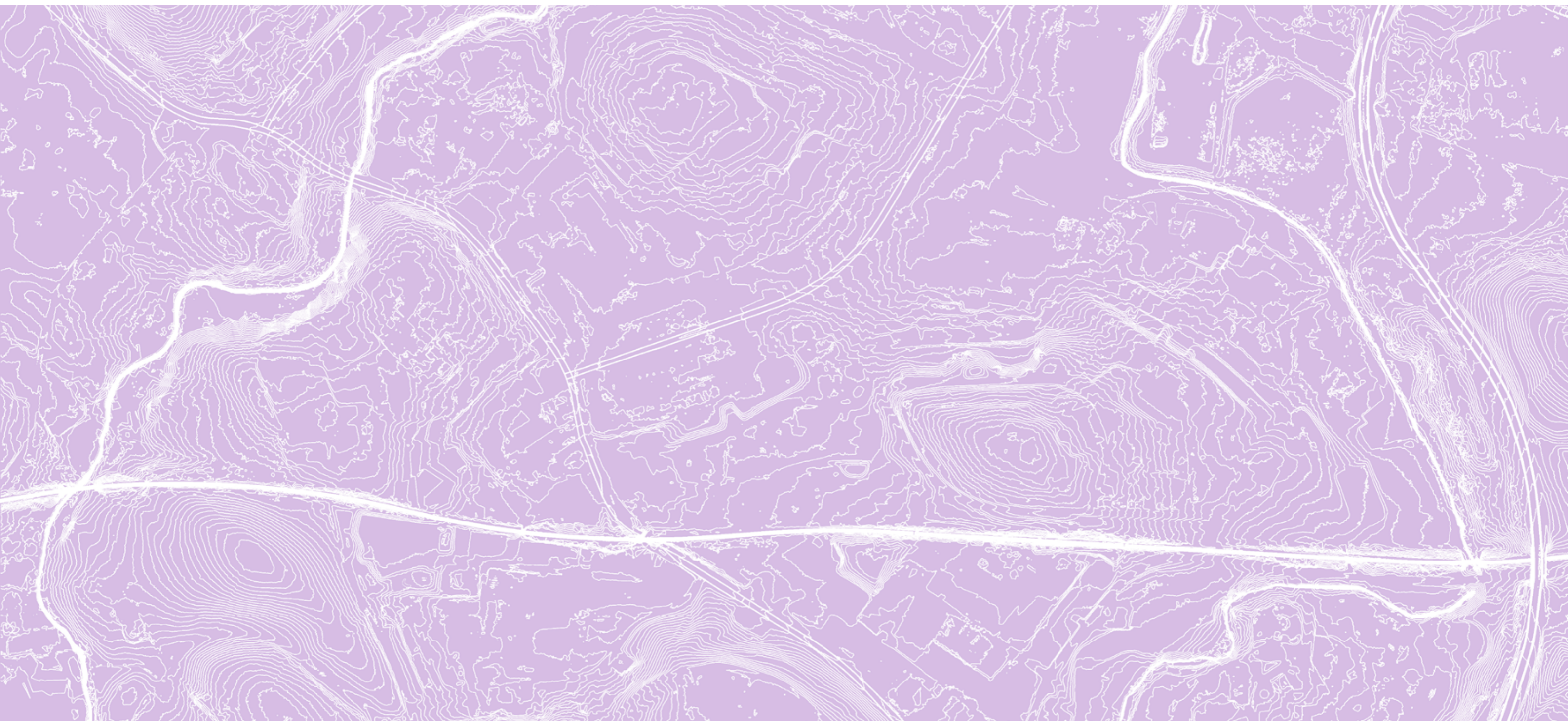


# Integrated Green Infrastructure Design Study

Nitshill: South West Glasgow



Client:

The Glasgow &  
Clyde Valley Green Network Partnership



Lead Consultant:

erz Limited



Consultants:

The EnviroCentre



Armour Construction Consultants



Funding Partners

Europe



InterReg



International Resources & Recycling Institute



Publication

Final Report November 2012

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# foreword

The aim of improving the quality of our urban and rural environments underpins many of the Scottish Government's National Outcomes e.g. "We live in well-designed, sustainable places where we are able to access the amenities and services we need". This has resulted in a renewed focus on place and placemaking which includes the spaces between the buildings within the wider built environment. Integrating green infrastructure into the design and masterplanning of new or regenerated places provides the opportunity to adopt an environmentally friendly approach to land development, growth and infrastructure planning.

Moreover integrating green infrastructure can provide multiple benefits by helping to develop places that are designed to deal with climate change, reduce our carbon footprint and support bio-diversity as well as providing surroundings that are safe, pleasant and supportive of healthier lifestyles.

In November 2011, the Scottish Government published guidance to support a new approach to the delivery of green infrastructure.

This study builds on that guidance by providing practical ideas and examples of best practice which demonstrates how green infrastructure can be integrated into site specific developments that will be re-generated over time. Many stakeholders were involved to produce a trans-disciplinary study that looks to inform the planning process to the benefit of the local community and to the wider value of the surroundings.

To this end I am very supportive of the principles behind this project and the practical advice it provides.

Ian Gilzean  
Chief Architect

Architecture and Place Division  
Scottish Government



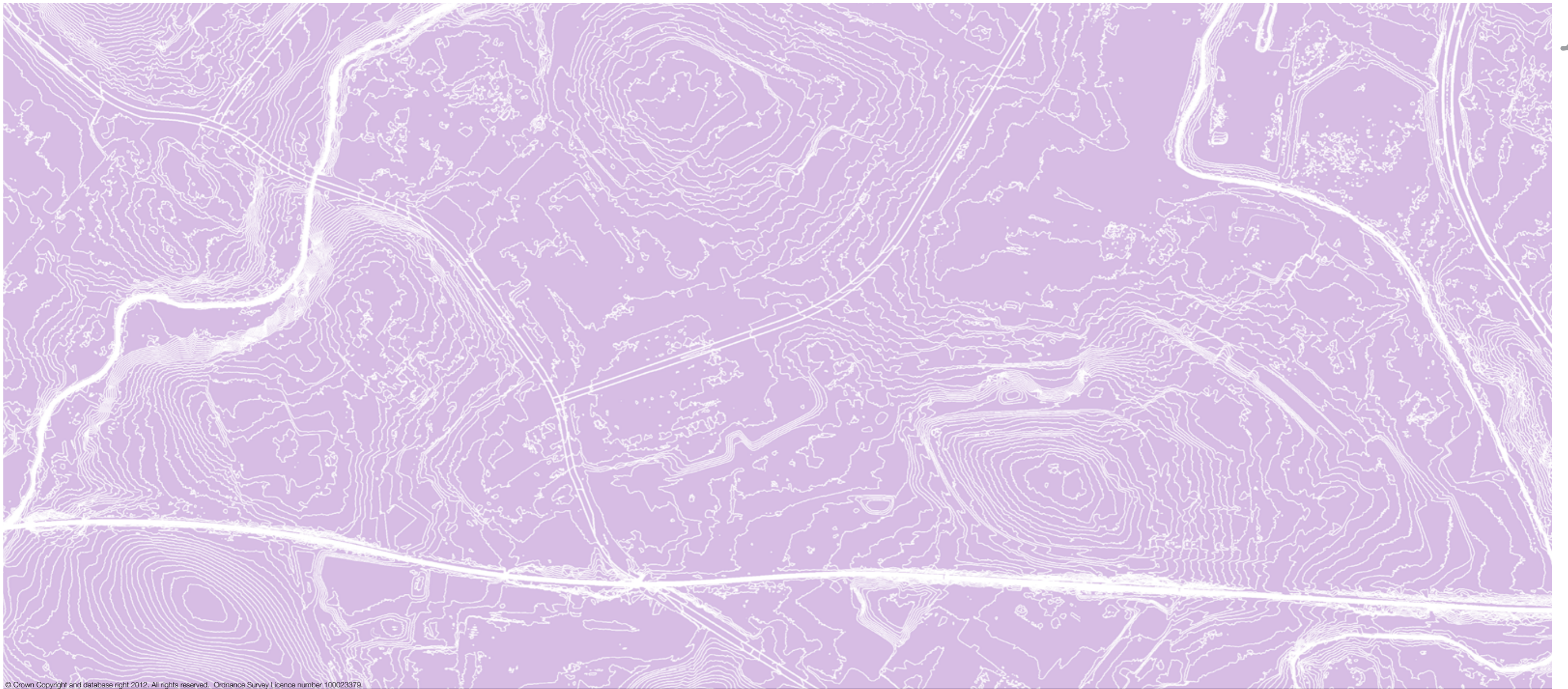
Integrated Habitat Design Competition 2012  
Overall Winner



The Nitshill Integrated Green Infrastructure Design Study has been endorsed by Scottish Environment Protection Agency.

# preface

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A

# introduction:

Erz Limited were appointed by the Glasgow and Clyde Valley Green Network Partnership (CVGNP) and the International Resources and Recycling Institute, in October 2011.

Erz has led the study with support from EnviroCentre Limited, who have provided expertise in terms of hydrology, ecology and habitat issues. Armours have acted as cost consultants, assisting in the generation of outline costings.

The study is focused on 2 geographically distinct areas (Nitshill in Glasgow and Spango Valley in Inverclyde) that were selected by the client body as 'test cases' to demonstrate the Integrated Green Infrastructure study approach and outcomes. This follows 4 previous studies completed for the CVGNP in 2011. The work also aims to generate valuable outputs, in terms of strategies and more focused design proposals that can help to inform the regeneration process in both areas.

The study has been carried out under direction from the core client body, but also in ongoing dialogue with steering groups on 2 levels.

## **1. local area steering groups:**

For both study areas, a local steering group was formed comprised of key officers from the relevant local authority, with responsibilities across a range of relevant issues (planning, parks, housing, roads etc.) alongside other key stakeholders such as landowners and others with an interest in the redevelopment of key sites.

## **2. executive steering group:**

The executive steering group is comprised of representatives of the key public agencies whose role and remit is relevant to the integrated green infrastructure agenda. This group includes representatives of: the Scottish Government (chief architect), the Scottish Environment Protection Agency (SEPA), Scottish Natural Heritage (SNH), Scottish Water (SW), the Metropolitan Glasgow Strategic Drainage Partnership (MGSDP) and Architecture & Design Scotland (A&DS). To ensure continuity and good communication, key public sector representatives of the local steering groups also attended the executive steering group meetings.

## **Study purpose:**

The study is geographically focused on Nitshill and more generally the south-western extent of the urban area of the city of Glasgow.

This is one of a pair of studies commissioned to demonstrate the Integrated Green Infrastructure study approach and its outcomes.

The study is driven by analysis of the area focused on the 5 core topics of Integrated Green Infrastructure, namely: water management, access networks, habitat networks, green & open space and stewardship over time. The study seeks to determine the key interventions that can deliver benefits across this full range of issues.

It must be highlighted that the study does not seek to generate a comprehensive urban regeneration plan for Nitshill and equally does not seek to generate a comprehensive strategy for habitat or ecological enhancement. The study focuses on the opportunities for significant combined effects – where a whole series of positive outcomes can be realised together.

We would argue that these opportunities for combined effect should form the backbone of any urban regeneration or ecological enhancement strategy. If you are going to start anywhere, this offers a framework for meaningful change that will deliver maximum benefit from the investment.

The analysis has included: geomorphology and hydrology, the characteristics of the built and unbuilt environment (including: its evolution over time, its current structure, patterns of movement, incidence of unused land, anticipated change and the structure and characteristics of the existing green network), habitat and ecological systems and the social and economic position.

# executive summary:

Some of the key findings of the analysis stage work can be summarised as follows:

## Hydrology:

- No major flooding or drainage issues have been identified by Glasgow City Council or Scottish Water in the Nitshill area. However pluvial flooding mapping and historic flood events identify issues within the lower reaches of the former John's Burn catchment (which essentially covers the core area of Nitshill).
- Based on these findings, interventions to manage pluvial flooding issues and manage the rate of flow into the Brock Burn are seen as beneficial.

## Urban structure & movement:

- The urban area is sub-divided by major roads, the rail line, watercourses & steep slopes. There are limited crossing / access points and where they exist they are often of poor quality.
- Nitshill neighbourhood centre has significant challenges in terms of viability. It is disconnected from its wider residential hinterland by barriers to pedestrian movement and has a small residential population in the immediate core area.
- The layout of residential areas is focused on car movement and there is a lack of legible / coherent walkable routes through residential areas connecting to community facilities.
- The dual carriageway roads (primarily Peat Road) form key links to community facilities, but lack human scale, are of poor character and discourage pedestrian use.
- There is a need for good quality, legible walking routes connecting residential areas to community facilities.
- There is also a need to increase the residential population in the core area of Nitshill.

