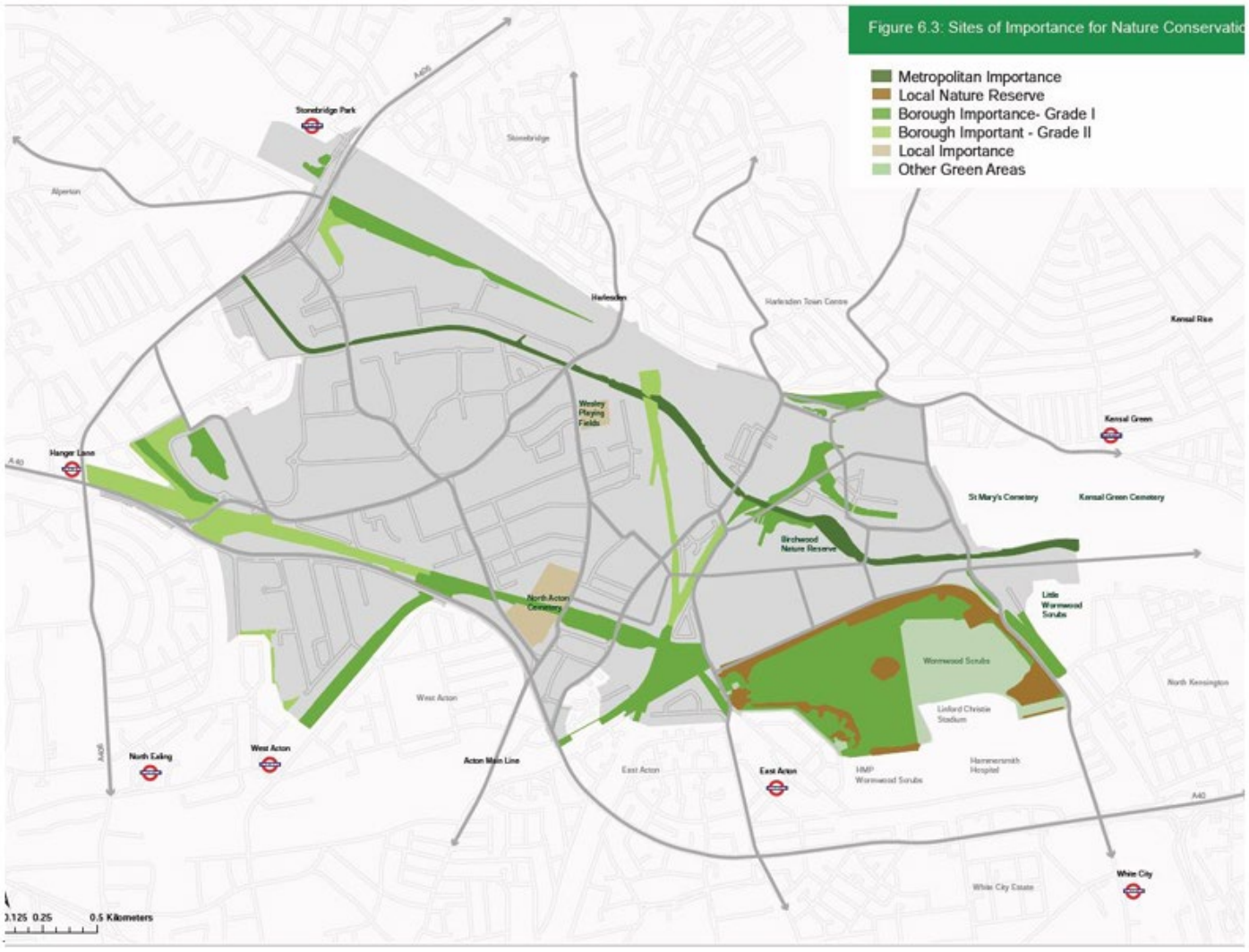
Wormwood Scrubs
47ha, of common land comprising maturing woodland, scrub and meadows supporting good populations of butterflies, common lizards and nesting birds. It is also valued as a bird migratory stop over in spring and autumn. Partly designated as a statutory Local Nature Reserve

North Acton Cemetery
A cemetery with areas of quite flower-rich grassland and scattered trees providing additional habitat.

Grand Union Canal
London's canals support a wide range of aquatic and invertebrate flora, breeding waterfowl and diverse fish community. The network of canals fulfil an important function in allowing nature into heavily built-up environments.

Diageo Lake
An extensive landscaped park with a series of tiered lakes descending over broad weirs, planted with emergents and set within a mature garden.

Railway Line-sides
The network of railway lines which criss-crosses OPDC provides some of the borough's most important wildlife habitats. Rail-sides tend to be undisturbed, with only infrequent management and no public access. Rail side land thus provides excellent habitat for plants and animals, corridors for the spread of wildlife and, often, a pleasant and deceptively rural outlook for train travellers.



# Existing Ecology and Green Cover

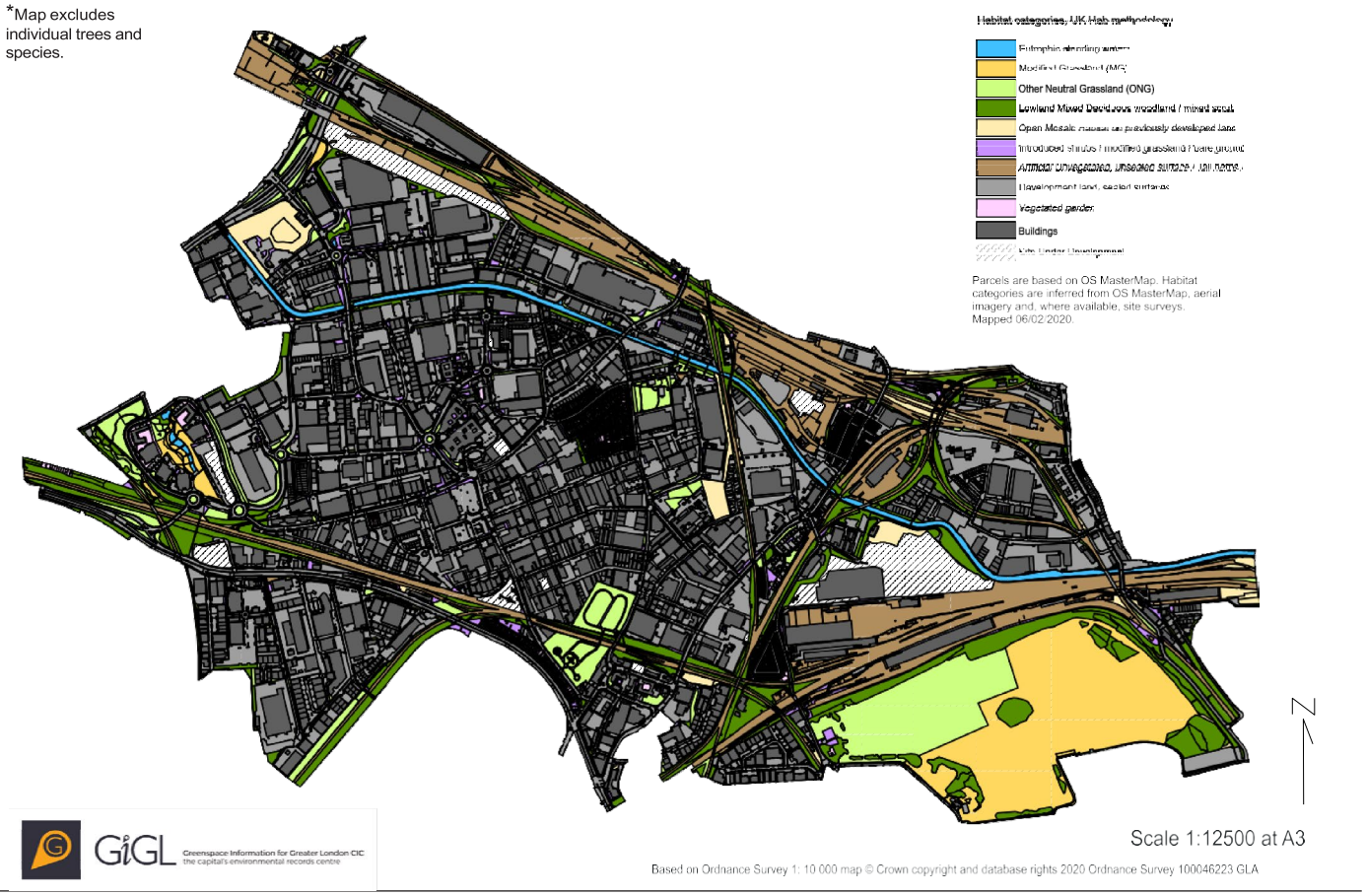
OPDC have produced a habitat map using the DEFRA Net Gain methodology in order to understand current habitat value and to set realistic targets to deliver biodiversity net gain. In collaboration with Green space Information for Greater London (GIGL) a map was produced based on a combination of field survey, remote sensing, existing open space data and OS Master-map. Existing habitats and areas in hectares (ha) are listed and shown on the map below. Detailed extracts of this map can be obtained from GiGL https://www.gigl.org.uk/.

Habitats: 2374.4 Biodiversity Units (area) - over 650ha

- Buildings: 163ha - 25%
- Developed land /sealed surfaces: 214ha - 33%
- Artificial unvegetated, unsealed surfaces: 78ha-12%
- Lowland mixed deciduous woodland/mixed woodland/mixed Scrub: 56ha - 9%
- Modified grassland: 39ha - 6%
- Other neutral grassland: 39ha - 6%
- Introduced shrubs/modified grassland/other neutral grassland/bare ground: 21ha -3%
- Open mosaic habitat on previously developed land: 13ha - 2%
- Vegetated gardens: 8ha - 1%
- Entropic standing waters: 7ha - 1%

Habitat Map

Biodiversity Net Gain baseline



# Biodiversity Net Gain and Urban Greening Factor

The Mayor's generic Urban Greening Factor has been adapted to OPDC to assist planners and developers in determining the appropriate provision of greening for new developments. The revisions to the GLA's UGF surface cover table is to encourage a greater take up of water-saving and reusing greening solutions. These are summarised below, with full details provided in the supporting Study.

- A new category called blue roofs included with a factor of 0.9
- A new category called intensive roofs without potable irrigation with a factor of 0.9
- Rain gardens and all vegetated SUDs increased factor from 0.6 to 0.8.

The Government's committed to make Biodiversity Net Gain mandatory through the planning system and for all new developments to deliver as a minimum 10% net gain. OPDC are adopting the use of the DEFRA metric to calculate net gain through the Local Plan.

Biodiversity net gain will be measured on a site by site basis, for each master-plan and planning application, but also on a district-wide basis, with a biodiversity net gain score for the whole OPDC area updated regularly (at least annually) to take account of approved developments.

## OPDC Targets

The urban greening factor will work to deliver the qauntum of greening that OPDC needs to deliver its vision, whilst the DEFRA Metric will ensure the greening delivered functions for wildlife as well as for people.

The OPDC target for Urban greening factor is 0.3 for industrial and 0.4 for commercial/ residential development. The revised OPDC surface cover type table should be used for all developments.

The OPDC target for delivering biodiversity net gain is a minimum of 10% for all developments.

Individual developments will be required to do their own pre-clearance baseline to provide a site specific and up- to-date version of the habitat BNG baseline map. Whilst this is not currently a planning requirement, it would be in the developer's best interest to avoid potential higher baseline scores and or understanding the sites suitability for protected and notables species as required to adhere to current legislation and national planning policy.

Fuller information is provided in the supporting study.

## Challenges

### Engaging stakeholders and professionals at the right stage

The developer should engage with competent experts and suitably qualified professionals throughout the planning, design and management process. To create habitats that thrive from a biodiversity perspective alongside any new urban context, an understanding of ecology and habitats is needed. Ecologists should help inform a developer's urban greening and landscape strategies to ensure the new ecosystem respects, where possible, the historic ecology of the area. The design of the development as part of the wider regeneration of OPDC should respond to the needs of the community, changes to the local micro-climate and underlying environmental conditions to create a resilient, connected, bio-diverse rich matrix of green-spaces that are connected and designed to get richer over time.

### Spatial and environmental change

Development and changes in urban form including density, massing and layout, puts natural systems under pressure and can result in climatic and biological impacts beyond the control of any management system in place. Protecting existing ecosystems and creating new ones will need to take into account the impact on the ecological network and its viability whilst tackling difficult conditions including wind speeds, atmospheric pollution, light and shade, soils, water, temperature and other factors that will be impacted by development.

### Fragmentation of habitats

The regeneration of OPDC can secure a diverse ecological network and high quality public realm that maximises opportunities to enhance biodiversity and establish OPDC as an exemplar for future urban development in London and the UK. The challenge is ensuring that developers contributes to the area wide strategy for green and blue networks rather than looking at sites independently. Failure to take a joined up approach to the protection of existing green spaces, habitat creation, water management, investment in ecological networks and the long term management of green infrastructure, will result in fragmented ecological networks and a poor quality public realm that does not achieve good growth, climate resilience, human and ecosystem health or biodiversity integration.

### Compensation versus enhancement and management

Under the Environment Bill, developments that cannot deliver 10% biodiversity net gain will first need to consider either off- site compensation or revisions to their design. Developments that cannot mitigate biodiversity net loss or where biodiversity units are unavailable to buy locally, developers must pay a cash tariff on their shortfall against net gain contributions. The challenge is ensuring that compensation over enhancement and management is not regular practice. Compensatory measures undermine strategic plans for biodiversity and green infrastructure improvements, limit opportunities for improving ecological connectivity, loss of control over long term management and the quality of public realm.

### LPA resourcing

Pressures on financial and human resourcing at local planning authorities has seen public planning moving away from a focus on policy making towards development management. This means that local planning authorities are understaffed and may not have suitably qualified professionals available to provide ad-hoc ecological, biodiversity or landscape advice as well as sufficient planning resources. A lack of suitable resources may mean that pre-application advice lacks understanding of the specialist ecology, landscaping and design issues that underpin the wider strategy for regeneration and public realm improvements across the OPDC area. A detailed review of the existing biodiversity has been commissioned and an analysis of the Biodiversity net-gain potential undertaken for different areas of the site to facilitate and inform design discussions.

### Viability

Biodiversity improvements and green infrastructure provision are essential to achieving a high quality public realm. However these often require expensive, season specific and independent assessments by suitably qualified professionals in the early stages of the planning and design process. Under the Environment Bill where there are genuine viability issues, urban brownfield sites which do not contain protected or priority habitats will not need to provide biodiversity net gain. Viability challenges may therefore impact the deliver-ability and connectivity of biodiversity and green infrastructure improvements unless stronger models for environmental objectives including legislation, guidance, metrics and developer contributions, are enforced.

### Appropriate for planning use

Planning plays an active role in guiding development towards sustainable development and solutions using a combination of legislation, policy, guidance and metrics. These tools guide the developer towards a series of interdependent and strategic objectives that ensure planning and design principles are understood rather than over-prescribed, public realm improvements are of a consistently high quality and that a foundation for pre-application discussions is easy to identify. The challenge is in ensuring that these planning and design principles are appropriately applied and interpreted.

## Outcomes, Monitoring and Management

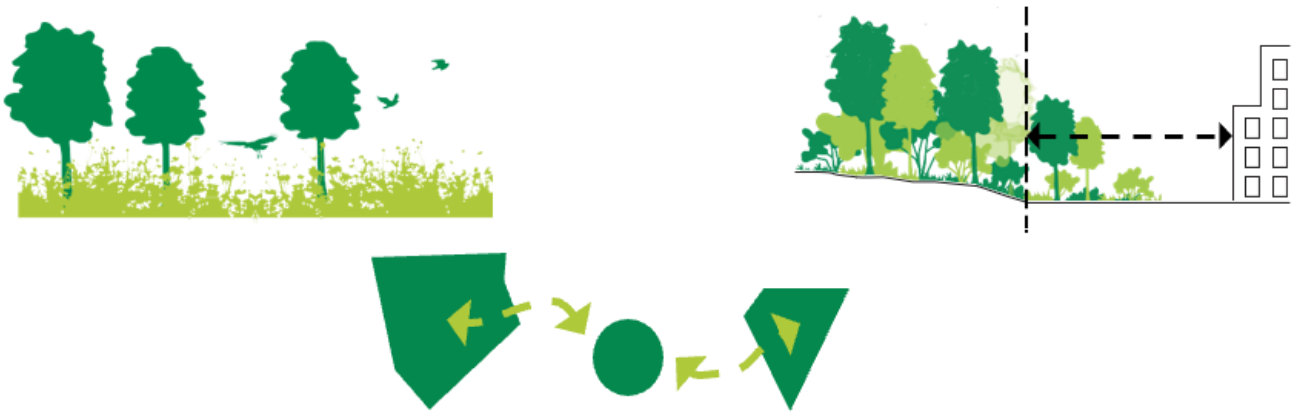
- Referring to the baseline evidence in this Biodiversity and Urban Greening Strategy and Defra's Biodiversity Metric 2.0 to inform pre- application discussions with the local planning authority and enable early discussions on viability, planning, ecology, landscaping and public realm improvements.
- Meanwhile uses and community schemes can be used to transition the scale of development within the community, enhance the quality of the public realm alongside wider regeneration activities, and help to foster new communities that will eventually inhabit OPDC
- Use of Planning Performance Agreements or similar planning mechanisms to identify, scope and fund resources to align with an agreed strategy for a pre-planning development.
- Apply planning conditions for biodiversity net gain as per the Environment Bill, to ensure a clear, consistent and strong model for enforcing environmental objectives.
- Through integration of biodiversity into the design process, development in Old Oak and Park Royal meets and exceeds targets for biodiversity net gain (10%) and urban greening (>0.3).
- Habitats and green infrastructure are resilient to climate change, and are well managed over a 30 year period in accordance with a Landscape and Ecology Management Plan or similar.
- Use of standardised data entry into the Green-space Information for Greater London (GiGL) database to ensure regular monitoring and review of the effectiveness of biodiversity management. LPA's can recalculate on an annual basis the biodiversity net gain against the pre-construction baseline and agreed targets or provision, and if necessary identify a process to re-mediate the loss of any net gain.
- Ensure s106 and CIL contributions are pro-actively spent on enhancing and protecting environmental assets that address deficits in network connectivity and quality, as a result of viability issues on other projects to offset habitat losses overall within the OPDC area.
- Adopt the appropriate land management strategy to suit the design and long term goals of the landscape.

## Vision

OPDC will integrate high quality, climate-resilient green infrastructure across Old Oak and Park Royal. It will seek to achieve a significant net gain for biodiversity that exceeds, where possible, the 10% mandate proposed by the Environment Bill on every development. It will deliver good quality urban greening and blue space that also contributes to improving the health and well-being of residents, workers and visitors to the area.

## Objectives

- To identify opportunities to protect existing habitats whilst ensuring any biodiversity enhancements are resilient to climate change.
- To deliver net biodiversity gain across the OPDC area and help enhance ecological connectivity to assets beyond the OPDC boundary.
- To design, implement and maintain for a minimum of 35 years, high quality bio-diverse green infrastructure that reflects local characteristics and helps to create distinctive and multi-functional spaces.
- To carefully integrate green space and biodiversity in ways that demonstrate how they can contribute to ecosystem health and human well-being as well as contributing to economic growth in mixed use and industrial areas.
- To ensure resources and governance are provided to maintain the long-term viability and resilience of green space and biodiversity across the OPDC area and beyond.



# Overarching Principles

New developments are expected to comply with the follow overarching principles in order to support the Mayoral environmental objectives for creating a greener and cleaner London through multi-functional & wildlife-rich green infrastructure (GI). The principles apply to every site, whether residential, commercial led, public or private land, or within the SIL. How the principles are applied, and the emphasis given to each, will depend on the location, size and nature of the proposed development, as each location differs in terms of its individual opportunities and constraints.

## Protect

PR1 New developments should adhere to the protection of existing green infrastructure (GI) including open spaces, statutory and non- statutory designated wildlife sites and other vegetation that provide habitat to support wildlife.

PR2 Whilst existing GI may limit developable area, developers should incorporate GI into new developments in recognition of its value to local wildlife and the many services it provides to people. To this end, new developments should aim to enhance, buffer, expand and celebrate existing GI.

PR3 All works must include an ecological survey based on best practice and including a pre- clearance biodiversity baseline. All plans must be accompanied by a biodiversity strategy showing how protection, enhancement, connectivity and resilience are addressed to maximise local ecology.

## Enhance

E1 New developments should maximise areas of green space whilst making them easily accessible and ecologically-rich to avoid undue pressure on existing green infrastructure, and to support a growing residential and working population alongside protecting and providing a place for local wildlife.

E2 Opportunities to provide or expand ecological buffers, corridors or stepping stones, such as existing canal bank vegetation, species-rich grassland, scrub or woodland that links up with existing GI should be maximised.

E3 An urban greening factor assessment should be produced to demonstrate the measures taken to maximise urban greening, water attenuation and biodiversity.

E4 Biodiversity net gain should where possible be delivered on site. Only where on site opportunities have been exhausted, that off-site provision will be considered.

species
should be prioritised, for their ability to support local wildlife across all life-stages (not just nectar food).

R2 Through design, planting and management, new developments should maximise nature’s beneficial services to people, such as phyto- remediation, soil protection, natural pest management, and carbon sequestration, alongside recognising the important role it brings to people’s personal well-being through physical contact with the natural world. Avoid simplifying landscape design into an art form rather maximise its role to support a functioning, urban ecosystem.

R3 New developments should avoid intensive management regimes that put strain on
water and energy resources and maximise opportunities to involve local communities to allow schemes to adapt to change and enable greater use.


Connectivity

C1 New development should recognise the importance of ecological connectivity in all its dimensions: spatial, vertical and temporal,
ensuring local wildlife populations can expand their range and increase in numbers.

C2 The opportunity to maximise spatial connectivity should be maximised on plot and in the wider environs recognising the shared need of people and local wildlife. Avoid
compartmentalising wildlife into a corner of a site, but locate new GI where it can join up, link with and enhance existing GI.

C3 Where green corridors are absent, stepping stone habitats may be effective, but need to be designed for the target species and specific mobility traits.

C4 New roofs, podiums and bridges should be designed to allow vertical and horizontal movement for ground-dwelling species so a range of common but declining species (e.g.
common frog) can make use of habitat at multiple levels.

C5 Meanwhile uses, before and during construction should be explored to maximise the use of vacant plots for wildlife benefit and provide continuity over time.

## Resilence

R1 In response to the climate and ecological crisis, new developments must approach landscape design and management in light of the risks of a changing climate and species' extinction. To this end, locally native species should be prioritised, for their ability to support local wildlife across all life-stages (not just nectar food).

R2 Through design, planting and management, new developments should maximise nature's beneficial services to people, such as phyto- remediation, soil protection, natural pest management, and carbon sequestration, alongside recognising the important role it brings to people's personal well-being through physical contact with the natural world. Avoid simplifying landscape design into an art form rather maximise its role to support a functioning, urban ecosystem.

R3 New developments should avoid intensive management regimes that put strain on
water and energy resources and maximise opportunities to involve local communities to allow schemes to adapt to change and enable greater use.

## Landscape Ecology Areas (LEA's)

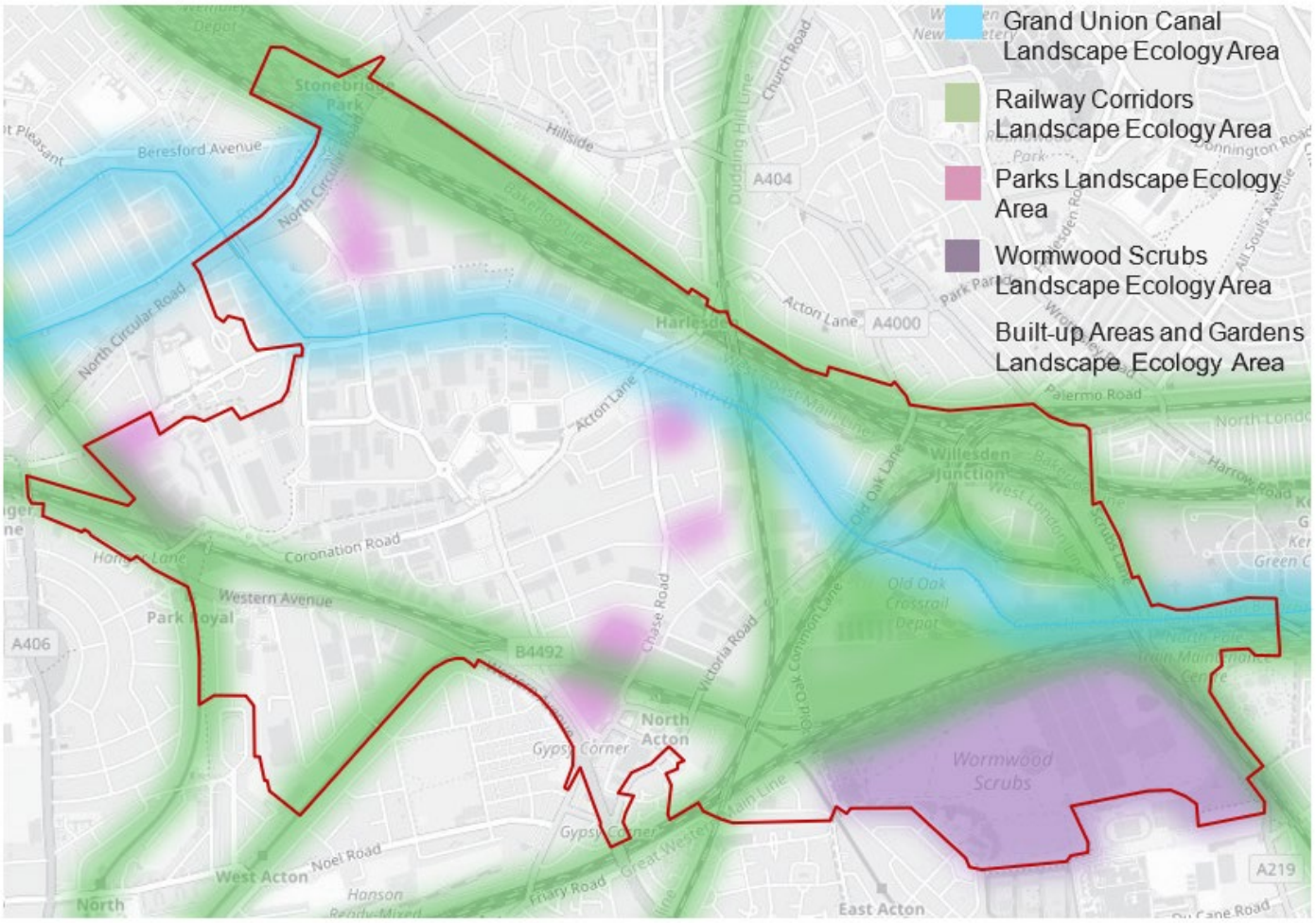
From an ecological perspective, OPDC is characterised by five distinct regions referred to as Landscape Ecology Areas (LEA's). These are:

- Built up areas and gardens
- Grand Union Canal
- Railway corridors
- Wormwood Scrubs
- Small Parks

Use the plan to find out which LEA your site is located in. Read the summary and photo captions to understand the existing ecological character.

Refer to the table to understand the key elements of habitat, flora and fauna of that particular LEA. It is not a comprehensive list, but picks out species
of importance (e.g. rare or a priority species) and are key to the LEA's character.

Use the recommendations for future development to consider how your site can protect, enhance, improve connectivity and strengthen resilience in relation to habitats, flora and fauna.




Map showing the five Landscape Ecology Areas in OPDC. LEA's are not designations, but areas of similar ecological character.

## Built-up Areas and Gardens

## Existing Character

This comprises a variety of industrial and commercial, low-rise buildings and private gardens, amalgamated together due to similar ecological characteristics.

Defining features include numerous tightly-spaced buildings, expanses of impermeable surfacing and vegetation confined to roadside shrub planting, young street trees and cookie-cutter patches of mown grass.

Traffic noise and numerous roads deter most wildlife, but hidden away in derelict sites and forgotten corners, species colonise where regular management has ceased.

Remnants of old hedgerows, ditches and tree-lines provide important pocket habitats for wildlife.

Boundary planting between a new warehouse and an access road.