## The existing green network:

- There is great potential to create a coherent green network in south-west Glasgow that: connects into the National Cycle Network & incorporates Pollok Country Park, Dams to Darnley Country Park, Rouken Glen Park, Carlibar/Centenary Park and the wider greenbelt
- There are key missing links that break the wider network at

present. The core paths through the study area do not form a coherent network at present.

- The ability to connect into the National Cycle Routes & Pollok Country Park is dependent on the layout / master planning of 2 sites identified for development.
- The main green corridors focused along the Lovern Water and Brock Burn lie to the edges of the residential neighbourhoods.
- The main green corridors are not tied into day to day activity, are not visible & are a 'latent' asset that could help to redefine the identity of the area.
- There is a lack of management / maintenance of sections of routes that acts as a significant barrier to use and access.
- There is a 'poorly focused' deployment of management / maintenance resources: with expanses of cut amenity grass with no function.
- There are often poor relationships between residential neighbourhoods and the green network arising from poor masterplan / layout decisions.

## Habitat & ecological systems:

- Wetland habitats which would have been present have been lost through the industrialisation and urbanisation of the study area.
- Unimproved grassland and broadleaved and mixed woodland habitats have been identified within the Glasgow Biodiversity Action Plan as priority habitats. The areas identified for enhancement could be managed to encourage the establishment of these habitats.

## Social & Economic position:

- The neighbourhoods to the north of the rail line that bisects the study area include some of the most deprived communities in Scotland that also demonstrate some of the poorest health data of all communities in Scotland.

These findings have informed the development of an Integrated Green Infrastructure strategy that aims to make a significant impact across this range of issues.

The strategy is outlined in the series of diagrammatic plans over the following 2 pages.

The key components of the strategy are explored in greater detail through a series of area specific design studies, as follows:

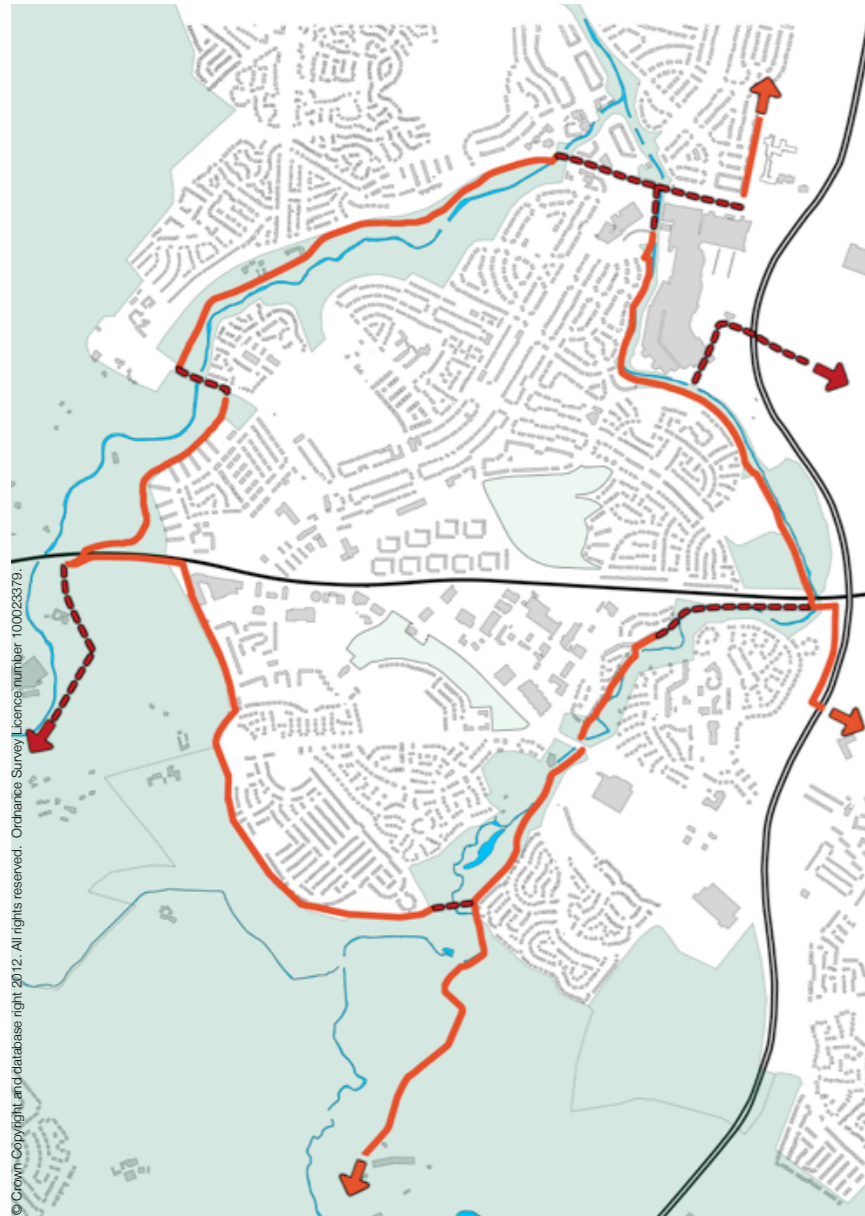
1. Nitshill neighbourhood centre
2. Peat Road corridor
3. Lovern Water to Hartstone Wood Hill
4. Darnley Mill to Glasgow Museums Resource Centre
5. strategy for landscape change and management

The outputs of the study, (the strategy and design studies) have been tested against the core ambitions of integrated green infrastructure, namely:

- water management
- access networks
- habitat networks
- green & open space
- stewardship over time

The proposals are found to deliver positive outcomes across the full range of issues, as described in detail later in the report.

# executive summary:



1. wider network links

intention:

- create a coherent green network in south-west Glasgow that connects into the National Cycle Network & incorporates Pollok Country Park, Dams to Darnley Country Park, Rouken Glen Park, Carlibar/Centenary Park and the wider greenbelt

intervention:

- form missing links in the wider green network/ existing core path network
- form strong links to the north to the National Cycle Routes and Pollok Country Park



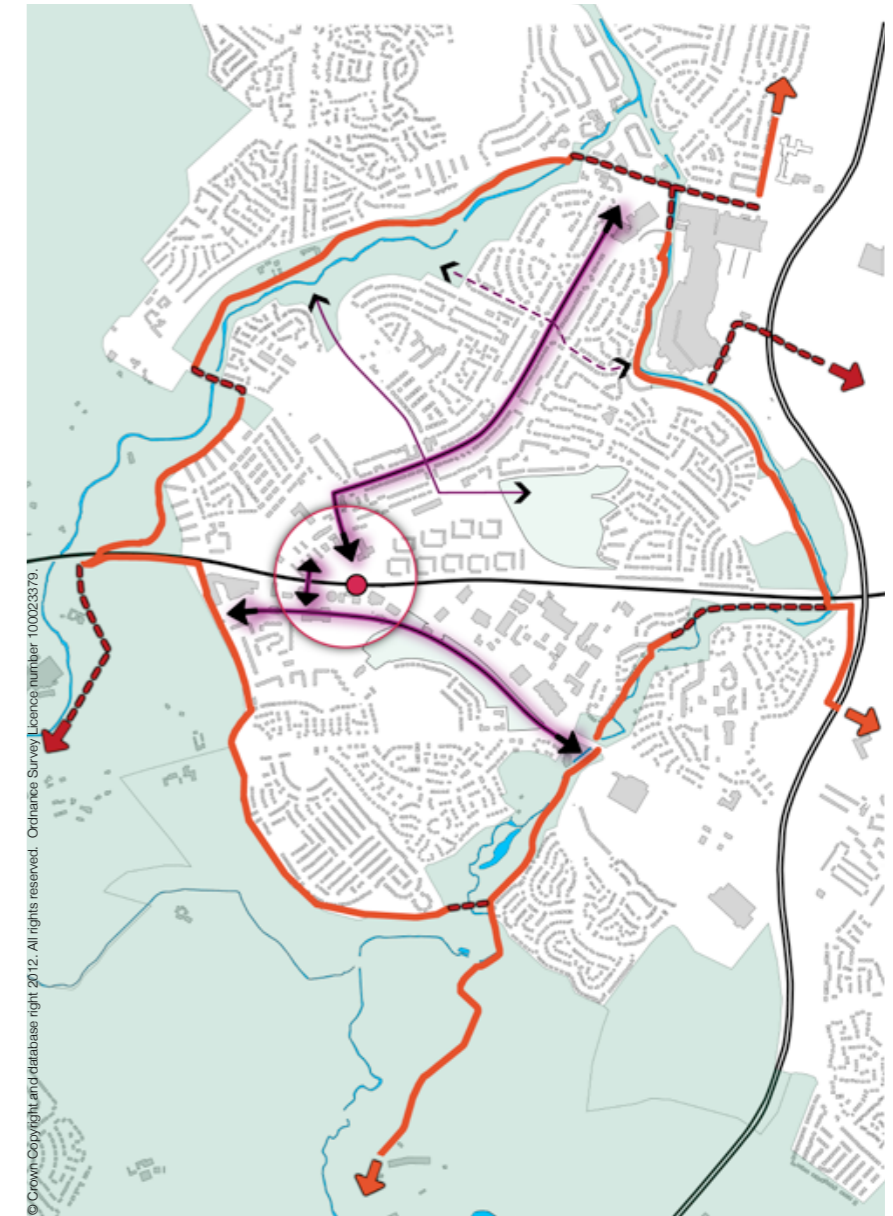
2. green network links within urban area

intention:

- integrate the green network into the urban area
- create legible, walkable and safe routes for pedestrians & cyclists
- connecting neighbourhoods to community facilities
- make the green network visible & redefine the character / identity of the area

intervention:

- redefine Peat Road as a good quality pedestrian and cycling environment: a 'green boulevard'
- form east-west links stitching the boulevard into the wider green network
- form an east-west link between Levern Water and Brock Burn corridors: between Darnley Mill & the Museum Resource Centre



3. connected green network

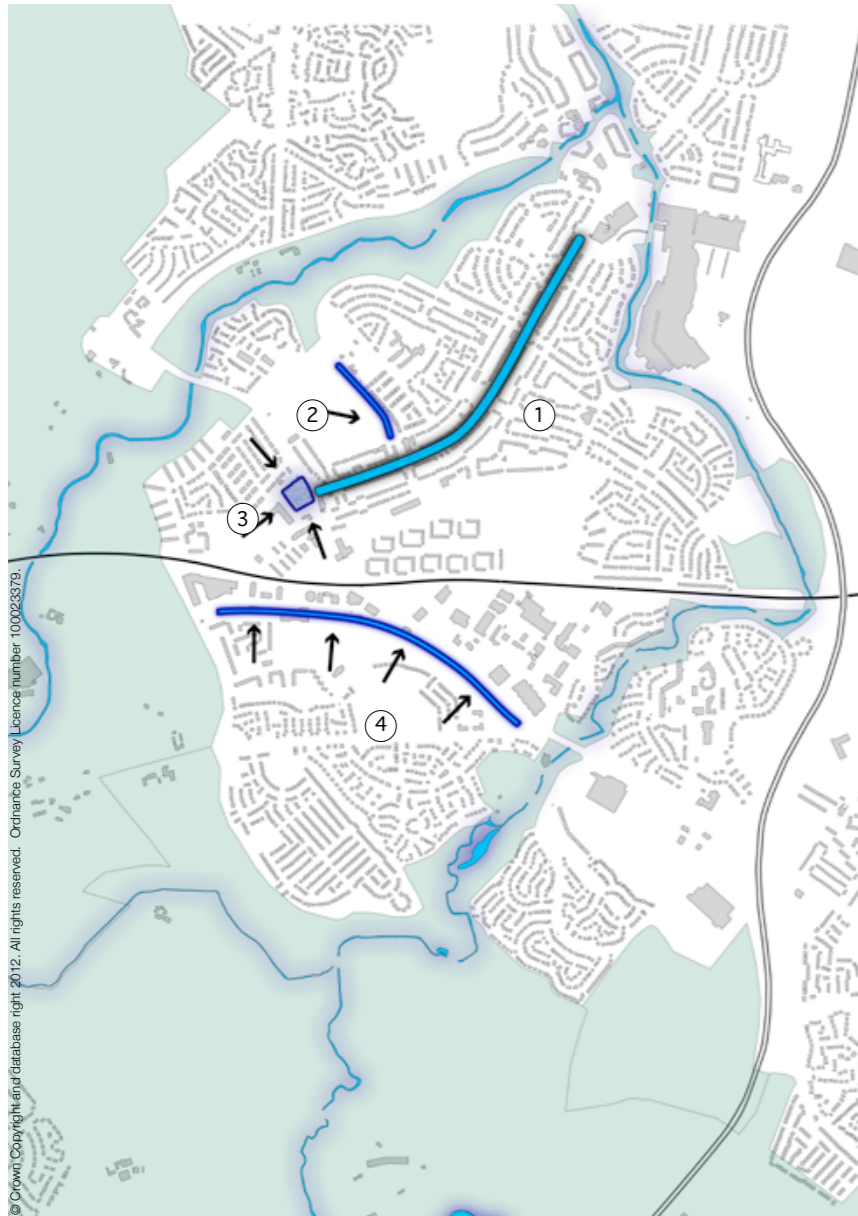
intention:

- make the green network accessible & visible & redefine the character and identity of the area
- a green network that functions on both a local and citywide level
- introduce new and provide enhanced habitat corridors

intervention:

- the centre of Nitshill becomes a hub of the green network & a key point of arrival to Dams to Darnley Country Park and the wider green network
- provide a more varied habitat network in line with the Local Biodiversity Action Plan





4. integrated water management

intention:

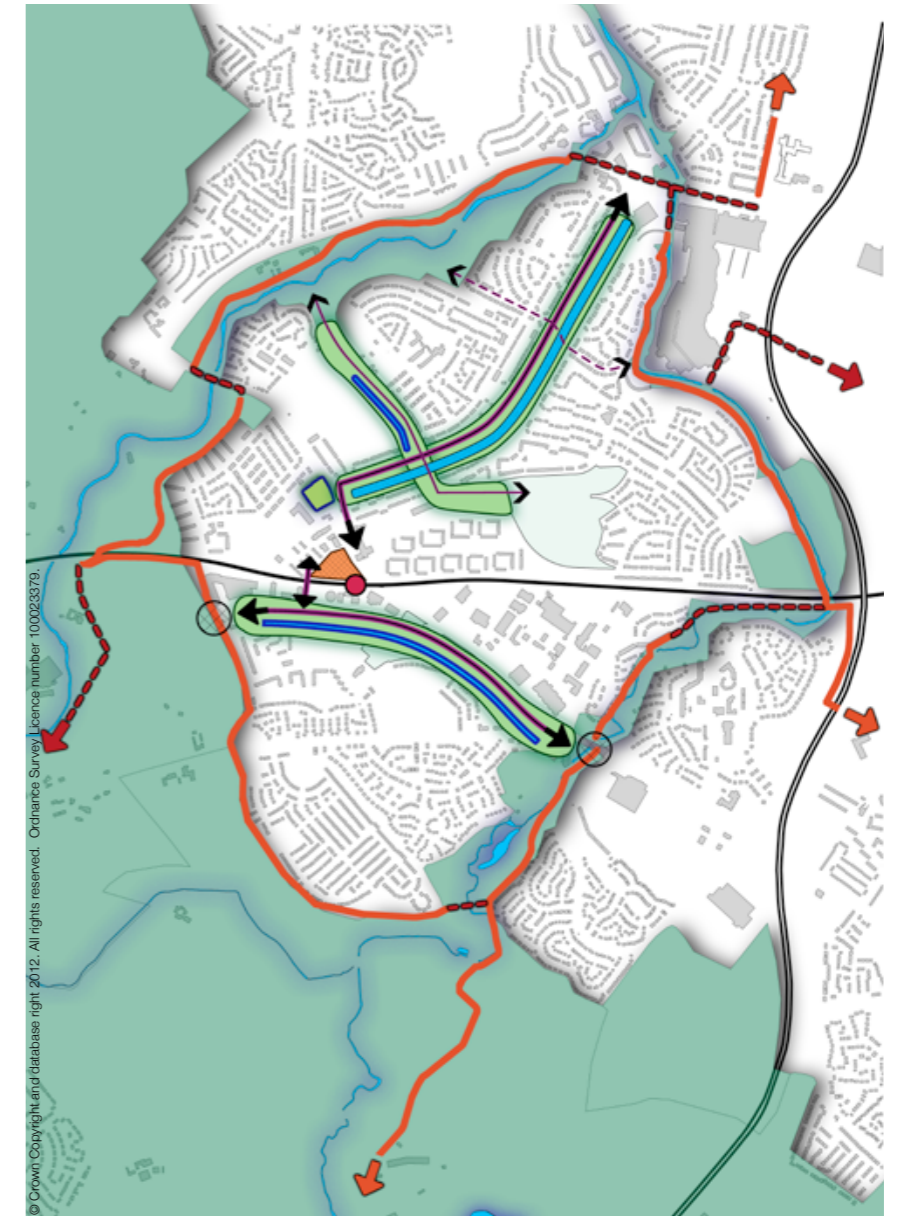
The long term intention is to create a surface water management network which can collect and manage the surface water from source to the confluence with the Brock Burn on or near to the ground surface. This would require a step-change to the present water management where surface water is collected in combined sewers along with foul drainage and conveyed to treatment works outwith the local catchment. It is recognised that achieving this would be a gradual process over an extended time period where works would likely be implemented as areas are re-developed or existing infrastructure requires to be upgraded.

intention:

- All surface water runoff from local catchment area allowed to drain on/near the ground surface from the source to natural confluence with the Brock Burn
- gradual decoupling of surface water from combined sewer is proposed and local areas for collective SUDS retrofit are provided
- that water management features provide resilience for climate change
- greenspace can be designed and developed for SUDS over time, allowing potential for open water when sufficient connections are in place
- provide local scale treatment as part of wider catchment system
- collect, attenuate and treat surface water connections before discharging back to combined sewer until fully dedicated surface water system in place

intervention:

1. Peat Road corridor redesigned to manage surface water thro' SUDs features such as: swales, linear wetland, tree planting etc.
2. SUDs features associated with adjacent residential development site incorporated into linear park
3. SUDs feature created as terminus to boulevard on cleared site: addressing water management requirements of surrounding development sites
4. linear swale/wetland SUDs features incorporated into design of green link: management of surface water in upper portion of catchment (south of rail line)



5. combined strategy response

# integrated green infrastructure:

## What is Integrated Green Infrastructure?:

### Multi-functional landscape:

Integrated Green Infrastructure as a physical outcome might be described as a well co-ordinated set of landscape spaces or features that simultaneously deliver a range of functions. Such 'green infrastructure' may function as public open space, as part of a wider network, offering health and social benefits, whilst performing a water management function and providing valuable habitat.

The starting point is therefore of a 'multi-functional' green network. This by definition demands the examination and consideration of a number of topics in parallel to develop a balanced and resolved set of outcomes.

Before discussing the approach to developing a 'multi-functional' green network, it is also perhaps useful to recognise the underlying challenges to delivering a successful green network / public open space in more general terms.

### Consider the green network & built environment together:

The green network cannot be considered as separate from the wider urban or 'built' environment. Indeed, this separation in thinking is arguably one of the generators of many of the dysfunctional public open spaces that exist in the Glasgow Metropolitan Region.

Public open space can take many different forms and perform different roles. Public open space or greenspace when it is of a scale and level of interest can become a 'destination' in its own terms. However, within an urban area, much greenspace will exist at a smaller and more incidental level, whereby its success will depend upon its association or relationship with other components of the urban environment.

Public open space within urban areas must succeed socially. Spaces that are unpeopled and secluded feel unsafe and will tend to act as a locus for anti-social behaviour. One of the core goals of designing public open space is to ensure adequate levels of human presence, activity and casual surveillance. Human presence tends to be self reinforcing, to quote a Danish proverb, 'people come where people are'.

Activity in spaces can be generated by:

- through movement: ie the space forms part of a wider route network
- buildings / uses surrounding the space: ie the space has a close relationship with surrounding built form to draw activity into the space
- the activities / facilities within the space

To realise successful public or common spaces, they have to become one of the key drivers of any master-planning process. The pedestrian and vehicular circulation network, relationship of buildings and spaces, approach to topography etc. have to be carefully considered to generate the right conditions for the spaces to succeed socially.

### New thinking alongside recognised good practice:

To deliver the ambition of Integrated Green Infrastructure, considerations of specific functions, such as ecological systems and water management strategies must be balanced with the underlying landscape architecture and urban design challenges of delivering successful green networks and public open space.

This necessarily brings together relatively new thinking (multi-functional public landscapes incorporating water management strategies) with established thinking, although seldom realised in practice, of co-ordinated design of green networks and the built environment.

### Integrated Green Infrastructure: a process:

To realise these ambitions of a successful, multifunctional green network a well informed and carefully balanced approach to analysis and design is required.

The process demands the parallel analysis of a number of topics that are typically isolated from one another in current planning and design practice in Scotland.

Understanding across a range of topics needs to be brought together and creatively moulded into a design solution that effectively and elegantly realises a multiplicity of positive outcomes through a single intervention.

One of the core purposes of this document and study is to demonstrate this approach.

# integrated green infrastructure:

## History & context:

The roots of this way of thinking about the built and unbuilt environment can be linked back to some of Scotland's innovative thinkers in landscape architecture and urban design.

Patrick Geddes (1854-1932) (born in Aberdeenshire), brought together consideration of a breadth of topics as exemplified through his 'place / work / folk' matrix. '... for Geddes planning risks losing touch with communities, cities & regions that it sets out to serve if it does not take a multiplicity of approaches into account'. (Murdo MacDonald 2009).

Ian McHarg (1920-2001) (born in Clydebank), was an innovator in the field of landscape architecture, having a significant impact on thinking and practice through his book 'design with nature' (1967). This exemplified an approach of mapping systems and data including hydrology, soils, movement, health etc. and overlaying information to build up an understanding of the issues and their interaction. The analytical processes of Integrated Green Infrastructure exemplified in this study are informed by this approach.

Given this innovative thinking about landscape and the urban environment originating in Scotland, one might expect that Scotland would have an exemplary system of planning and delivery of change in the built and unbuilt environment.

## The current system of planning and delivery of change:

Change in the built and unbuilt environment in Scotland is arguably frequently realised by 'single topic' specialised agencies, for example:

- private sector developers or public sector housing agencies
- local authority roads departments
- statutory service providers such as: Scottish Water
- health agencies such as the National Health Service
- environmental agencies such as: Scottish Natural Heritage / the Forestry Commission

Each of these agencies has a focused agenda and works to deliver outcomes in terms of their core 'mission' which is specialised and topic specific.

If this analysis is accepted, it necessarily raises the question of how the activities of the institutional providers / agencies can be orchestrated to deliver outcomes that put people at the core of the process and deliver better places?

There are current examples of policy that aim to more effectively shape and direct activity, for example:

- The Scottish Government's 'better place making' policy, which aims to 'provide communities with an important cultural context' and to deliver places of distinctive identity that are community focused.
- Glasgow City Council's: 'equally well Glasgow' policy, which aims to put people at the core of the process: driven by community participation and with the aim to integrate health into the planning system.

Beyond broad policy, the challenge of attempting to orchestrate activity more effectively essentially falls to the Local Planning Authority planning officer (principally through the development control role).

This is structurally problematic, in that development control is by its nature reactive and focused on a particular site. The issues being discussed demand an understanding of broader systems across a wider area.

Without other input to this process it is arguable that the desired co-ordination of different ambitions (development, green network, water management etc.) simply cannot be delivered. It seems clear that supplementary study or design guidance is required to support the planning officer in this role.

## The role of the Integrated Green Infrastructure model:

The role of the integrated green infrastructure model could be argued to be a currently missing step between broad policy and effective delivery. It gathers and focusses views around a set of propositions at a strategic level that can help to coordinate and inform the actions of a range of agencies and partners.

Through the evolution of a co-ordinating design response at a strategy level, it enables a common dialogue to take place that can meaningfully engage the community in the shaping of proposals.