## Key Elements

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| **Habitat** | Street trees, tall herbs, semi-improved neutral grassland, native hedgerows, wet ditches, introduced shrubs, woodland belts, amenity grassland, running water, open mosaic. |
| **Flora** | **Trees**: pedunculate oak, introduced species. **Shrubs**: hawthorn, blackthorn hazel, introduced species. **Plants**: bee orchid, mouse-ear hawkweed, rough chervil, marsh marigold, celery leaved buttercup, soft rush., male fern. |
| **Fauna** | **Mammals**: pipistrelle and Soprano bats. **Birds**: black redstart, house sparrow, swift, robin, dunnock, blue tit. |

## Recommended Approach for Future Development

| | Protect | Enhance | Connectivity | Resilience |
|---|---|---|---|---|
| **Habitat** | • Native hedgerows<br>• Mature trees<br>• Ditches<br>• Low input management | • Low maintenance substrate beds by seeding with native wild-flowers<br>• Value for invertebrates<br>• Value to breeding birds | • Join up habitat along site boundaries with habitat in adjacent plots.<br>• Link up isolated shrubs and trees by leaving a strip of long grass between them.<br>• Create stepping stone habitats with easy reach for local bat and bird species | • As big as possible<br>• Strategically designed and placed<br>• Management considered upfront<br>• Avoid irrigation and chemical |
| **Flora** | • Bee orchid populations | • Green infrastructure to prioritise native species | • Allow animal movement by creating access holes in walls and fences. | • Maximise diversity |
| **Fauna** | • Dense vegetation | • Prioritise 106 agreements/Offsetting to create new habitats along roads, underused areas. | • Locate new nesting opportunities with knowledge of the species and their territory behaviour | • Engage local communities to monitor populations |

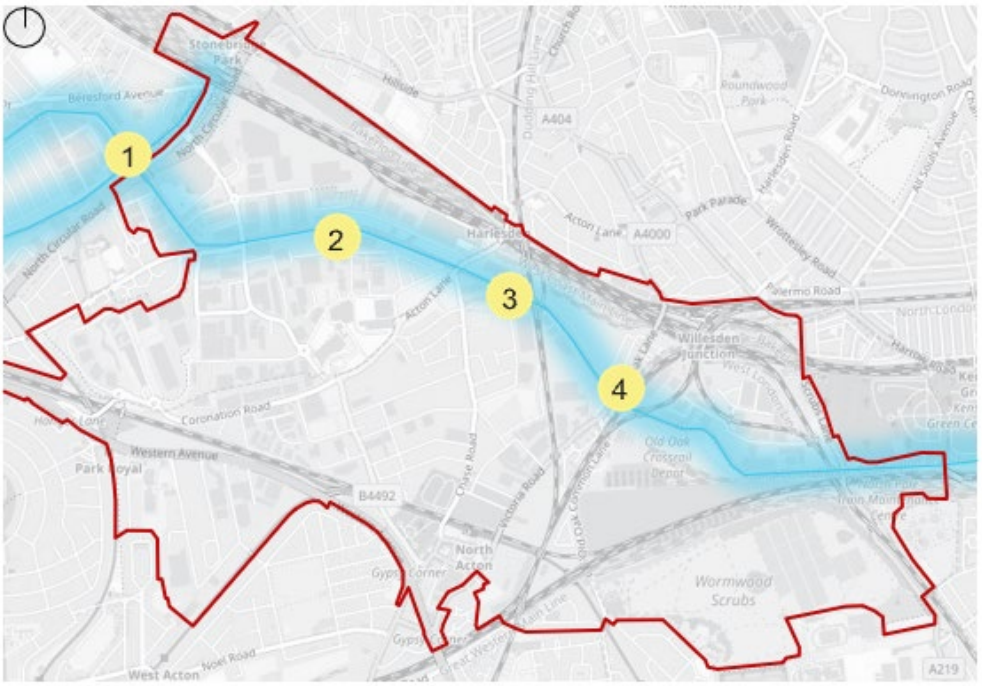
# Grand Union Canal

## Existing Character

This area encompasses land around and including the Grand Union Canal, Site of Metropolitan Importance for Nature Conservation (SMI). The canal is an important blue and green habitat corridor which provides ecological connectivity, supporting a limited range of aquatic and terrestrial species typical of urbanised areas.

The canal is delineated for the most part by mature woodland, and scrub. This provides an ecological corridor for the movement of bats, birds and invertebrates, all with in a relatively undisturbed and dark environment.

Although derelict buildings, fly-tipping and industrial waste are tarnishing the condition of habitats, the canal remains important for its bird populations, aquatic plants and fish. With neglect, vegetation has colonised vacant sites and derelict buildings provide habitat for roosting bats.








1. The Brent River, is particularly well-wooded, as it passes underneath the Grand Union Canal along the western boundary of OPDC.
2. A typical view of the Grand Union Canal with a mature belt of broadleaved woodland delineating the canal and tow-path.
3. A mix of native vegetation is typical, with local variation such has Elm woodland (pictured) birch woodland (on adjacent old rail-sidings), hawthorn, hazel and blackthorn hedges.
4. A wet-ditch delineates the edge of the tow-path, supporting amongst other species, celery-leaved buttercup, a scarce species in London.

## Key Elements

| | |
|---|---|
| Habitat | Standing open water, running water, wet ditches, deciduous woodland, native scrub, marginal vegetation, semi-improved neutral grassland, amenity grassland and native hedgerows. |
| Flora | **Trees:** goat willow, grey willow, small-leaved elm, Crack willow, ash. **Shrubs**: blackthorn, common hawthorn, hazel, bramble. **Plants**: common nettle, ivy, celery-leaved buttercup, marsh marigold, bee orchid. |
| Fauna | **Mammals**: Daubenton, Pipestrelle, Noctule, brown long-eared, Soprano and Narthesius bats, hedgehog. **Birds**: kestrel, Mallard Duck, Moor Hen and Coot, Mute Swan, Heron, Cormorant. Grey Wagtail, sedge warbler, **Invertebrates**: Woodland butterflies (purple hairstreak and purple emperor), saproxylic beetles. **Reptiles**: Slow-worm, common lizard. **Amphibians:** Common newt, common frog, common toad. |

## Recommended Approach for Future Development

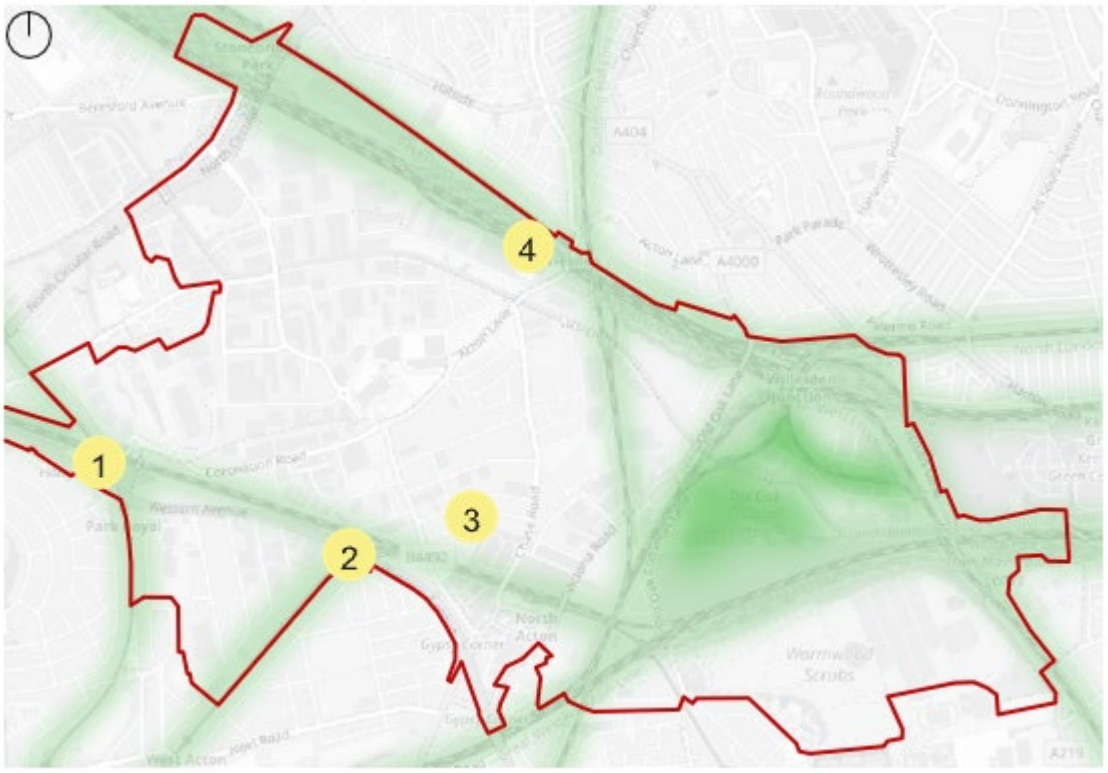
| | Protect | Enhance | Connectivity | Resilience |
|---|---|---|---|---|
| Habitat | • Soft canal banks<br>• Self-willed character of vegetation<br>• Wet ditches<br>• Wild, wooded areas at the intersection with rail corridors | • Create new reed-bed marginal planting along wider canal sections.<br>• Create new SuDs in adjacent residential developments<br>• Habitat creation at new access points | • Fill in gaps with new trees and woodland planting, e.g. where old wharfs or industrial uses have removed canal-side vegetation.<br>• Minimise lighting, direct it away from vegetation and avoid reflections on water. | • Confine water-front activities to discrete locations away from sensitive habitat<br>• Regulate canal users disposal of on-board waste |
| Flora | • Establishment of self-willed species (except injurious weeds) | • Resolve water pollution to increase plant diversity<br>• New planting to be 100% native or self-willed/naturalised species | • New planting should link with existing vegetation through species selection, management and vegetation structure. | • Stringent control on polluting industries adjacent to canal |
| Fauna | • Darkness<br>• Tranquillity with minimal/ discrete waterside activities<br>• Wooded and undisturbed corridor | • Create nesting holes for bats, kingfisher and sand martins in canal facing façades<br>• 30m x 30m minimal area of sedge planting for single breeding pair of sedge warbler | • Cleaner water, more marginal vegetation, wooded corridors and improved connectivity may attract other species recorded in adjacent boroughs such as water vole, otter and kingfisher | • Native tree species and "fresh water" to ensure an abundance of insects |

# Railway Corridors

## Existing Character

This area encompasses the railway lines and associated infrastructure, including active tracks, rail-sidings, line-side, depots and compounds.

The majority of railway land has been designated as Sites of Borough Importance for Nature Conservation (SBI). This is in recognition for their relatively undisturbed habitats and wider function as an ecological corridor.




Railway Corridors landscape Ecology Area

Habitats include mature oak- sycamore and birch woodland, bramble scrub, tall herbs. Semi- improved neutral grassland, ephemeral vegetation and bare ground.

Restricted access has allowed wildlife to thrive in relative undisturbed and “wild” environs. This is important for birds and insect species that favour large areas, along with bats (numerous species) and hedgehogs that travel large distances to find food.





1. This area is well-wooded, with mature oak trees, scrub and woodland de-marking the footpath towards Park Royal Tube station.
2. The Central Line west of White City supports mature oak woodland.
3. The native climber Traveller’s Joy covers a railway fence, providing excellent foraging for invertebrates.
4. Naturalised vegetation consisting of tall herb, semi-improved grassland and scrub create a rich mosaic along the railway banks west of Willsedon Junction.

## Key Elements

| | |
|---|---|
| Habitat | Deciduous woodland, dense scrub, tall herb, semi-improved neutral grassland. |
| Flora | **Trees**: pedunculate oak, field maple, sycamore, ash. **Shrubs**: blackthorn, hawthorn, hazel, bramble. **Plants**: false-oat grass, Yorkshire-fog, bracken, honeysuckle, traveller's joy. |
| Fauna | **Mammals**: Pipistrelle, Noctule, brown long-eared, Soprano and Natthesius bats, hedgehog. **Birds**: greater spotted woodpecker, tawny owl, kestrel, spotted flycatcher. **Invertebrates**: Woodland butterflies (purple hairstreak and purple emperor), saproxylic beetles. **Reptiles**: Slow-worm, common lizard. **Amphibians:** Common newt, common frog, common toad. |

## Recommended Approach for Future Development

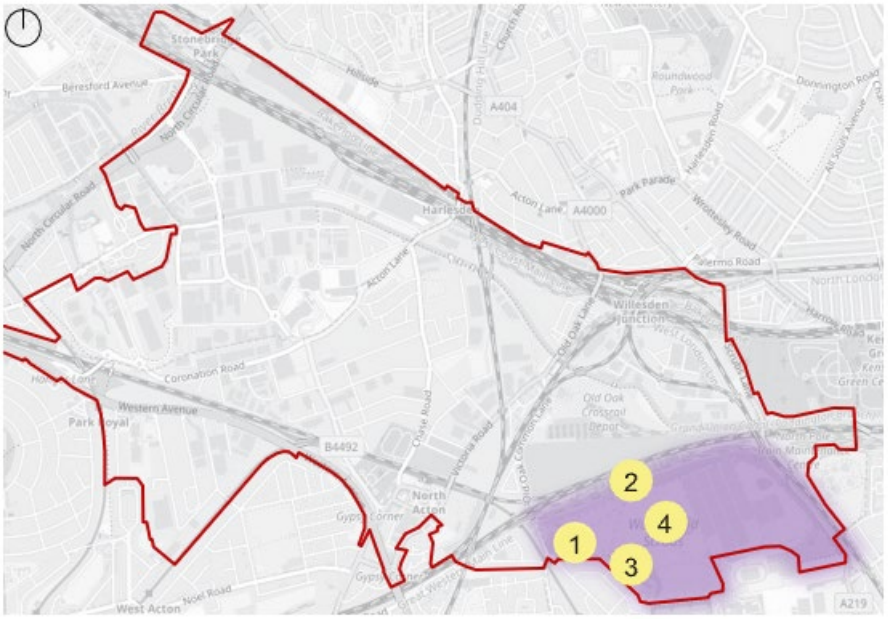
| | Protect | Enhance | Connectivity | Resilience |
|---|---|---|---|---|
| Habitat | • Maturing woodland where rail operations allow<br>• Mature trees<br>• Intimate mosaic of scrub, grassland and tall ruderals | • Allow natural colonisation after rail maintenance work<br>• Community gardening on railway platforms | • Avoid using light columns over rail bridges or next to rail corridor<br>• Set back lighting and direct down and away from green corridors<br>• Use technology (e.g. sensors, timers) to reduce brightness during sensitive times of the year, or only turn on when in use<br>• Link new GI on adjacent development plots to the green rail corridor | • Involve local communities in station gardening<br>• Provide interpretation of wildlife value to rail customers<br>• Engage train users of the habitat they see. |
| Flora | • Establishment of self-willed species (except injurious weeds)<br>• Climbers that have established on boundary fences | • Seed with wild flowers | • None identified | • Avoid importing amenity topsoil.<br>• Use existing aggregates/ materials and select hardy wild-flowers |
| Fauna | • Inaccessibility | • None identified | • to nearby habitat via SUDs, porous boundary features and as a last resort road drains | • Avoid planting invasive plants in adjacent development plots. |

# Wormwood Scrubs

## Existing Character

This area encompasses land immediately around and including Wormwood Scrubs, the largest green space in OPDC at 65ha. As former common land, Wormwood Scrubs supports oak woodland, scrub, acid and semi-improved neutral grassland and is designated for its natural, amenity and historical importance.

Wormwood Scrubs supports important populations of breeding birds, invertebrates and common reptiles. Over 100 species of breeding birds nest in the dense scrub and the large meadow areas supports ground nesting birds such as the London rarities Meadow Pipit and skylark. The meadows are also particularly important in spring and summer, when migratory birds use it as a temporary stopover. Such as Ring Ouzel, European Turtle dove, Spotted flycatcher, and Whinchat are very rare to see in London.






1 The mixture of thickets, scattered mature trees and open scrub provide an extensive mixture of ideal nesting and feeding areas for a large range of bird species.

2 Male blackcap (photo credit: Amy Lewis)



3 Goldfinches feeding on seeding creeping thistle on the Scrubs.

4 Rewilding of Wormwood Scrubs has produced a good list of unusual and scarce insects associated with rough grassland.

## Key Elements

| | |
|---|---|
| **Habitat** | Dense native scrub, oak dominated woodland, semi-improved neutral grassland, tall herbs, wet grassland, acid grassland. |
| **Flora** | **Trees**: pedunculate oak, weeping birch, field maple. **Shrubs**: blackthorn, hawthorn, hazel, bramble. **Plants**: false-oat grass, bird's-foot trefoil, creeping thistle, sheep's fescue. |
| **Fauna** | **Mammals**: pipestrelle, soprano and noctule bats. **Birds:** blackcap, kestrel, garden warbler, greater spotted woodpecker, gold finch, green finch, chaffinch, common/lesser whitethroat, chiffchaff, meadow pipet, skylark. **Reptiles**: common lizard, slow-worm. **Amphibians**: common frog, common toad. **Invertebrates**: small /Essex skipper butterfly, purple hairstreak and purple emperor, common blue butterfly. |

## Recommended Approach for Future Development

| | Protect | Enhance | Connectivity | Resilience |
|---|---|---|---|---|
| **Habitat** | • Size of habitat patches, (not just total habitat area)<br>• Lester's Embankment which is the best area for breeding birds<br>• Dense native scrub and rough (tall) grassland<br>• Inaccessibility of long grassland from dogs and people | • Expand scrub and meadow areas to increase bird breeding success<br>• Restore patch of acid grassland | • Avoid fragmenting habitat by minimising human intervention (lighting, sealed surfaces, fences, regularly mown grassland) | • Educate users of Wormwood Scrubs to manage impact of disturbance from dog walkers, in particular<br>• Avoid over enhancement with offsetting/ section 106 funding when existing habitats are good already |
| **Flora** | • None identified | • New planting to be 100% native species | • None identified | • Avoid importing topsoil |
| **Fauna** | • Sufficient area of rough grassland to allow migratory birds to stop-over in autumn and spring<br>• Reptile population<br>• Area of undisturbed dense scrub for breeding birds | • Adjacent developments to create habitat on podiums for breeding birds. (e.g. dense scrub vegetation)<br>• New road infrastructure to plant native shrub and manage for breeding birds. | • Adjacent developments should use technology (e.g. sensors, timers) to modify lighting during sensitive times of the year (during migration), or turn on only when in use | • Create alternative open spaces around Wormwood Scrubs to reduce pressure on bird and reptile populations.<br>• Large events strictly prohibited in western half. |

# Small Parks

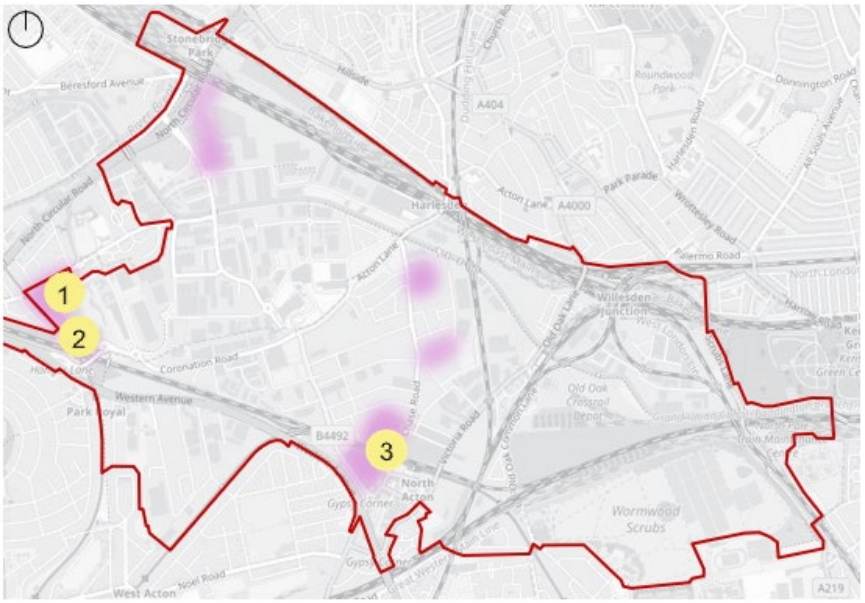
## Existing Character

This area encompasses parts of Park Royal Strategic Industrial Location that contain a variety of green spaces and parks. They have been separated out as they provide an important local resource and need to be incorporated into new development strategically.

Diego Park is a Site of Borough Importance for Nature Conservation (SBI). It's landscaped garden contains a stream, water-bodies and mature garden vegetation.

Wesley Playing Field is a Site of Local Importance for Nature Conservation (SLI) supporting
pockets of garden vegetation and grassland.

Acton Cemetery SLI, dominated by mown semi-improved neutral grassland and many mature scattered trees.




Coronation Gardens is a SBI, characterised by semi-improved neutral grassland, scrub and patches of broadleaved woodland.



1 Daigeo Lake with lush planting and wetland habitats. Currently the site is inaccessible to the public.

2 Coronation Gardens supports scrub and young woodland habitat, with areas of meadow and lawn.

3 Adjacent development impacts on Acton Cemetery.

## Key Elements

| | |
|---|---|
| **Habitat** | Semi-improved neutral grassland, amenity grassland, standing open water, running water, marginal planting, introduced shrubs, mature trees. |
| **Flora** | Trees: pedunculate oak, field maple, beech. **Shrubs**: guelder rose, hawthorn, hazel, Introduced shrubs. **Plants**: black knapweed, bird's-foot trefoil, red fescue, common bent, sneezewort, ox-eye daisy, self-heal. |
| **Fauna** | **Mammals**: hedghog, pipestrelle, soprano and parthesius **Reptiles**: common lizard, **Amphibians**: palmate newt, great crested newt, common newt, common frog, common toad **Birds:** Mistle Thrush,Tufted Duck, **Invertebrates:** Ruddy and common darter dragonflies, common blue butterfly, meadow brown. |

## Recommended Approach for Future Development

| | Protect | Enhance | Connectivity | Resilience |
|---|---|---|---|---|
| **Habitats** | - Size of existing parks and open spaces<br>- Dense scrub habitat<br>- Open access to local people | - Reconfigure gravestones at Acton Cemetery to create more usable open space<br>- Expand area of meadow<br>- Improve habitat diversity through SUDs creation | - Link existing green spaces via new green streets and development led green space | - Nurture "Friend's of" groups to improve wildlife management and benefit local people<br>- Increase size of habitats |
| **Flora** | - None identified | - Increase diversity by removing cuttings and seeding with yellow rattle<br>- Green infrastructure to prioritise native species | - Link up isolated shrubs and trees by leaving a strip of long grass between them. | - Increase diversity of species<br>- Establish planting that is drought tolerant and suitable for impoverished soils |
| **Fauna** | - None identified | - None identified | - Keep dead wood, leaf litter insitu to generate insect life. | - Retain long vegetation over summer/winter (e.g. creeping thistle for Goldfinch) |

# Design Typologies

To understand what specific opportunities there are for maximising urban greening and biodiversity in the context of new development, it is useful to use the terminology of urban designers. This section sub-divides the built environment into five distinct typologies: Industrial, mixed use, civic spaces, streets and green spaces. This enables greening and biodiversity to be considered alongside other factors such as, future plot layouts, use and access requirements.

Green Spaces
Green spaces have a huge responsibility to deliver a multitude of functions and to benefit a wide range of users, which can be a challenge when space is limited.

Industrial
New industrial development will intensify existing plots. Large service areas will remain but a greater mix of businesses will occupy different floors given greater opportunities for sharing resources.


Streets
New development will facilitate the improvement of adjacent streets unlocking the potential for more tree planting, pedestrian routes and SUDs.

Residential and Commercial
High density buildings will completely transform Old Oak, and will need to be well designed to avoid impacting negatively on the public realm.

Civic Spaces
Busy, people-focused places around transport hubs are some of the hardest places to design for wildlife. But, to exclude nature would be to exclude the very thing that makes people happy and healthy in places they visit on a daily basis.

# Applying Biodiversity Principles - Green Space

## Context

Green spaces have a huge responsibility to deliver a multitude of functions and to benefit a wide range of users. When space is limited, compatibility can be challenging. Like sports facilities, wildlife habitats need a certain amount of space to work effectively. People put pressure on this workability if this space is also used for sports and recreation uses. The existing open spaces like Wormwood Scrubs and the Grand Union Canal cannot deliver everything.

Designing with Nature

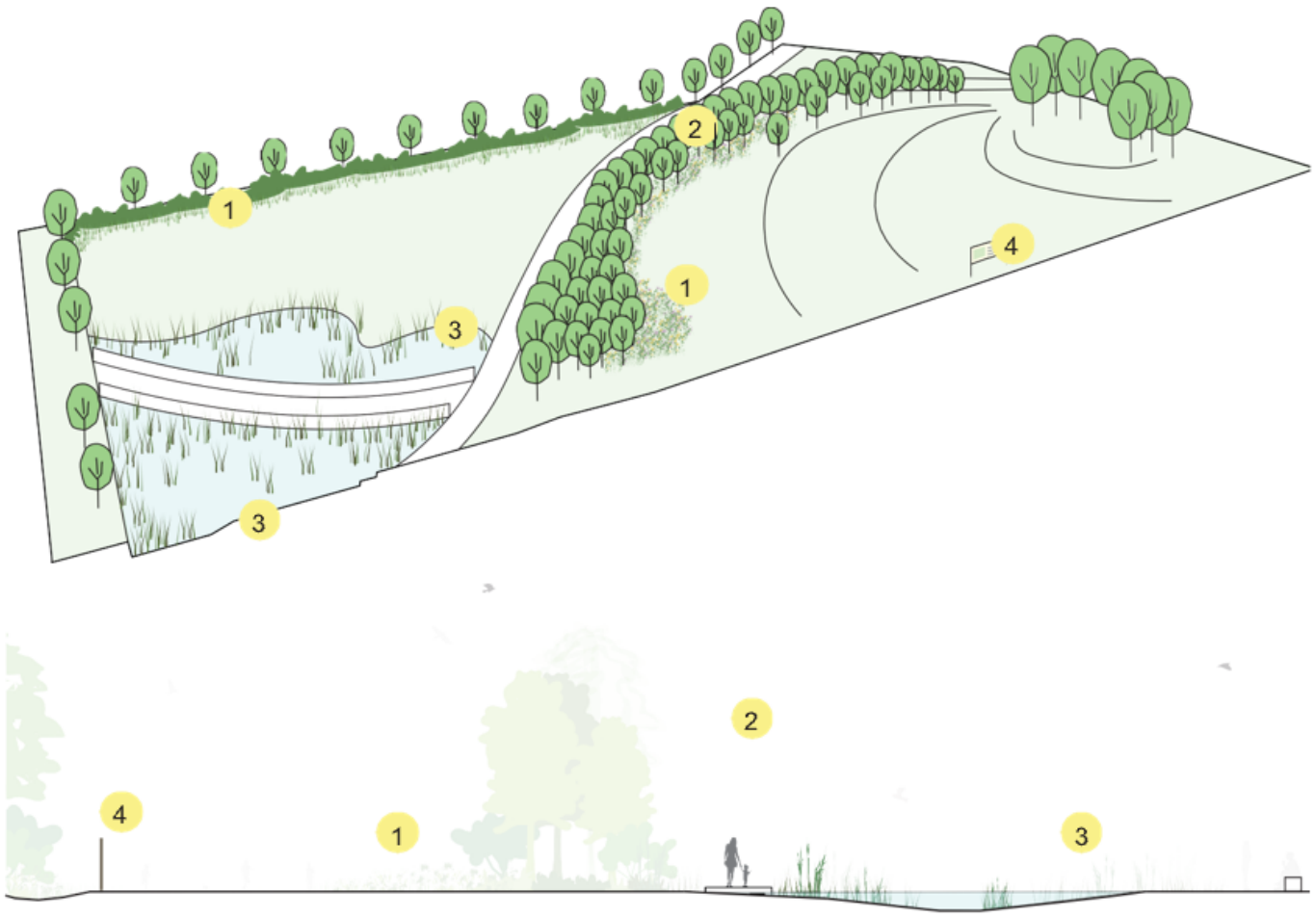
To avoid putting undue pressure on existing green spaces, new green spaces should be as big as possible, easily accessible and ecologically rich. In this way, they will spread the pressure of an increase in human population on habitats that need to support wildlife too.