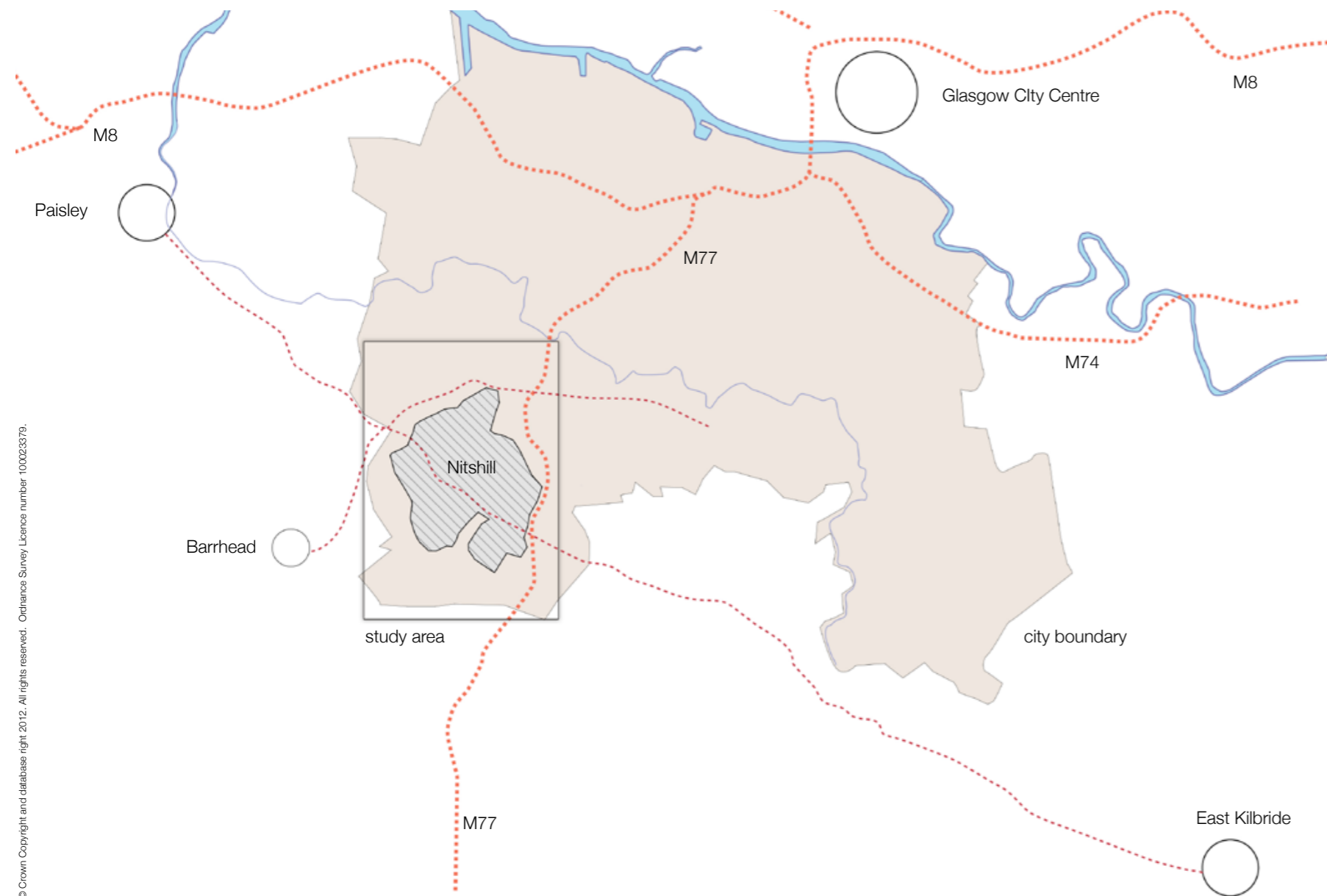
- it applies a co-ordinating design response to a series of presently independently considered and delivered institutional roles
- it assists in bridging the gap between the activities of technical, institutionalised agencies and community participation
- it creates a platform for a community focused process: fully informed in terms of technical issues and opportunities



study area: immediate setting

- |                             |                              |
|-----------------------------|------------------------------|
| 1. Lavern Water             | 7. Study Area Boundary       |
| 2. Brock Burn               | 8. Nitshill Area Development |
| 3. M77                      | Framework Boundary           |
| 4. Silverburn Retail Centre | 9. Nitshill Road             |
| 5. Nitshill                 | 10. Peat Road                |
| 6. Darnley Retail Centre    | 11. Nitshill Railway Station |

# site / development context



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## study area: city context

The study area was initially defined by Glasgow City Council as the core of the Nitshill neighbourhood. Given the nature of this study and the urban structure, a wider study area has been defined; bounded to the west by Barrhead road and to the east by the M77, extending south to the city boundary.

Two main watercourses flow through the area; the Levern Water to the west and the Brock Burn to the east.

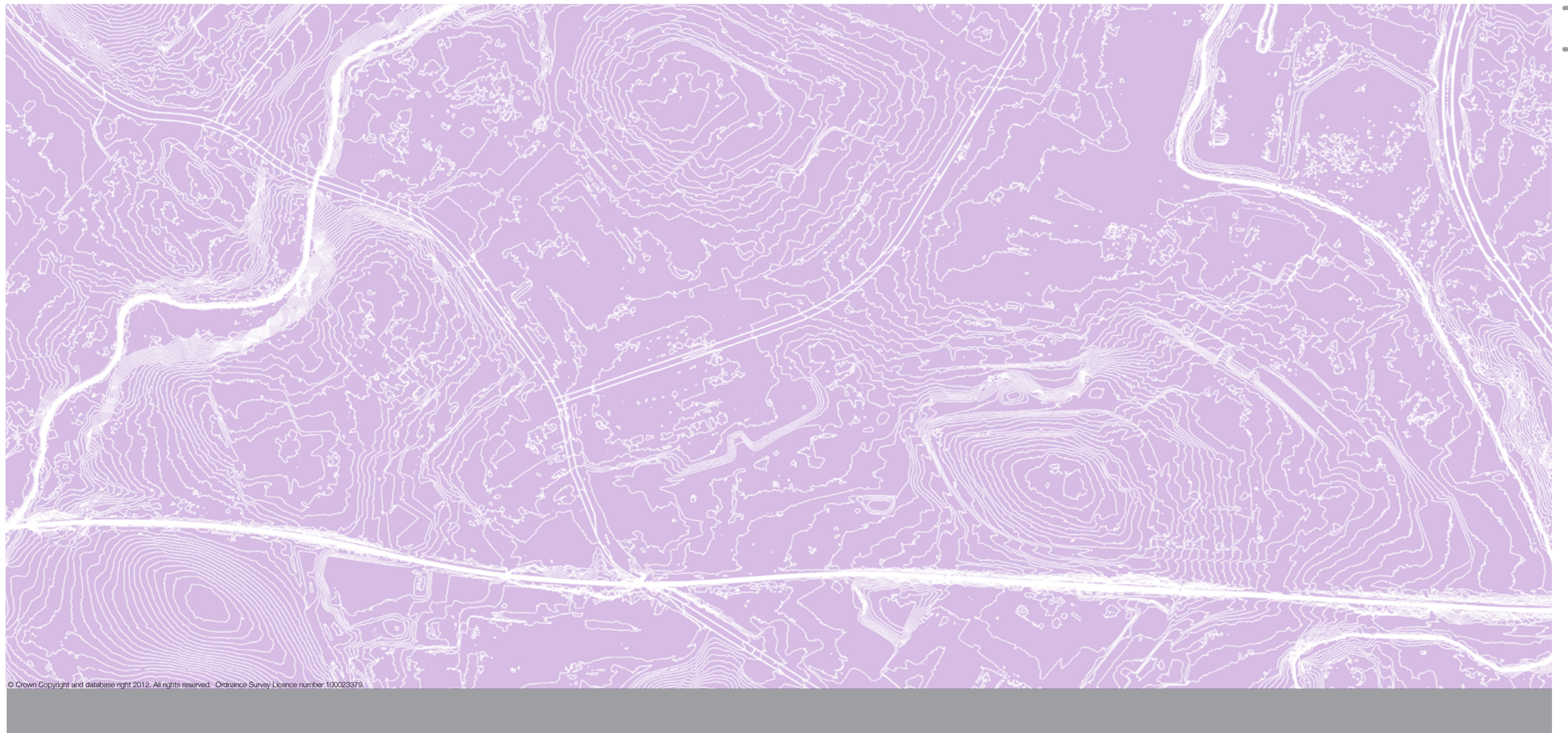
The urban area is predominantly residential, with large scale car based retail developments at Pollok (Silverburn) and at Darnley. Business and industrial development is largely focused to the immediate south of the rail line that bisects the study area.

This core study area has also been considered in a broader city context throughout the study. The study area represents the south-west extent of the urban area of Glasgow city.