1 Grassland management
- Long grass and flower-rich meadows are hugely valuable to wildlife. Buffer sensitive areas from dogs, by dead hedging and scrub planting.

2 Connectivity and size
- Creating a mosaic of habitats that connect and grade into each other will increase ecological value. Wildlife often require a minimum area to find food and raise young. Each species is different. But generally, the more food that is available the smaller the area is needed.

3 Sustainable urban drainage (SuDS)
- If designed well, parks make good locations for large wetland features, that can double up as managing water from adjacent development plots.

4 Signage
- Clear way-marking and interpretation can reduce the risk of disturbance, by explaining to park users why some areas are out-of- bounds.



## Case Studies


- Grassland Management
- Cutting of grassland allows for different uses (Hughendon Manor, Buckinghamshire)


- Connectivity
- A mosaic of different materials and planting provides the micro-habitats ideal for invertebrates (Goodman's Fields Aldgate, Tower Hamlets).


- Sustainable Urban Drainage
- A series of ponds provide an attractive setting, whilst providing species rich grassland and wetland habitat (Kidbrook Village).


- Sign-age
- Explaining "why" to people, will hopefully reduce the risk of unintentional disturbance (Barking Riverside, Barking & Dagenham).

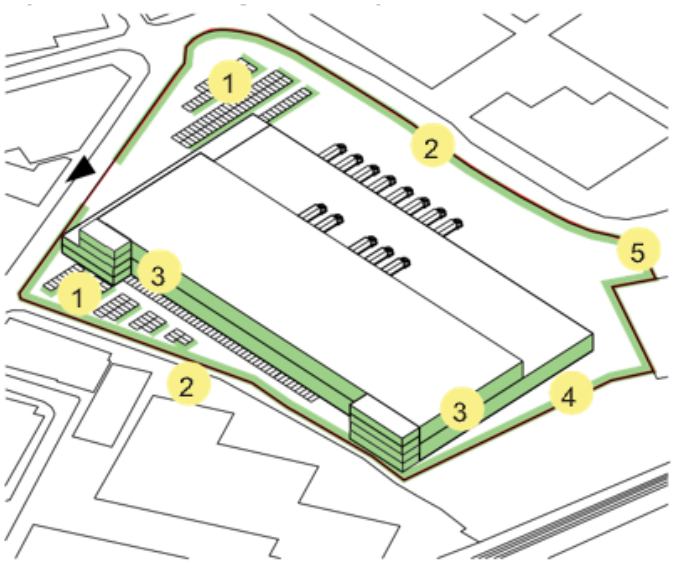
# Applying Biodiversity Principles – Industrial

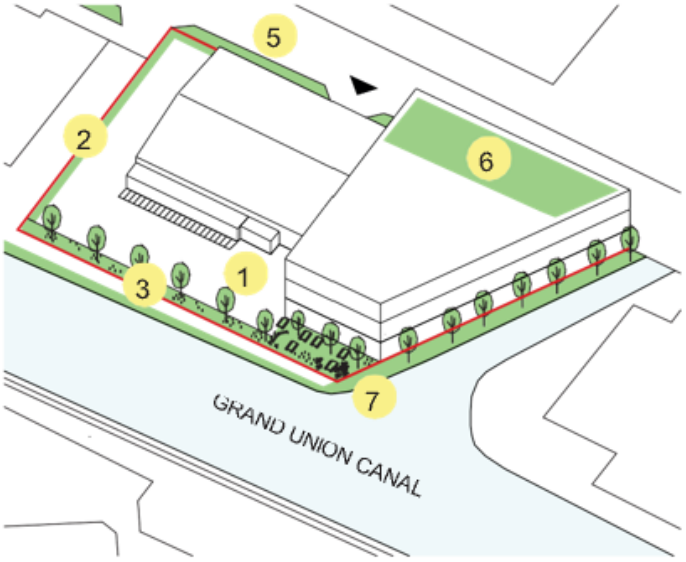
## Context

Existing industrial sites will need to intensify, and this is envisaged to occur through a variety of ways such as diversifying typologies, sharing facilitates and building upwards. Improvements to public infrastructure and cycle and pedestrian facilities will reduce the need for employee car-parking, but large service areas for loading and expanses of hard surfacing for access will still be required. Although demands in greening are less for industrial development, London and regional Net Zero Targets will require developments to demonstrate how they are reducing energy consumption and water demand alongside other sustainability efficiencies.

Designing with Nature

Planting specifications needs to be simple, reducing the risk of schemes being value-engineered. Vegetation needs to be seen as bioengineering; integral to improving building performance, providing outdoor spaces for office-workers, infiltrating polluted runoff and increasing the efficiency of Photo-voltaic roof panels. Planting should activate nature's free service, choosing species resilient to existing soils or recycled materials to avoid cost of imported soils or high-water input.




1 Car-park SUDs
- Swales and rain-gardens, trap surface pollutants and meet discharge rates

2 Boundary road verges
- Low-maintenance, open mosaic habitat

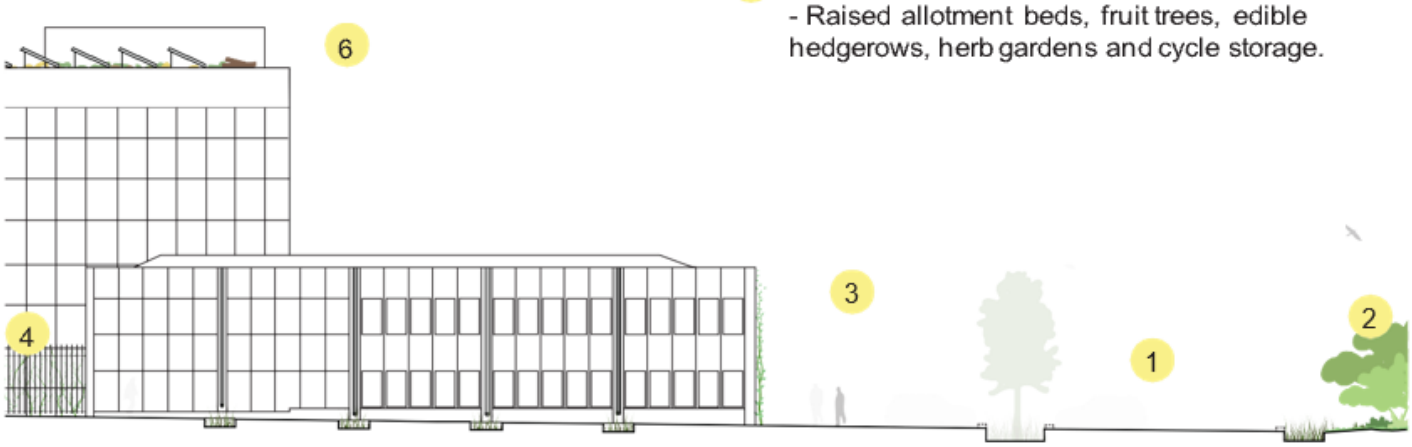
3 Green walls
- Low maintenance climbing plants such as evergreen jasmine and ivy.

4 Boundary fences
- Use self-reliant climbers such as honeysuckle, traveller's joy and English hop.

5 Front-facing roadside vegetation
- Retained street trees, swales and rain-gardens

6 Bio-solar roof
- 5% increase efficiency of PV panels and thermal insulation whilst delivering wildlife gains.

7 Greener seating areas and facilities
- Raised allotment beds, fruit trees, edible hedgerows, herb gardens and cycle storage.



## Case Studies


- Car-park SUDs
- Car-park planted with swales, Portland, Oregon (Credit: Dusty Gedge).


- Boundary road verges
- Recycled ceramics, glass and brick used to create ground conditions for Open Mosaic habitat (Credit: Grass Roof Company, Essex).


- Green wall
- Species such as hops and grape vines have vigorous growth that enables them to grow in excess of 20m from the ground (Basel, Switzerland).


- Boundary fences
- Existing climbers on railway line fence.


- Bio-solar roof
- PV's, even when laid flat, can work well with green roof vegetation.


- Greener seating areas and facilities
- Essential bike infrastructure delivers a green roof and nesting habitat (Ikea, Greenwich).

# Applying Biodiversity Principles - Public Realm - Streets

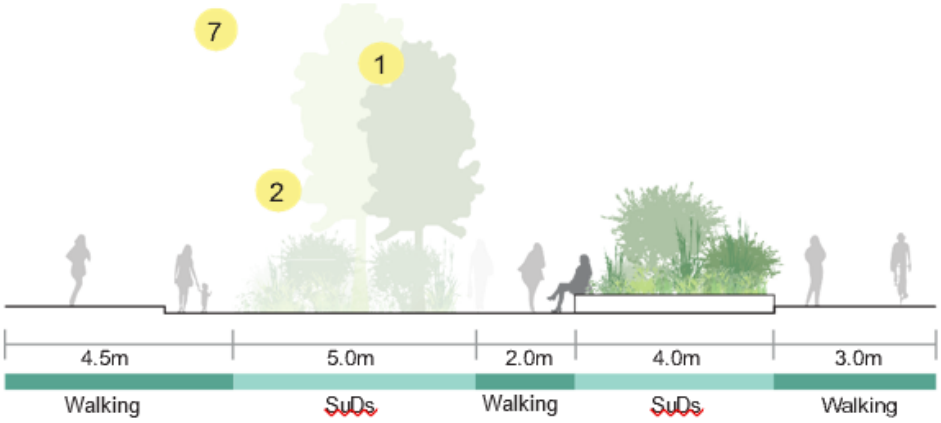
## Context

At present, green infrastructure and wildlife benefits along most streets in the OPDC area are accidental. This is all to change as improvements across the area are expected through delivery of new mixed use areas, intensification and public realm improvements. A new hierarchy of streets is planned to reduce car dependency and encourage use of public transport and active travel modes.

Designing with Nature

To ensure the delivery of high-quality street design, it is important a chartered Landscape Architect provides strategic oversight on the design. This minimises single-use infrastructure and ensures new planting, SUDs and cycle routes are integrated effectively.

Typical traffic-free Green Street

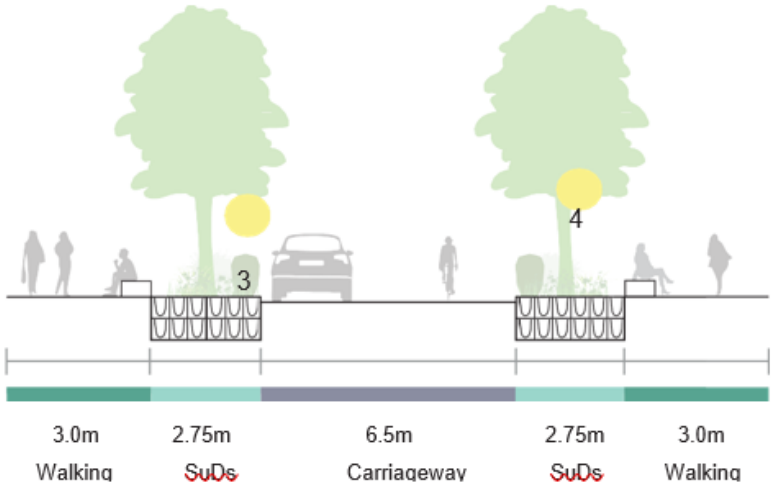



1 Street trees
- In all cases, species should be long-lived varieties, with known value to local wildlife. Tree size should reflect the scale of adjacent buildings and available space.

2 Sustainable Urban Drainage
- Locate trees in SuDs to maximise space, irrigate trees and create a wetland habitat with native and horticultural species tolerant of periodic flooding.

3 Hedges
Plant hedges between the road and street trees to intercept vehicle fumes and accidental damage.

Typical Minor/ B-Road and cycle lane provision




4 Connected tree pits
- Plant trees below ground in connected pits. Research suggests trees "talk" through their roots enabling them to combat disease better.

5 Connected canopies

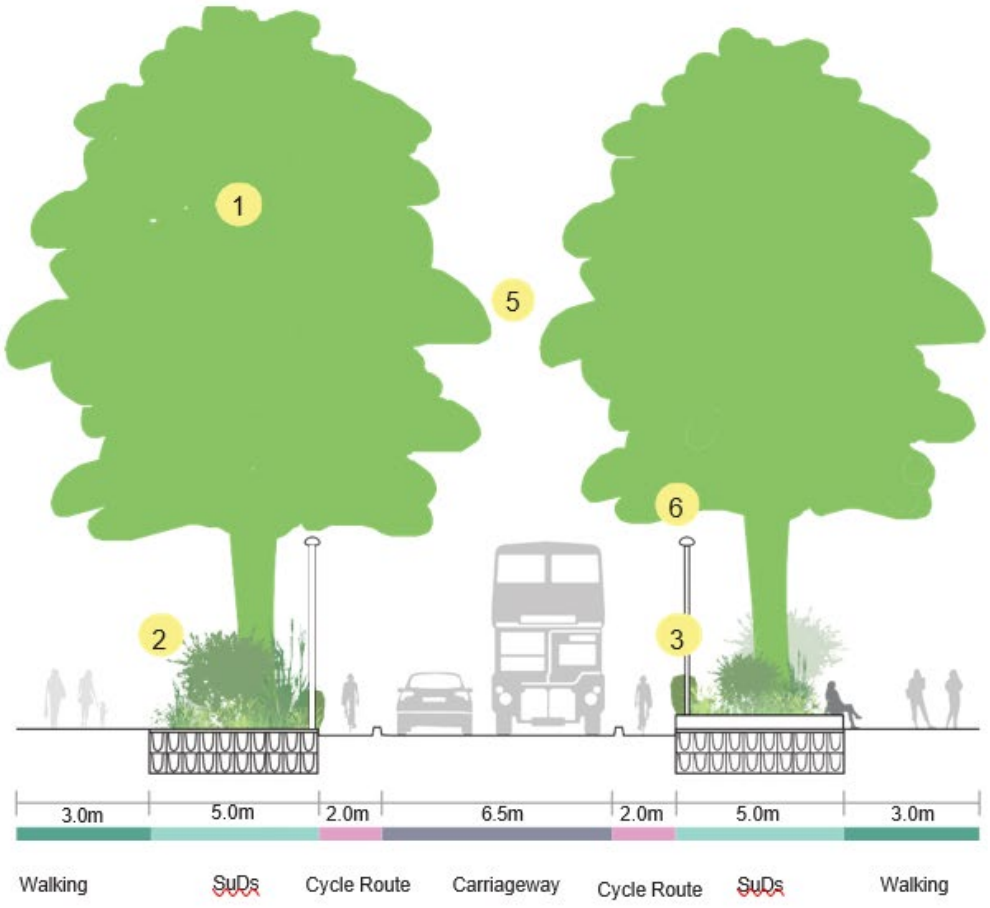
- In all cases select species,

which with maturity, their canopies will overlap, creating a green corridor, for commuting bats.