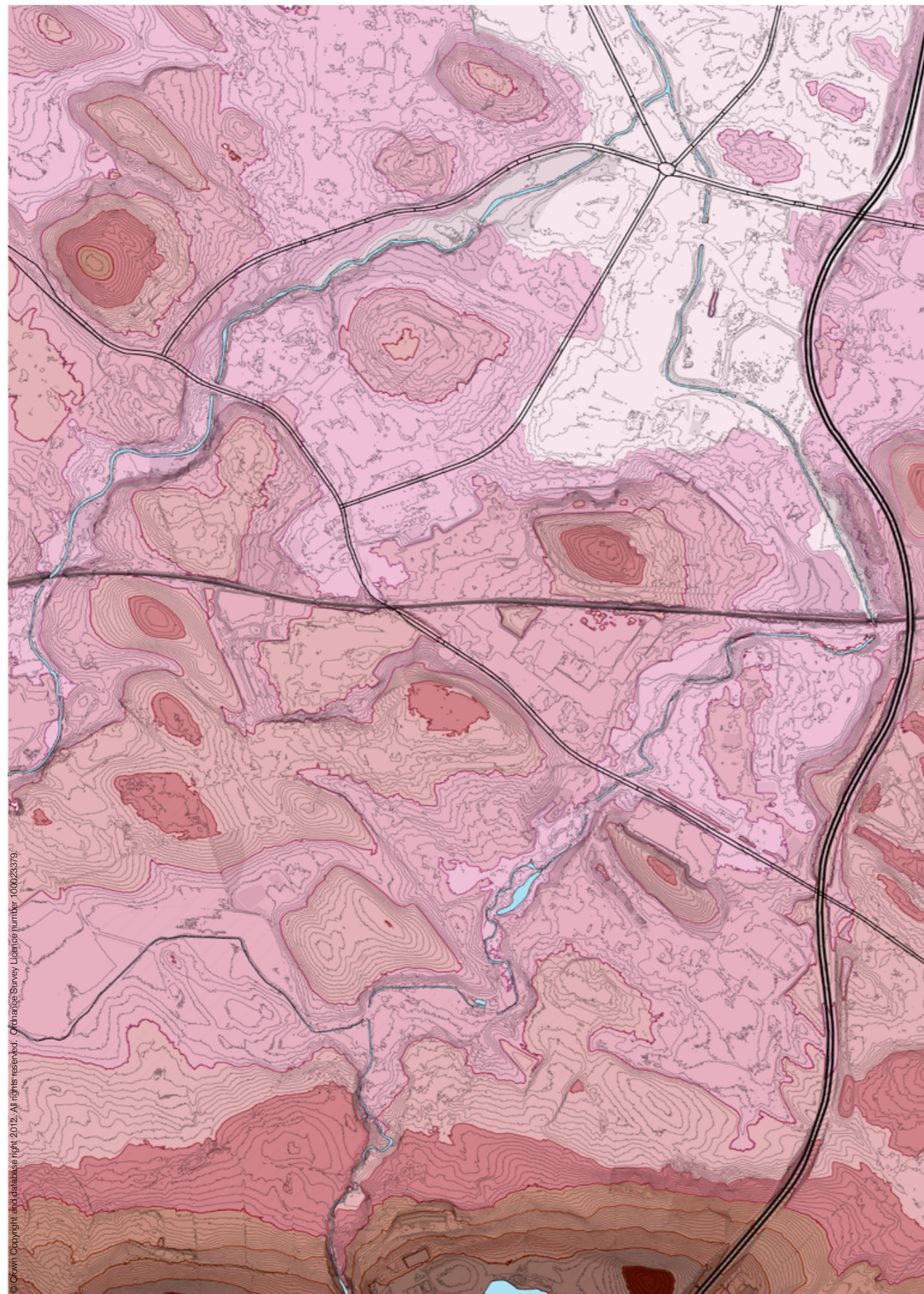


analysis

geomorphology / hydrology



B



### topography - elevation

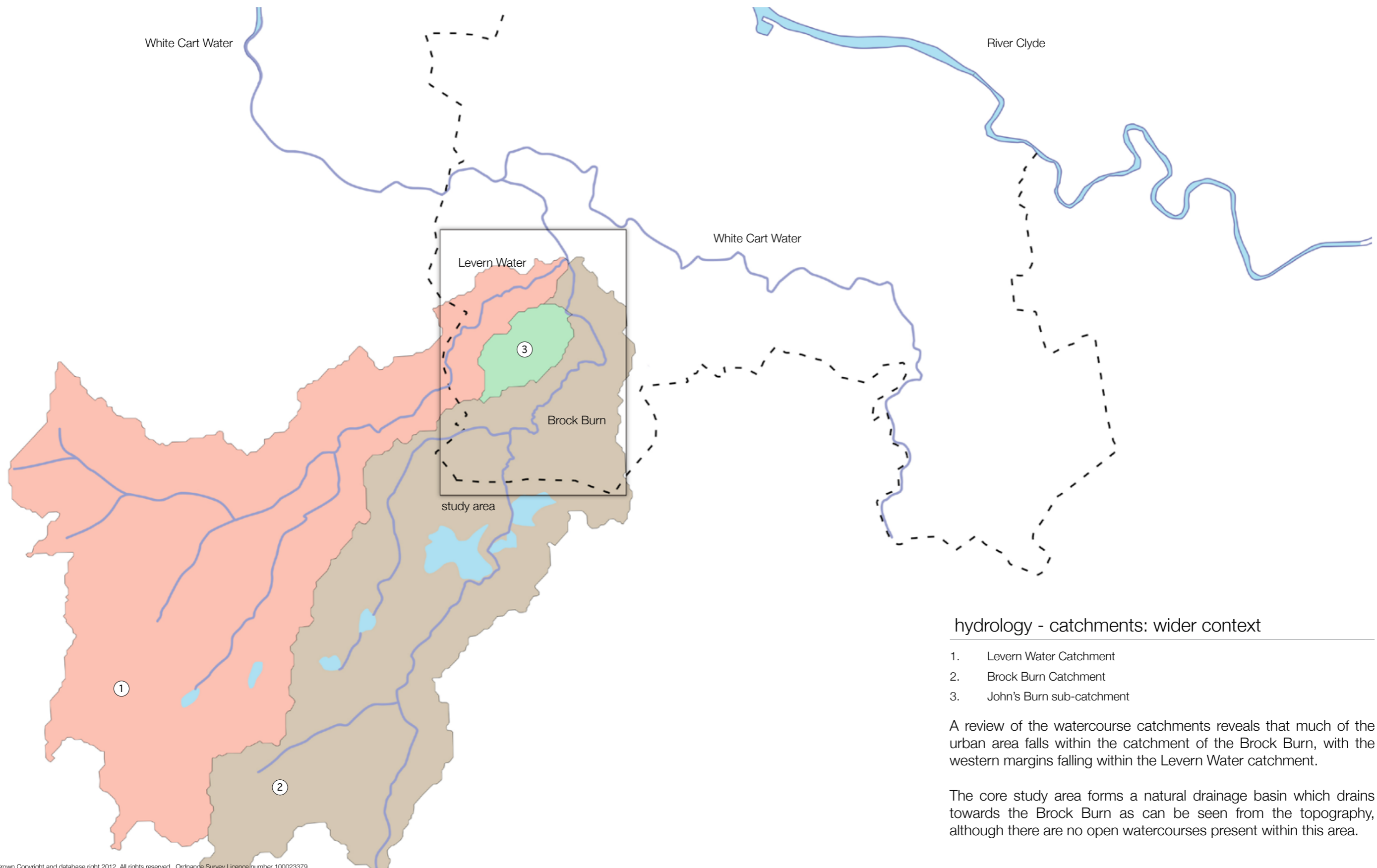
|          |          |           |            |
|----------|----------|-----------|------------|
| 10 - 20m | 40 - 50m | 70 - 80m  | 100 - 110m |
| 20 - 30m | 50 - 60m | 80 - 90m  |            |
| 30 - 40m | 60 - 70m | 90 - 100m |            |

A graphic analysis of the topography of the study area, highlights the following:

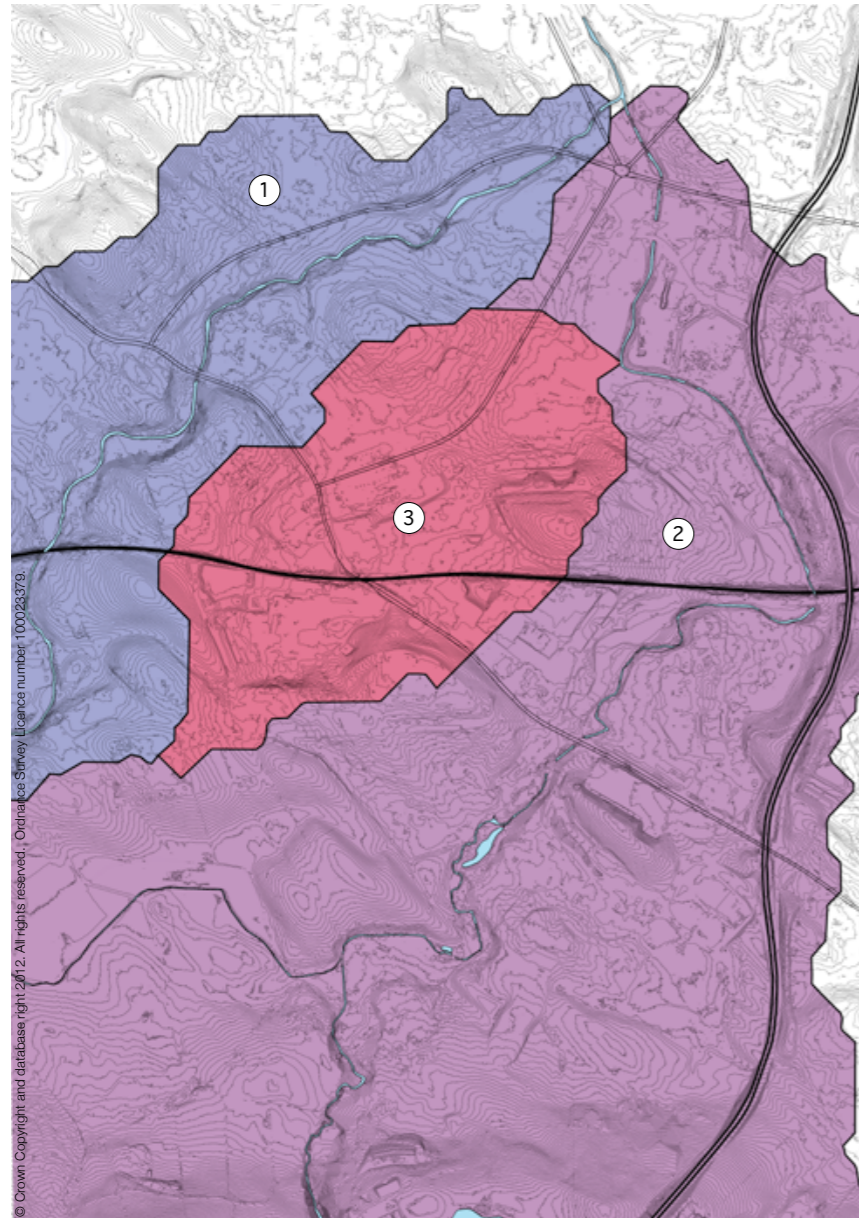
- levels within the study area broadly rise to the south
- the urban area is predominantly at an elevation between 10m and 40m
- there are localised areas of higher ground above 50m



# geomorphology / hydrology:



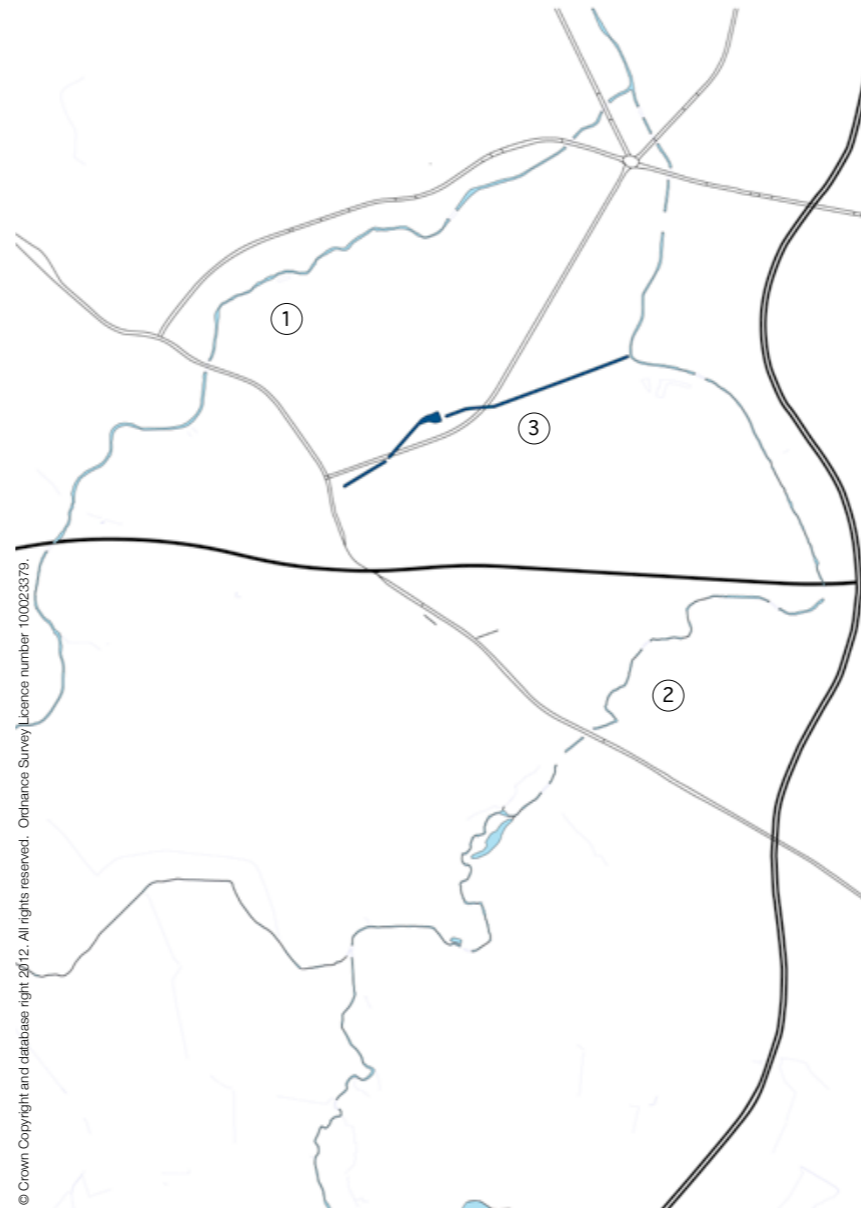
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hydrology - catchments