6 Directed street lighting
- Lighting columns should be lower than start of tree canopy to direct light towards its use not within wildlife habitat.

7 Traffic-free streets
- Planting can provide sustainable drainage, play opportunities and wildlife value.

Typical Main/ A-Road




## Case Studies


- Sustainable Urban Drainage
- Rain gardens can provide solutions that look attractive and prevent trip hazards (Portland, Oregan, Credit: Dusty Gedge).


- Connected tree pits
- Plenty of opportunity to plant underneath and between this line of trees (Queen Elisabeth Park).


- Traffic-free ~~streets~~
- With no traffic the use of the road can provide ~~exciting~~ opportunities for engagement and habitat creation.

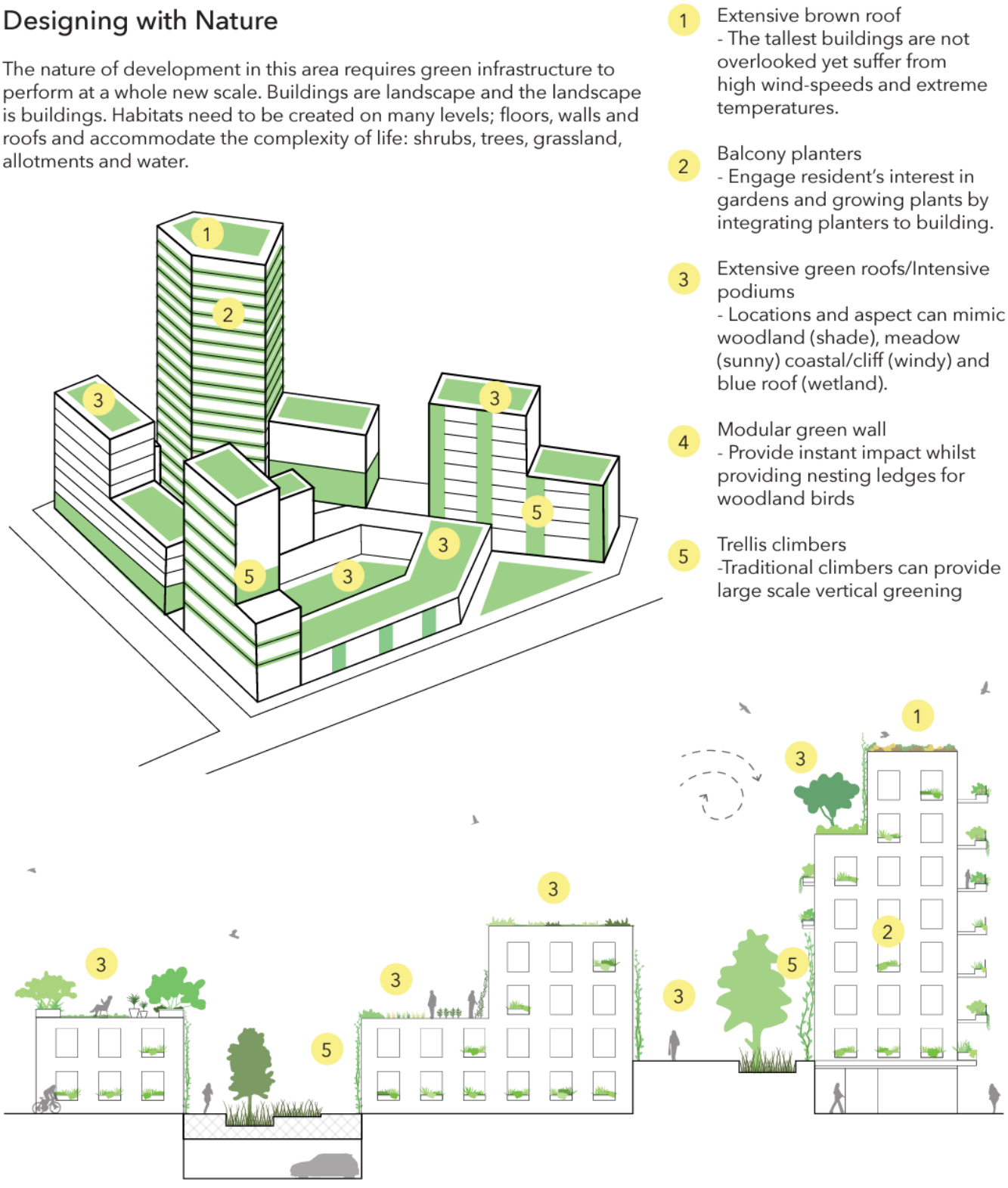
# Applying Biodiversity Principles - Residential and Commercial

## Context

The proposed height and massing of buildings will create ecological characters resembling cliffs, canyons and plateaus altering the local micro-climate and manipulating light and wind. In the presence of tall buildings, most vegetation struggles for three reasons; firstly, lack of purpose (typically ornamental in structure and size), second, limited space (both underground for roots and above to reach ultimate height) and third, the wrong species selection. Replacing unhealthy plants is costly and can be avoided.

Designing with Nature

The nature of development in this area requires green infrastructure to perform at a whole new scale. Buildings are landscape and the landscape is buildings. Habitats need to be created on many levels; floors, walls and roofs and accommodate the complexity of life: shrubs, trees, grassland, allotments and water.



## Case Studies


- Extensive brown roof
- These roofs make use of the free service provided by nature in the form of prevailing winds to bring seed onto the roofs (Laban Dance Centre, Deptford).


- Balcony planting
- One enthusiastic gardener has transformed the first level balcony (Shad Thames, LB of Southwark).


- Extensive green roof/Intensive podiums
- The intensive roofs at Goodman's Field provides upper apartments with an attractive view, whilst providing high quality habitats (LB of Tower Hamlets).


- Modular green wall
- This modular green wall designed by Franco Blanc provides a rich mosaic of shrubs, ferns, herbs and perennial plants (Madrid).


- Trellis climbers
- Species such as hops and grape vines have vigorous growth that enables them to grow in excess of 20m from the ground (Basel, Switzerland).

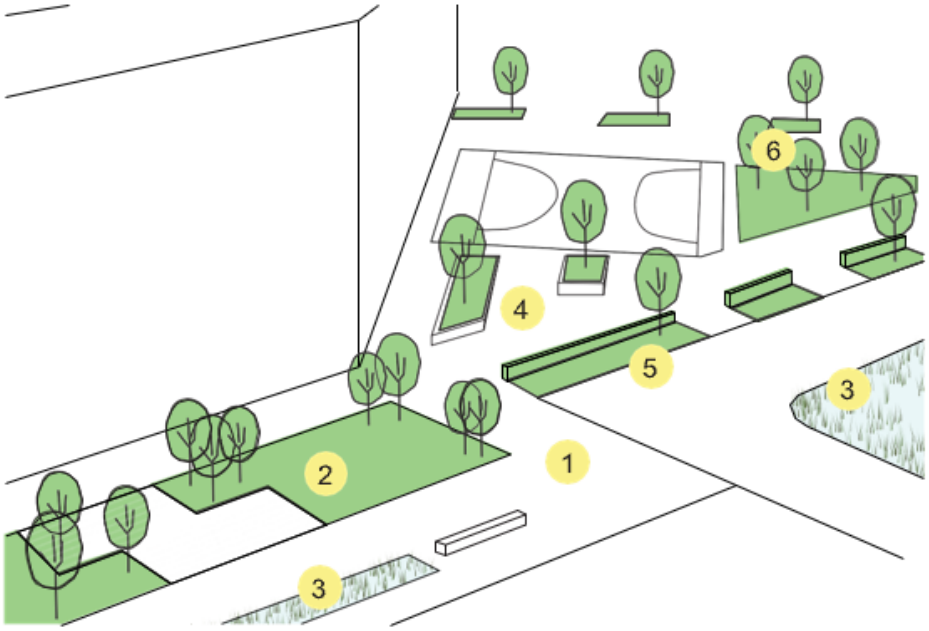
# Applying Biodiversity Principles - Public Realm - Civic Spaces

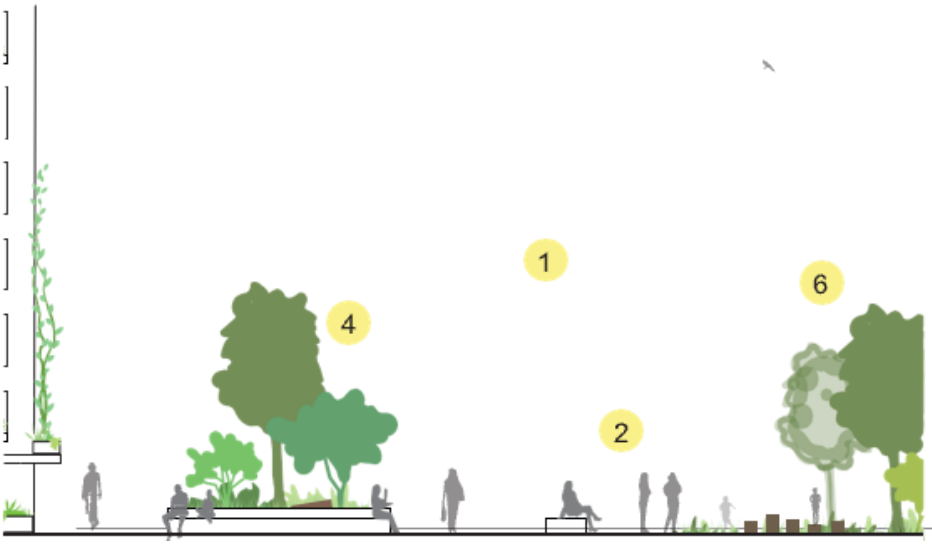
## Context

The public realm within the Old Oak and Park Royal areas will be inherently busy, people-focused places. The design of streets and public realm will result in the delivery of hard landscaped social spaces which will be important nodes in the urban network where people meet, spend time and use daily going about their lives. To exclude wildlife and high-quality green infrastructure would be to exclude those things that enrich the sense of place and benefit the health and well-being of people.

Designing with Nature

In civic spaces, green infrastructure needs to be smart in order to demonstrate its placement will not effect the flow of people, safety and multi-use. Trees are particularly valuable due to their biomass being located above head- height but its important to remember that too much space can actually hinder movement. Place Management professionals are using smart technology to understand how urban spaces work and not work. Use this science to push for more vegetation, to create quiet place off main routes for mini gardens, copses, ponds and rain gardens.




1. Landscape led
   - Entrances should be designed by the layout and use of the public space, not by individual buildings.
2. Quiet places off main routes
   - Seating provides opportunities for planting and wildlife watching.
3. Sustainable urban drainage
   - Rainwater and surface run-off can be can be designed to include vegetation that contributes to the overall biodiversity of an area (rain gardens and bio-swales).
4. Planters
   - Make these as big as possible and design them to facilitate movement.
5. Connected tree pits
   - Plant trees below ground in connected pits. Research suggests trees "talk" through their roots enabling them to combat disease better.
6. Tree canopy and lighting
   - Avoid up-lighting trees that can provide food for night-time flyers (e.g. moths and bats). Getting lighting design right has a critical impact on the life-cycle of many insects and the whole ecosystem.

## Case Studies


- Quiet places off main routes
- Quiet Seating has been provided whilst creating a mini woodland (White City),


- Sustainable Urban Drainage
- A stream provides great enjoyment whilst providing a habitat for wildlife (China, Credit; Dusty Gedge).


- Water
- A raised water feature supports fish and water lilies (Old Spitafield Market, LB Hackney).


- Planters
- Raised planters provide seating and planting whilst keeping main routes free (King's Cross Development).

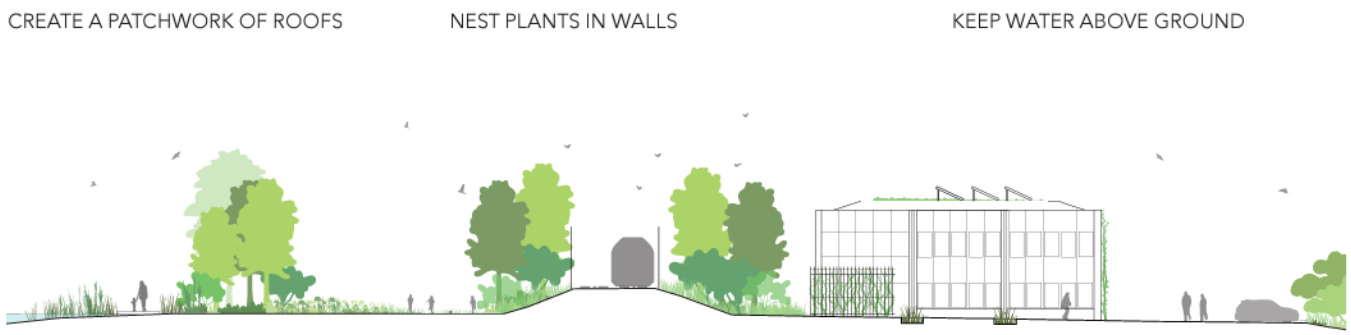
This The main factors to consider when designing a GI feature is to try and emulate natural habitats. These have been simplified into eight components, which are illustrated on the next page for a bio-diverse green roof, which they are most commonly associated with, but would benefit wildlife if applied to all roofs, façades, SUDs and planting areas, Management is important but should allow a degree of natural colonisation, dispersal and change to allow planting to adapt to a changing environment.

There are six distinct categories: sustainable urban drainage, roofs, façades, planting and species, land management and street furniture. Use the information to maximise gains for wildlife and people.

Roofs
Roofs provide a range of opportunities for wildlife, depending on a number of factors including height, aspect, substrate, depth and structure.