1. Lavern Water Catchment
2. Brock Burn Catchment
3. John's Burn sub-catchment

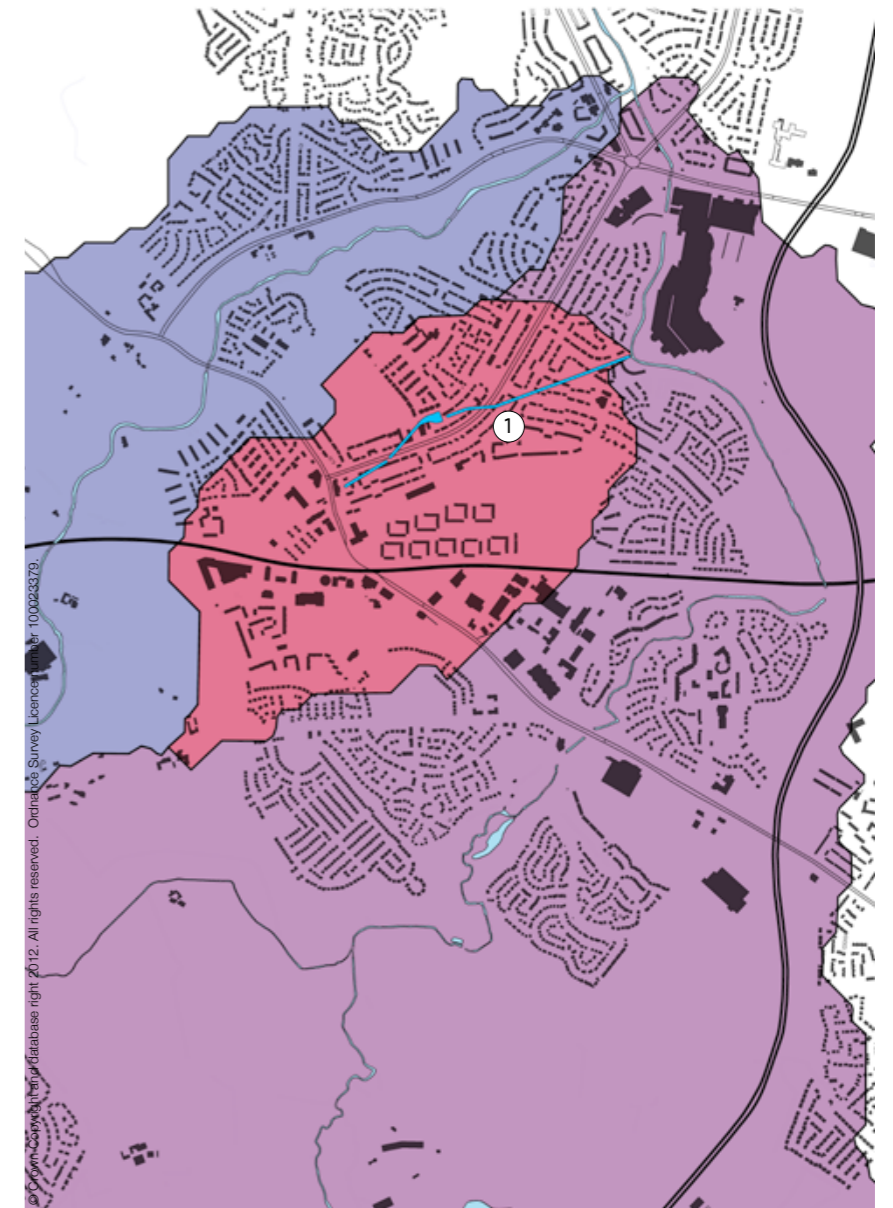
Focusing on the core study area, the overlay of topography and the transport network with the hydrological catchments highlights that the central portion of Nitshill lies predominantly within the John's Burn sub-catchment.



hydrology - former watercourses

1. Lavern Water (current)
2. Brock Burn (current)
3. former John's Burn

A review of historical mapping identified that the John's Burn was once an open watercourse which drained the Nitshill area to the Brock Burn. There are no open reaches of this burn remaining today, with the water which once fed the burn now collected in the combined drainage system and largely drained out of the local catchment.

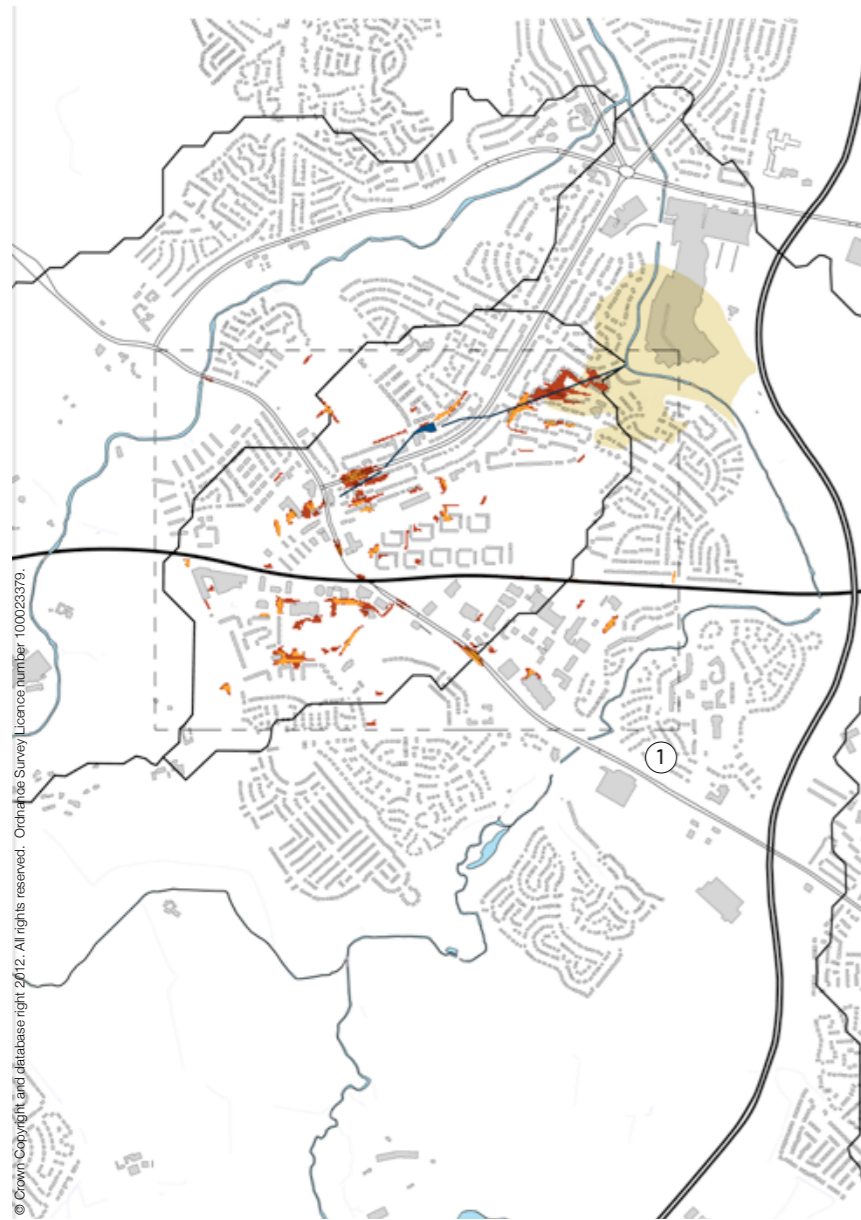


hydrology - catchments/ former John's Burn

1. former John's Burn & Catchment

The overlaying of the former John's Burn on the current urban structure highlights its route broadly similar to the alignment of Peat Road in its western extent, before running through the residential area to the east as it nears the Brock Burn.

# geomorphology / hydrology:



## hydrology - flooding

- 200 year pluvial flood
- 30 year pluvial flood
- 1984 mapped flood event
- 1. extent of mapped data

The mapping of pluvial flood risk and the extent of a flood event in 1984 highlight the lower lying ground through which the former John's Burn watercourse would have flowed and the potential flood risk areas

There is a concentration of pluvial flood risk within the lower lying reaches of the former course of the John's Burn and around the confluence with the Brock Burn, which was also the focus of the 1984 flood event.

## hydrology - summary of findings:

No major flooding or drainage issues have been identified by Glasgow City Council or Scottish Water in Nitshill.

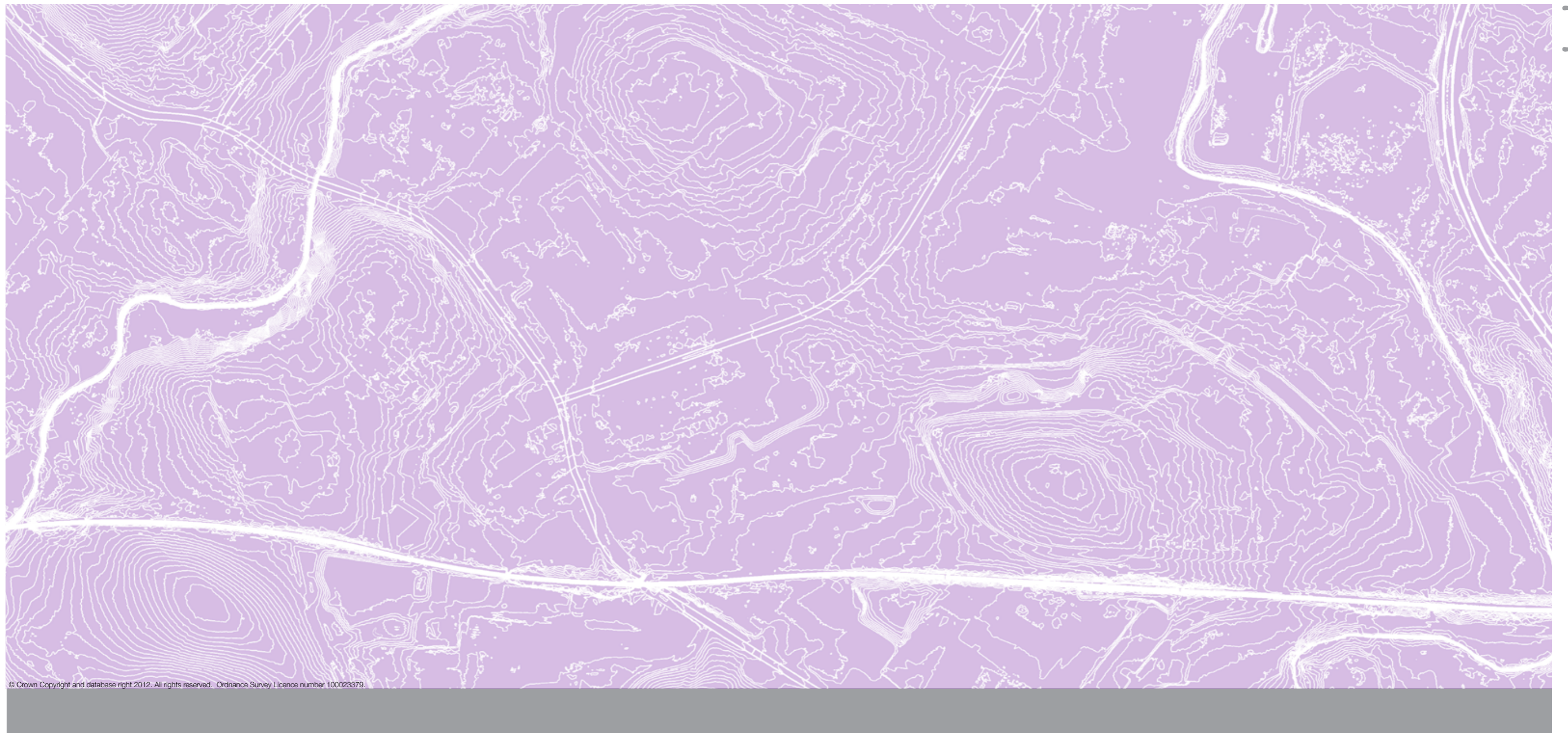
The 1984 flood event was focused around the Brock Burn which will have been influenced by run off from the study area. The pluvial flood risk mapping identifies areas of potential flood risk within the lower reaches of the former John's Burn.

Based on these findings, interventions to manage pluvial flooding issues and manage the rate of flow into the Brock Burn are seen as beneficial.