Façades
Over the last few years, the range of options available to green façades has grown significantly and where feasible can greatly enhance urban areas.

Sustainable urban drainage (SuDs)
Most professionals are familiar with the range of options and the value these can provide to wildlife. Slope angle and plant choice are critical to maximise benefit.




Land Management
Society's obsession with tidiness is limiting the potential for new landscapes to function for wildlife. Simple solutions exist that can improve this, whilst recognising the need for beauty.

Planting and species
What plants are specified and how they are arranged matters hugely to which wild species can make use of them and how much they contribute to people's health and well-being.

Street furniture
Thinking creatively whilst specifying is limiting the potential for new can maximise the function of furniture that is standard requirement for most public realm or street-scape.

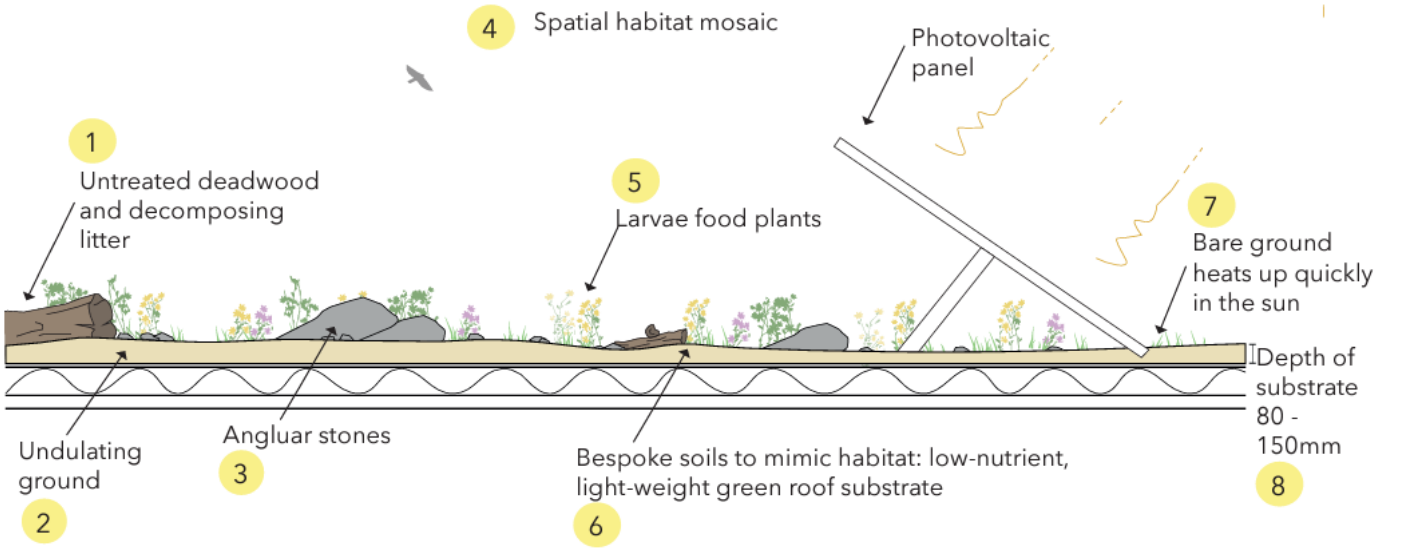

INVOLVE THE COMMUNITY
PRIORITISE NATIVE SPECIES
SPECIFY WITH WILDLIFE IN MIND

# Design Opportunities

This section sets out the most suitable green infrastructure features relevant to OPDC. They are grouped under five key headings:

- Roofs
- Street Furniture
- Façades
- Planting and management
- SuDs

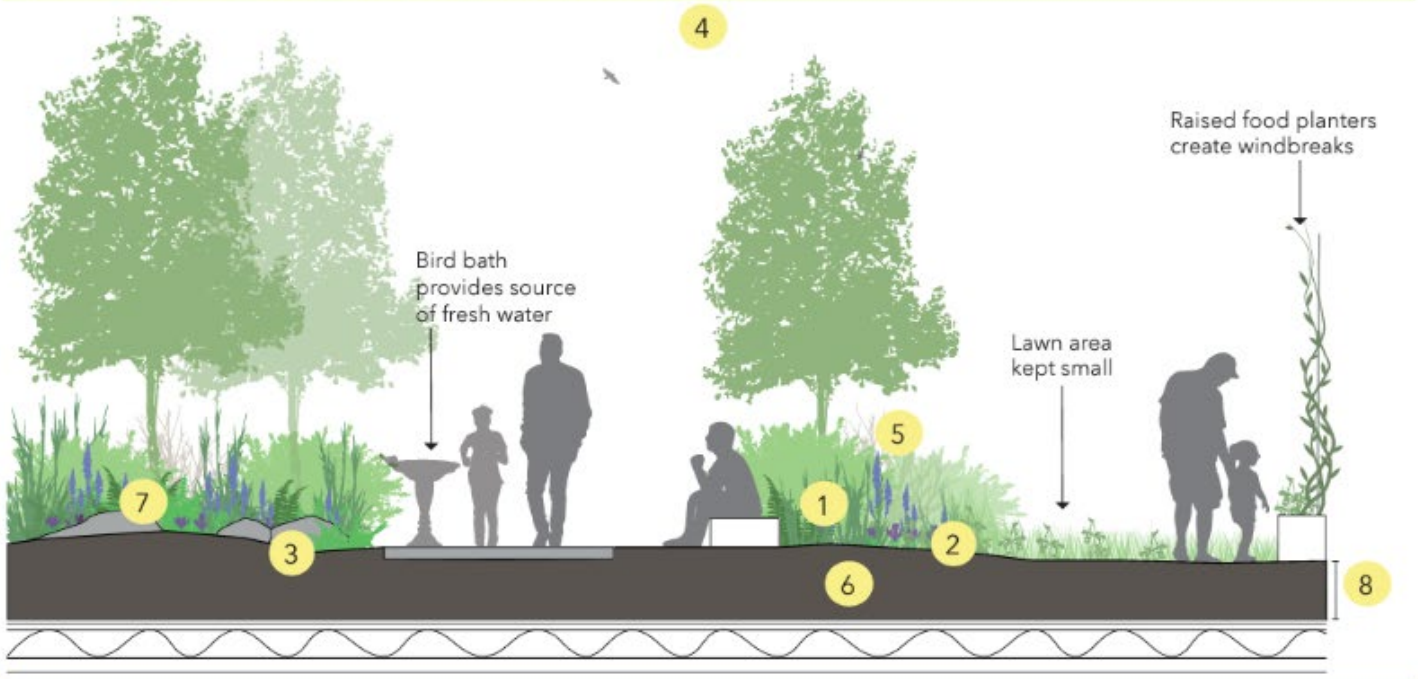
## Bio-diverse Green Roof (with PV)



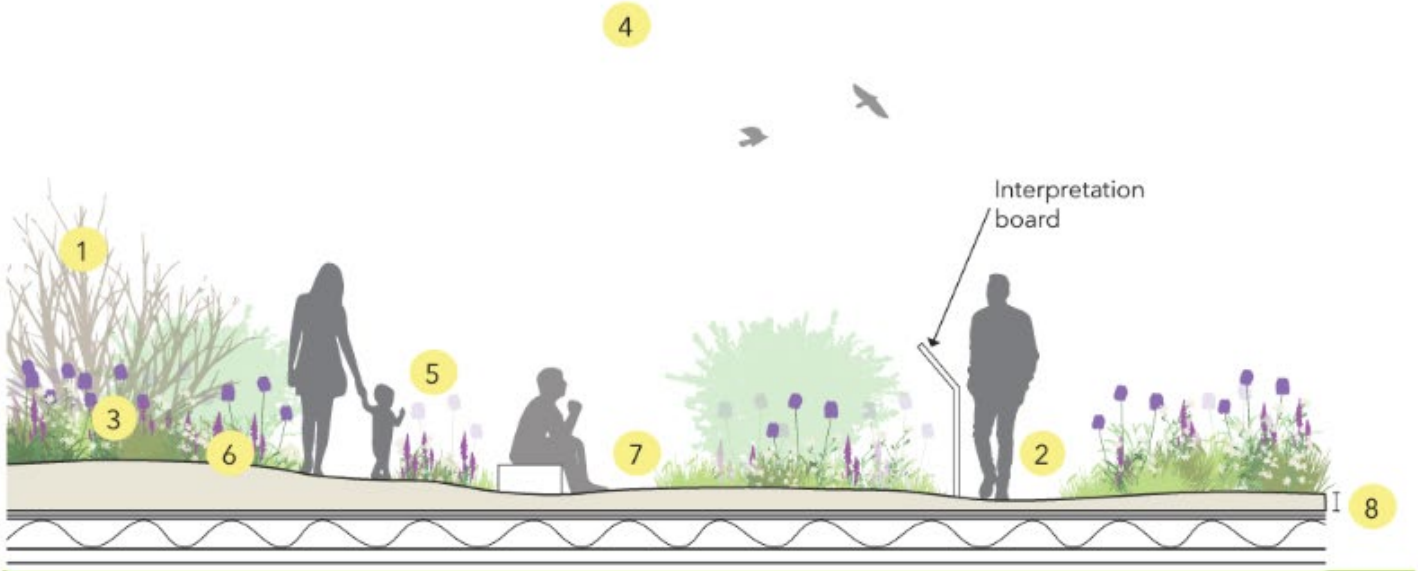

## Recommended Approach for Future Development

| GI Feature | Description (Use /Location, Composition) | Substrate (Depth / Texture / pH) | Reference Habitat |
|---|---|---|---|
| "Bio-diverse" Green roof (with PV) | 100% native vegetation that is tolerant of wind swept, exposed and impoverished soils. Best suited for the tallest buildings. | >80-150mm<br>Large particle size<br>Slightly acidic | • Open mosaic<br>• Alpine |
| Intensive green roof gardens, podium / decks) | Designed for people, typically in more sheltered locations. Overlooked and with multiple uses including private communal spaces, food growing and entertaining space. Mix of native and non-native species. | >400mm<br>Texture varies<br>PH varies | • Woodland<br>• Garden<br>• Meadow<br>• Scrub-land<br>• Hedgerow |
| Extensive /semi-intensive green roof | Designed for people, whilst avoiding heavy loads. This restricts choice of planting to drought tolerant species of native and non-native origin. | >60mm-200mm<br>Texture varies<br>Slightly acidic | • Meadow<br>• Scrub-land<br>• Open mosaic |
| Blue roofs | Capacity to store rainwater below a green roof. If the outlet pipe is raised above ground level, this would create pooling on the surface. 100% native. | >80mm<br>Texture varies<br>Typically slightly acidic | • Marshland |
| Extensive/ Sedum blanket | Designed for light-weight roofs. Lowest value. | <60mm<br>Large particle size<br>Slightly acidic | • Alpine |

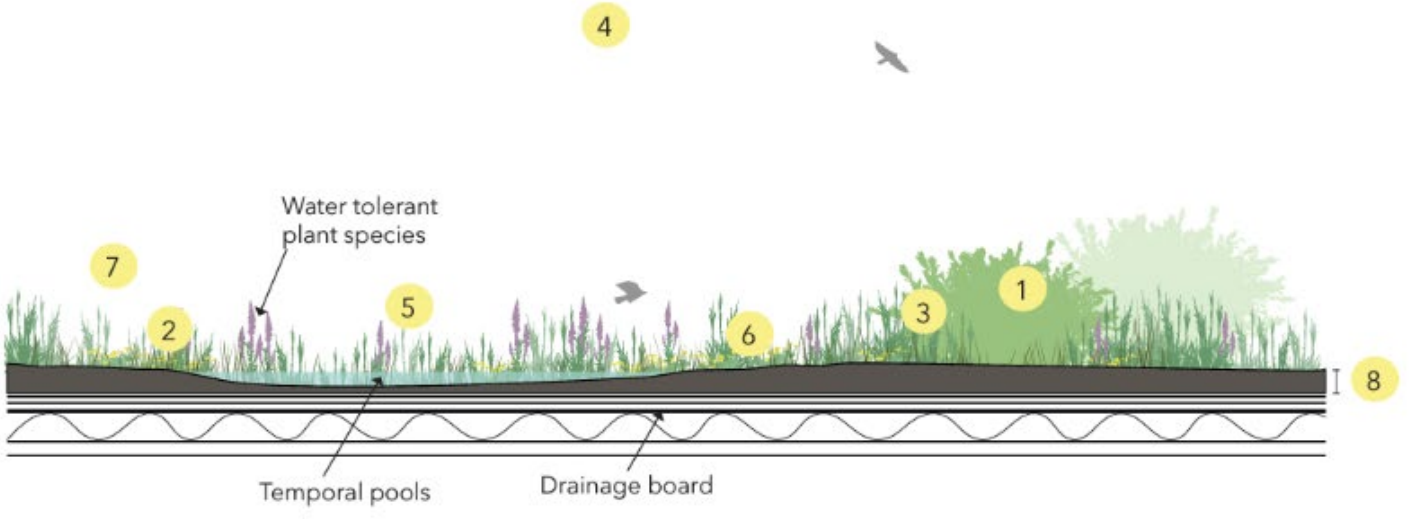
## Intensive Green Roof (Roof Gardens, Podiums, Decks)