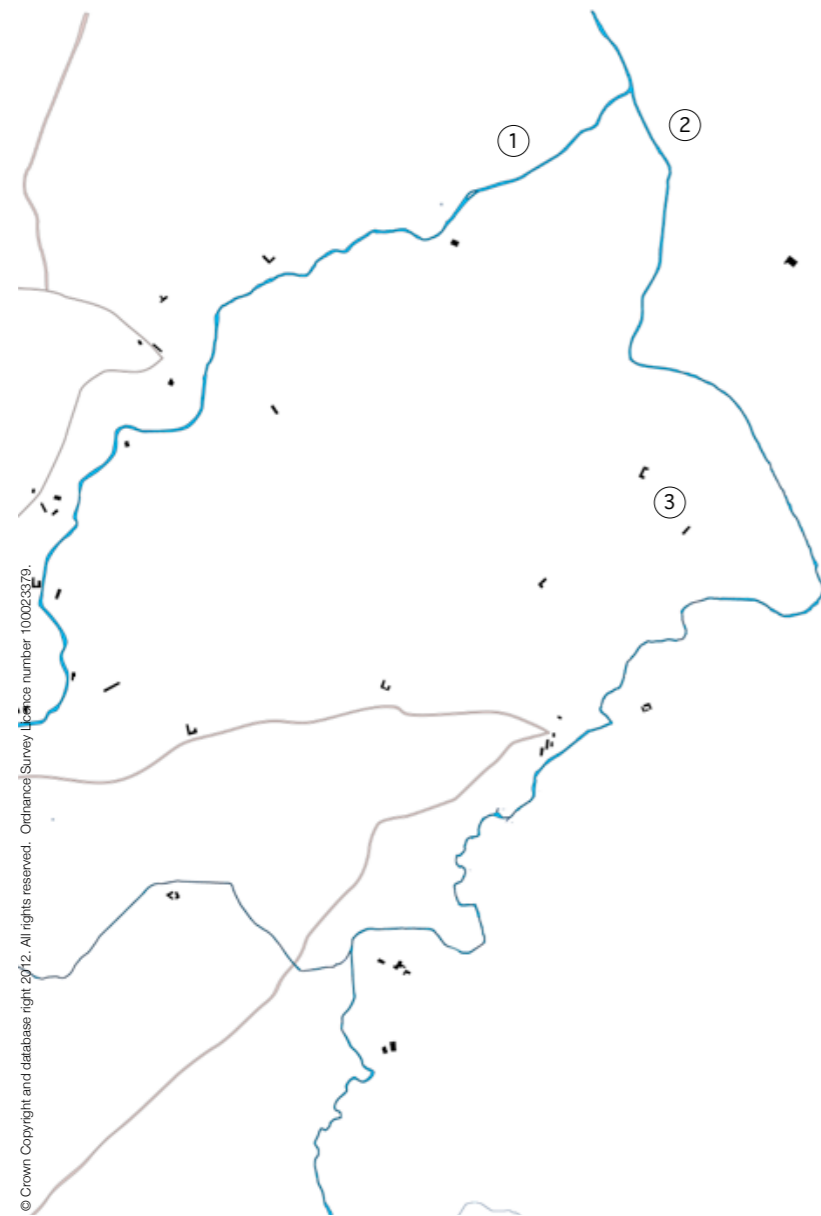
analysis

urban structure: 1. process of change



B

# urban structure: 1. process of change



historical development - 1747 (agricultural)

1. Levern Water
2. Brock Burn
3. Estate houses / farms

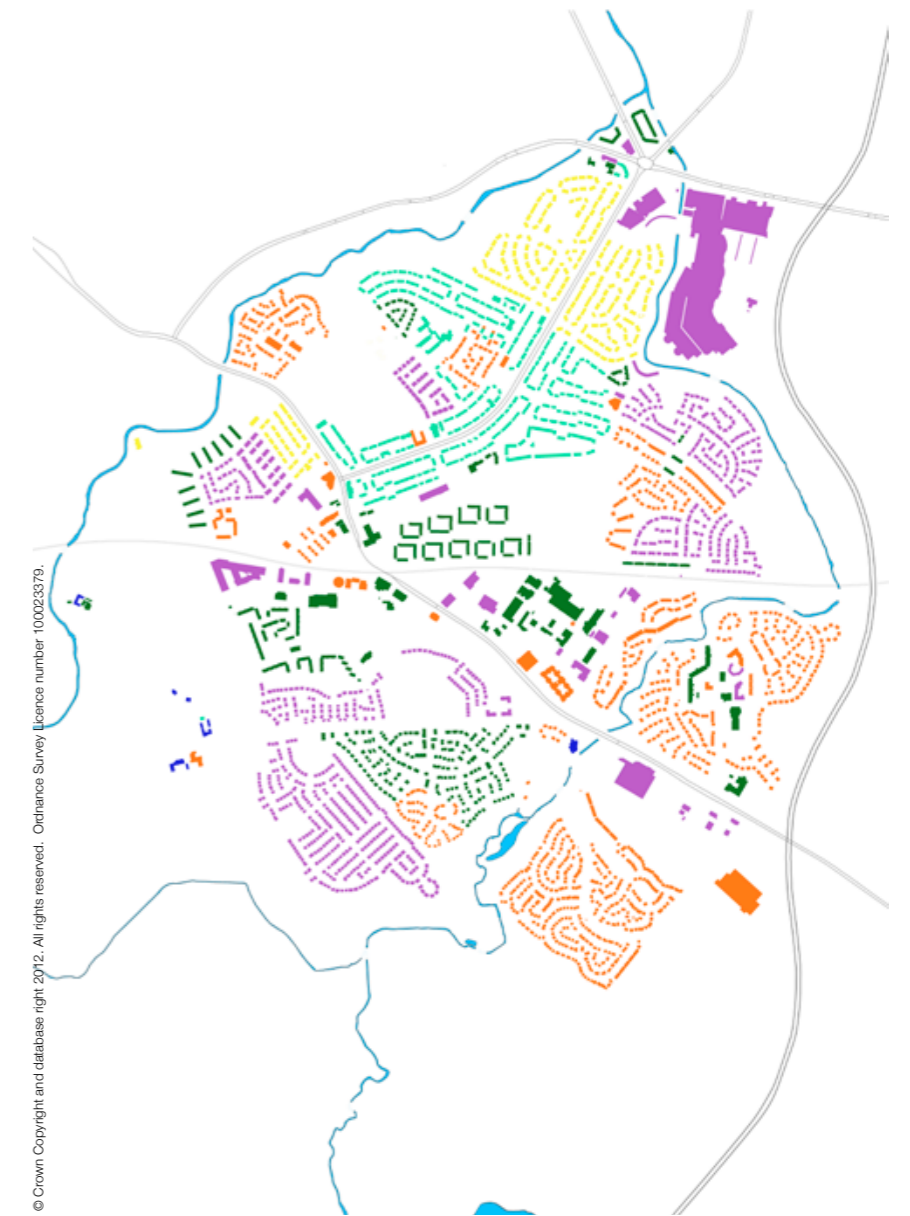
- estates / farms broadly clustered along watercourses
- primarily agricultural landuse



historical development - 1858 (agricultural/ industrial)

- early road network
- rail line
- settlements & industrial development
- woodland
- water bodies associated with industrial development

- network of roads developing
- settlement and industrial development away from watercourses



historical development - 20<sup>th</sup> Century (residential/retail)

- 1920s + 1930s residential development
- 1940s + 1950s residential development
- 1960s + 1970s residential / industrial
- 1980s + 1990s residential / other
- 2000s + 2010s residential / retail / other

- sequential, primarily residential development thro' 20th century
- recent large scale retail & museum developments

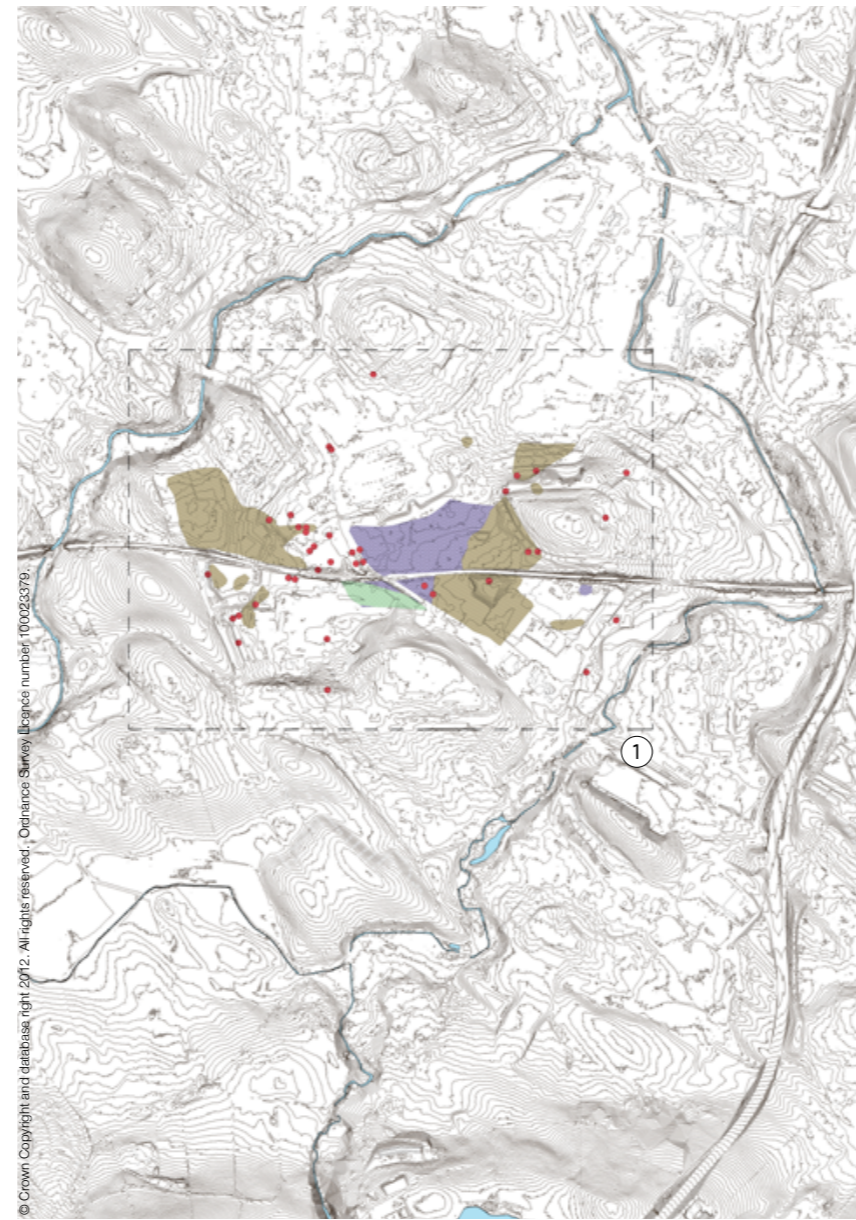
# urban structure: 1. process of change



consistent features of pre/post 20th century layout

- consistent with earlier road layout
- remaining shelterbelts / woodland
- pre 20th century buildings

Although fundamentally transformed through 20th century residential expansion there are traces of earlier routes / features within the study area. These are highlighted above. Notably, the alignment of Barrhead Road and Nitshill Road are longer standing and Peat Road overlays part of an earlier route.



ground conditions

- known shallow mining
- infilled ground
- made ground
- abandoned mineshafts
- 1. extent of mapped data

A review of mapping of known mine workings and other disturbed ground reveals a concentration around the core of Nitshill. This legacy of 19th century mining and industrial activity must clearly be considered in detail in any redevelopment proposals.

## process of change - summary of findings:

The review of historical mapping illustrates the progressive change in the study area through the 18th, 19th and 20th centuries.

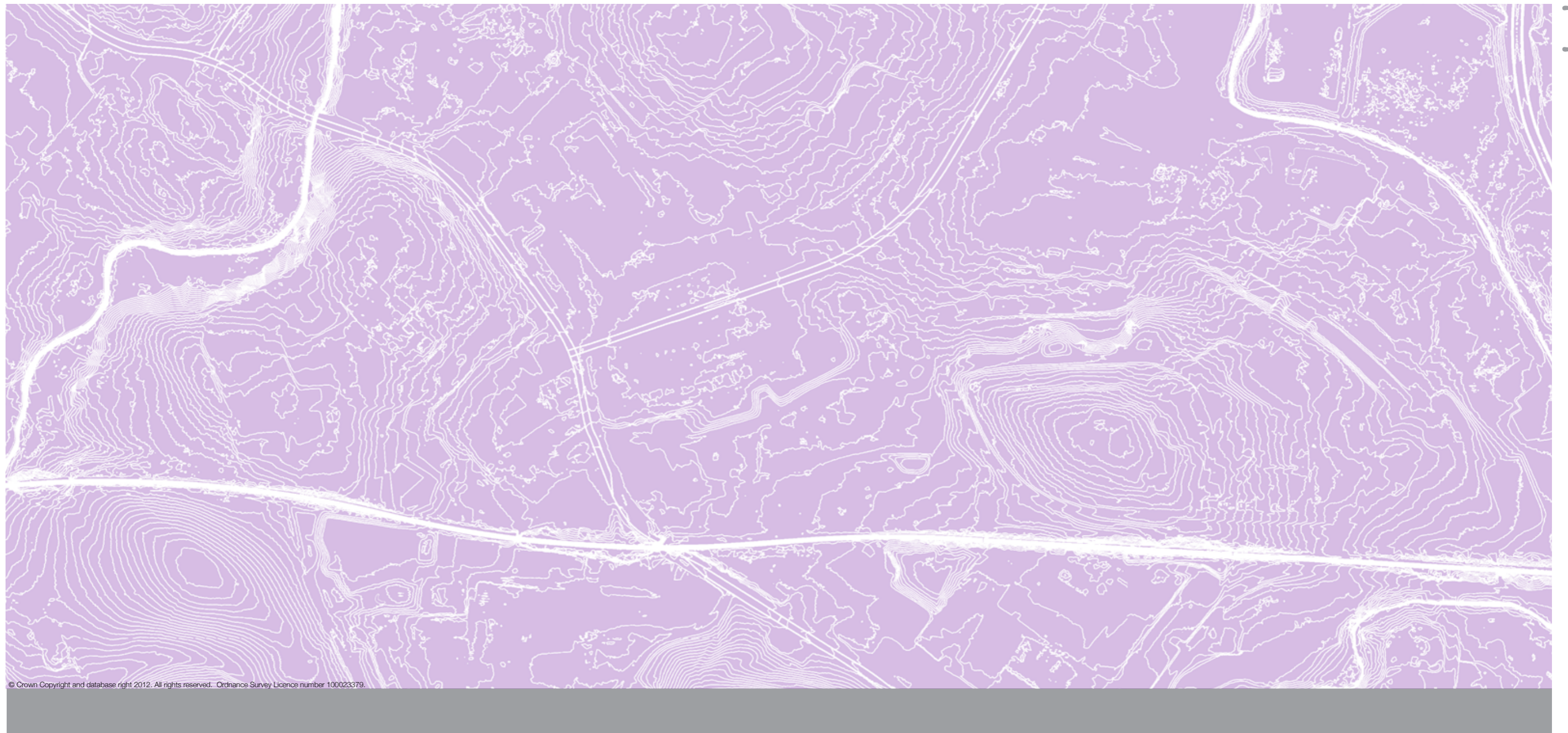
The study area has been transformed from an agricultural landscape, with limited settlement focused along the watercourses, to a predominantly urbanised area through 19th century industrial activity and subsequent residential expansion through the 20th century.