## Extensive/semi-intensive Green Roof

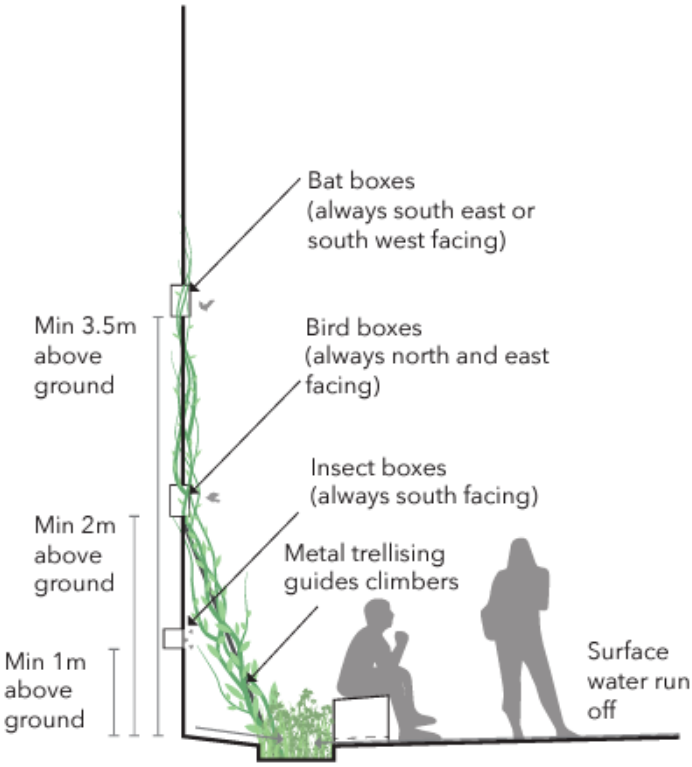



## Blue Roof

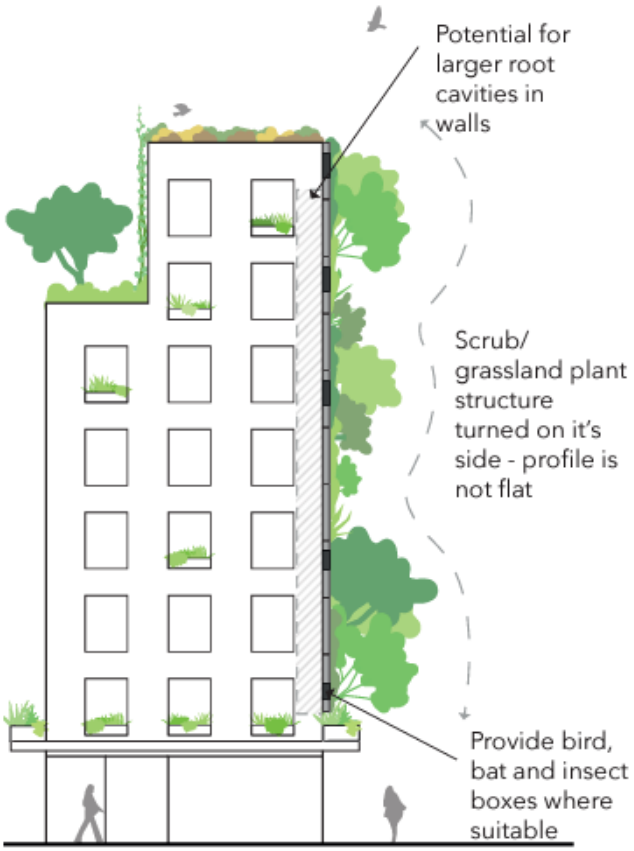


# Design Opportunities with Facades

## Traditional Climber / Trellis Method




## Modular Method




| Feature | Description |
|---|---|
| Modular green wall | Most use a plastic frame, with plants inserted in soil pockets or troughs. An alternative system uses hydroponic technology and root plants in fabric. All types require irrigation and can be expensive to design, install and maintain. Systems that use rain-water intercepted from roofs or down-pipes are the most sustainable. |
| Traditional, climber/ trellis | The traditional green wall, where climbing plants are rooted in the ground and depending on the species will either be self-clinging or require support (e.g. trellis or steel cables. Irrigation is generally not required. Adjacent hard surfaces can be designed to divert surface runoff into planters. |

## Window Box Method

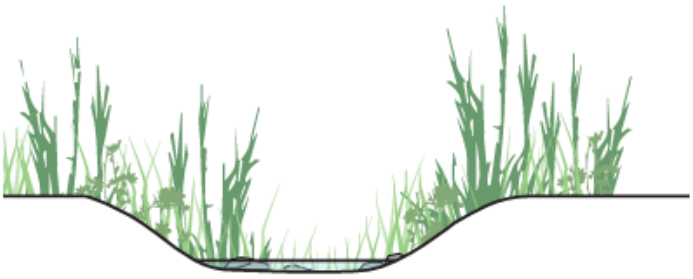
## Balconies Method


| Feature | Description |
|---|---|
| Balconies | Planters are designed as part of the architecture, which improves water-holding capacity and space for sizeable plants. Integrated planters encourages residents to grow plants without the cost of purchasing individual pots. |
| Window boxes | The smallest and with high water demands, window boxes are the least favourable option. They are still of value, particularly for the individual, but are more labour intensive to maintain. |

# Design Opportunities with SuDs

## Habitats, Species and Connectivity

SuDs provide excellent habitat for wildlife. It is important to remember that species such as reptiles, newts, frogs and toads will all use them quite happily, but need certain features. SuDs should connect to existing vegetation, have some all year cover, gradual slopes to allow access/ egress and preferable have links under busy roads to avoid large fatalities. Emulate different habitats using native species to form the structure. This still provides space for exotic species to give visual interest.



- The gradient should be no greater than 1:5 (12°) and preferably less than 1:20 (3°)
- Creating a large draw-down zone creates many more habitat "niches" then a narrow / steep zone
- Marginal vegetation protects the water's edge for wildlife, whilst creating a natural barrier to children

Neutral wet grassland

Open mosaic

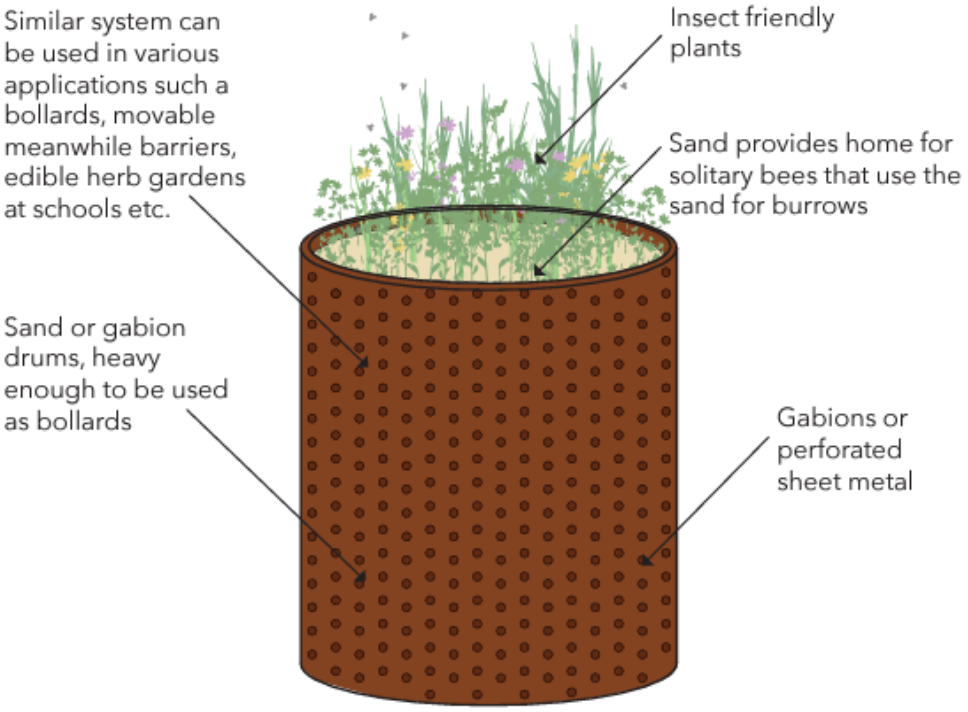
Willow scrub

| Typology | Description | Design Clues |
|---|---|---|
| Rain gardens | Small depressions that collect water close to source, typically from a building down-pipe, road, pavement, podium or roof. Once full, water is then conveyed to bigger features lower down the SUDs system. | Perfect for capturing and temporarily storing water from short, regular rain-fall events. Every planting bed could be a rain garden. |
| Swales, buffer strips, ditches, | Linear depressions that collect and convey water to lower down the SUD system. | Features that require more space, so suitable at site boundaries or along roads. |
| Retention basins | Large depressions that collect water during larger rainfall events. Typically, dry for most of the year and at the lowest point of the SUD system before discharging off site. | Can double up as natural play or events spaces or planted with a wild flower meadow to buffer existing sensitive sites. |
| Green walls | Can include green walls that collect water from roof or down-pipes. | Can be created on pretty much any vertical surface: fences, walls, bridges, stairs, columns and building façades, |
| Green roofs | Roofs that support a substrate of greater than >60mm depth provide attenuation as part of a SUDs system. | Typically designed for buildings but can also be created for bike shelters, bin sheds, pram-sheds and electricity sub-stations. |

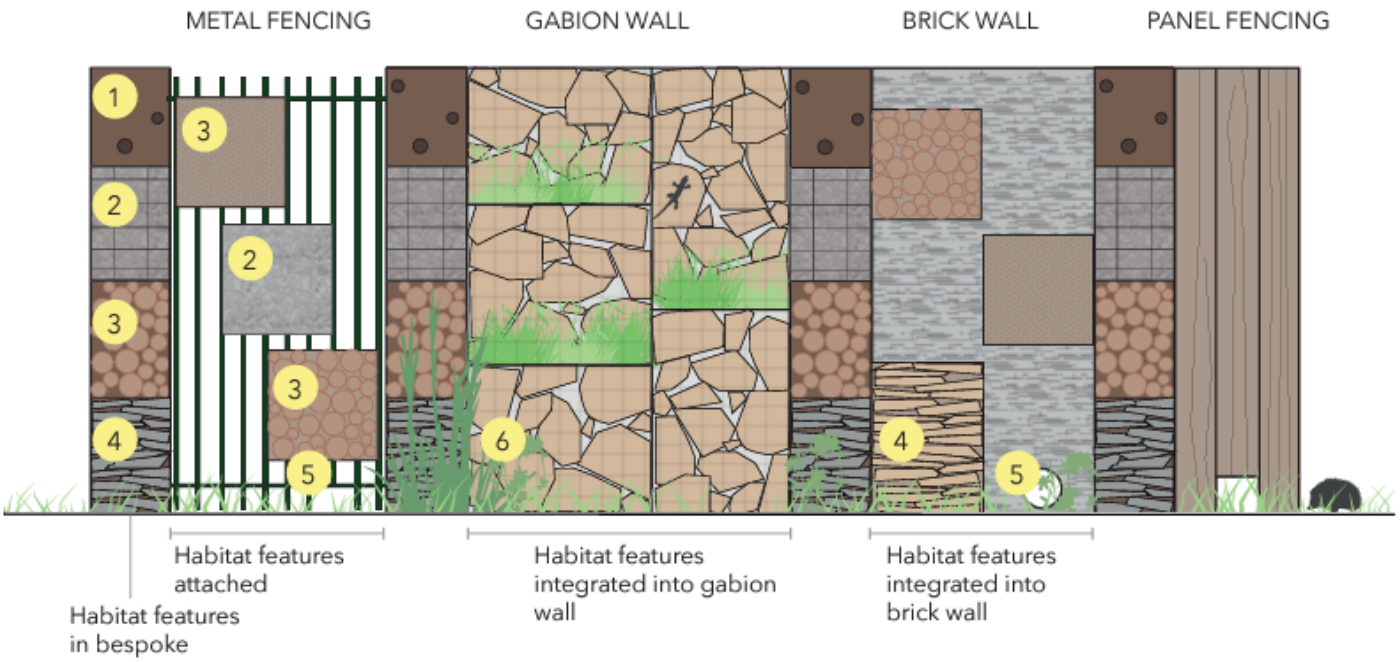
# Design Opportunities with Street Furniture

## Habitat Bollards

Thinking creatively when specifying can maximise the function of furniture that are also required for most public realm or street-scape. See supporting study for more information.




## Boundary Treatments




1. Bird/bat nesting box
2. Material for nest building (e.g. sheep's wool)
3. Untreated wood with drilled holes for solitary bees
4. Un-cemented stones to provide cavities for plants & animals
5. Gaps at ground level to allow hedgehogs to pass freely in the search of food
6. Places for climbers to establish and grow up

# Design Opportunities with Planting and Management

## Complexity, Naturalness, Management and Species

Complexity, naturalness, management and species are the important factors.

There is a positive relationship between wildlife rich planting and the benefits this brings to people's health and well-being.

Design in complexity by emulating natural habitats, not simplifying or abstracting elements of them.

Plant with as many layers as possible (as pictured on the right) and try to provide food and vegetation structure all year round.


## Naturalness

| Where possible | Prioritise | Avoid |
|---|---|---|
|  |  |  |
| Wild ---- Naturalistic ---- Formal | | |
| • Minimal management<br>• Self-willed<br>• Process driven<br>• Soil specific<br>• Species-rich<br>• Multiple layers<br>• High biodiversity value | • Managed (e.g. hay-cut)<br>• Semi-natural<br>• Communities<br>• Soil specific<br>• Species-rich<br>• Multiple layers<br>• High biodiversity value | • Intensively managed<br>• Controlled<br>• Single species<br>• Nutrient rich<br>• Species-poor<br>• One or two layers<br>• Low biodiversity value |

# Design Opportunities with Planting and Management

## Land Management

| Process | Description | Try to: |
|---|---|---|
| Decomposition | The rotting of vegetation and wood provides food for a whole host of invertebrates. This then provides for species further up the food chain. | Avoid removing dead wood, Avoid blowers that disturb soil, and remove loose material. |
| Enrichment | Nutrient rich environments favour the thugs in the plant world, that grow fast and dominate over others. This prevents species diversity both in terms of flora (and associated fauna). | Specify low nutrient soils and mulches. Remove grass cuttings. Avoid using fertilisers. Add yellow rattle in seed mixes to reduce vigour of grasses. |
| Succession | If left alone, given time, nature will colonise bare ground, grassland will turn to scrub and then eventually woodland. This gives nature space to be what it wants to be. | Make use of nature's free service by allowing natural succession and colonisation where aesthetics is not a priority. |
| Stress | Many of the most important plants for biodiversity thrive in stressed soil environments; Specific communities of plants favour acid, or lime, wet and dry or a combination of these. They are very beautiful and important food plants for a wide range of declining invertebrate species. | Make use of different soil types to steer plant selection. Choose communities of plants over individuals to create landscapes that fully support invertebrate populations (homes as well as food and shelter). |

## Species

Green infrastructure it's not just for people, but for wildlife benefit too. Understand the local species relevant to your site and design for them - as if you were designing for a group of society that had no voice. Native species are essential to entice wild species and enrich our daily lives. Understand life-cycles and engage ecologists. The picture below shows an example of how to design for bats in OPDC.