analysis

urban structure: 2. structure / movement



B

# urban structure: 2. structure / movement



figure ground / divisive elements

1. M77
2. dual carriageways
3. rail line

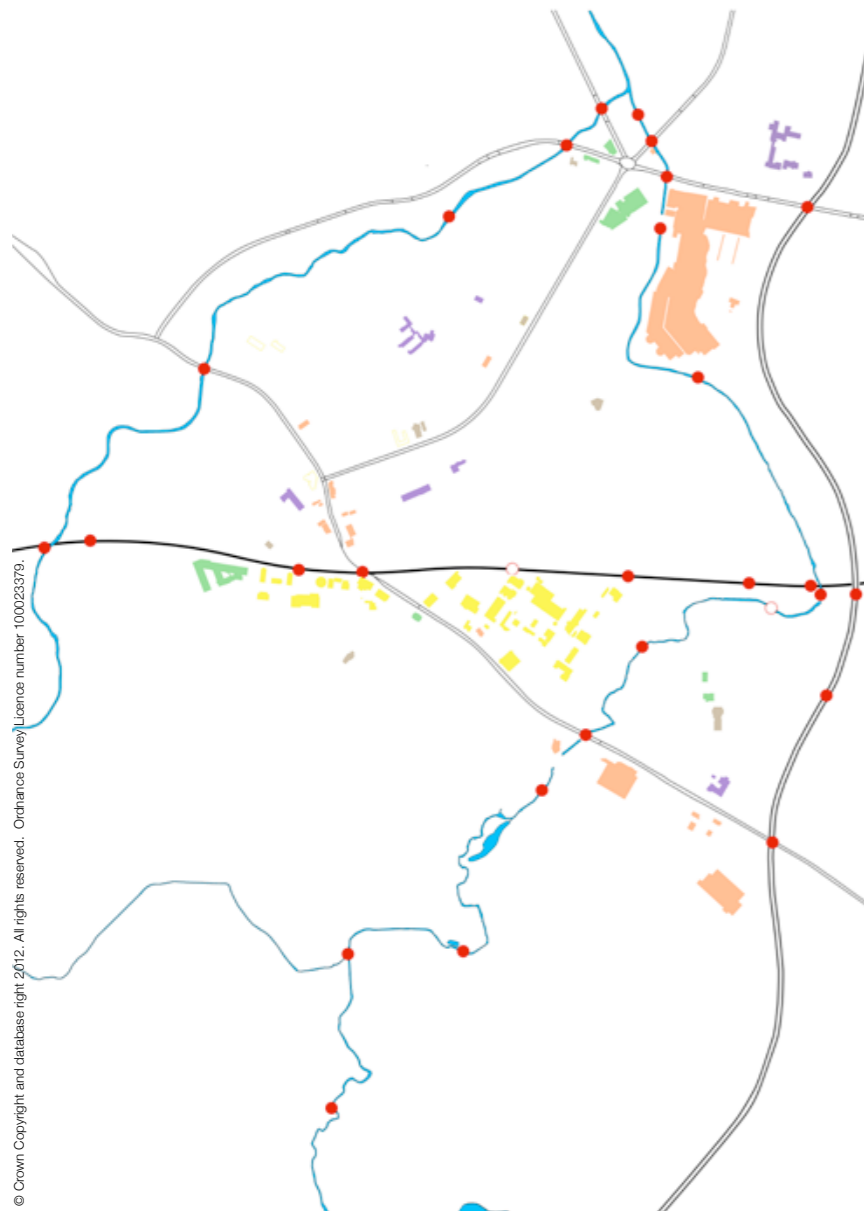
The study area is bounded and sub-divided by major roads, the rail line & watercourses. Given the scale and character of these features, they act as divisive elements both spatially and physically within the wider urban structure.



divisive elements: roads

The study area is bounded and sub-divided by dual carriageways which are out of scale to the residential areas and offer infrequent crossing points.

# urban structure: 2. structure / movement



barriers to movement: crossing points

- public buildings
- industrial / commercial
- retail
- schools
- places of worship
- crossing points
- derelict crossing points

The major roads, rail line and watercourses present significant barriers to movement and sub-divide the study area.

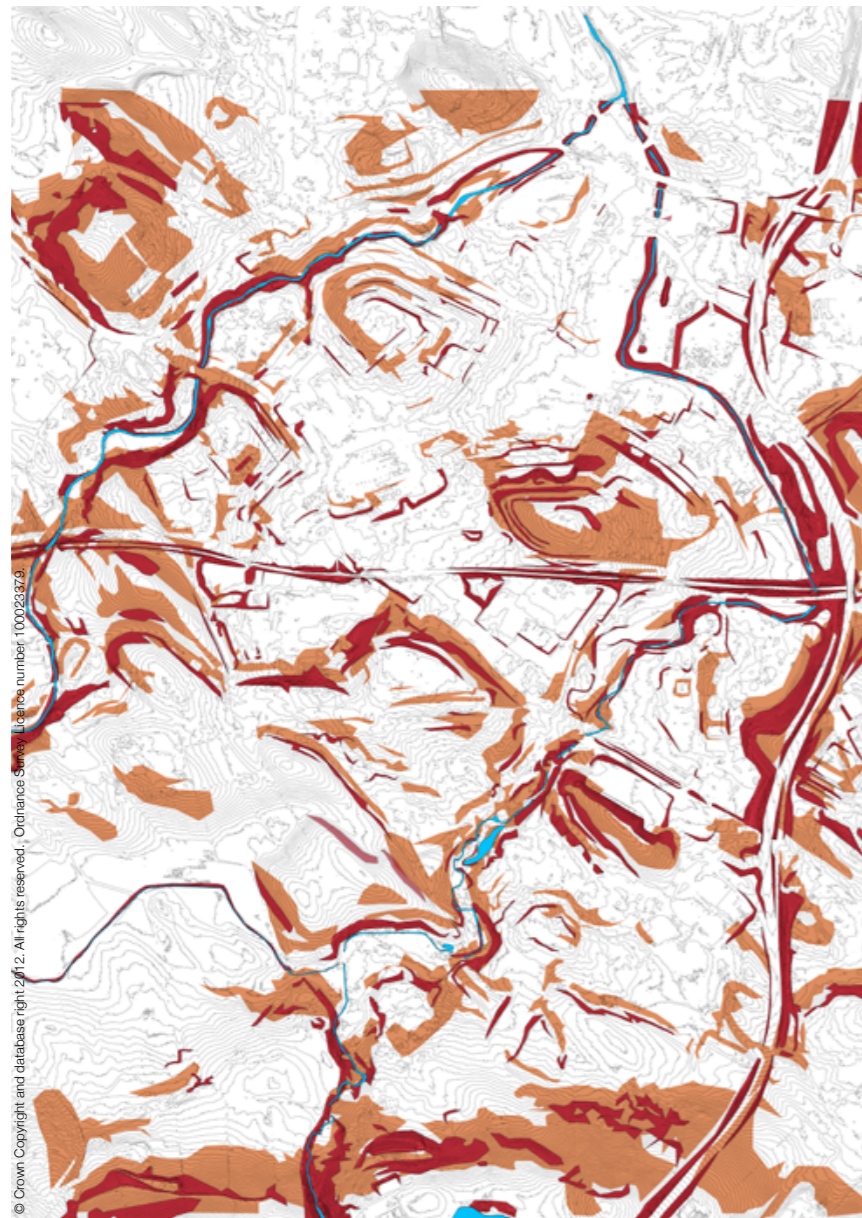
There are a limited number of crossing points of these various linear features, as identified above.



barriers to movement: crossing points

Where crossing points do exist they are frequently of poor quality and strongly discourage access.

# urban structure: 2. structure / movement

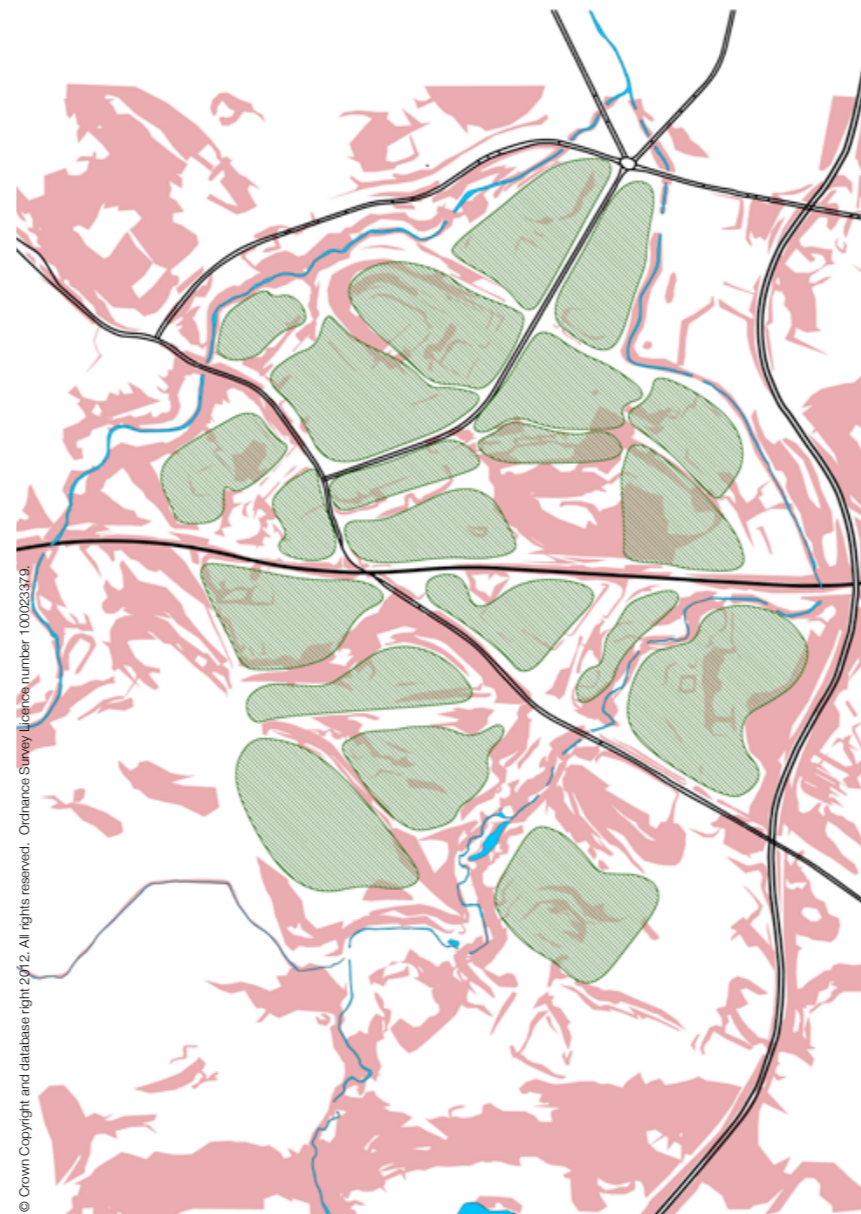


step slopes

- 1:5 and steeper
- 1:5 to 1:10

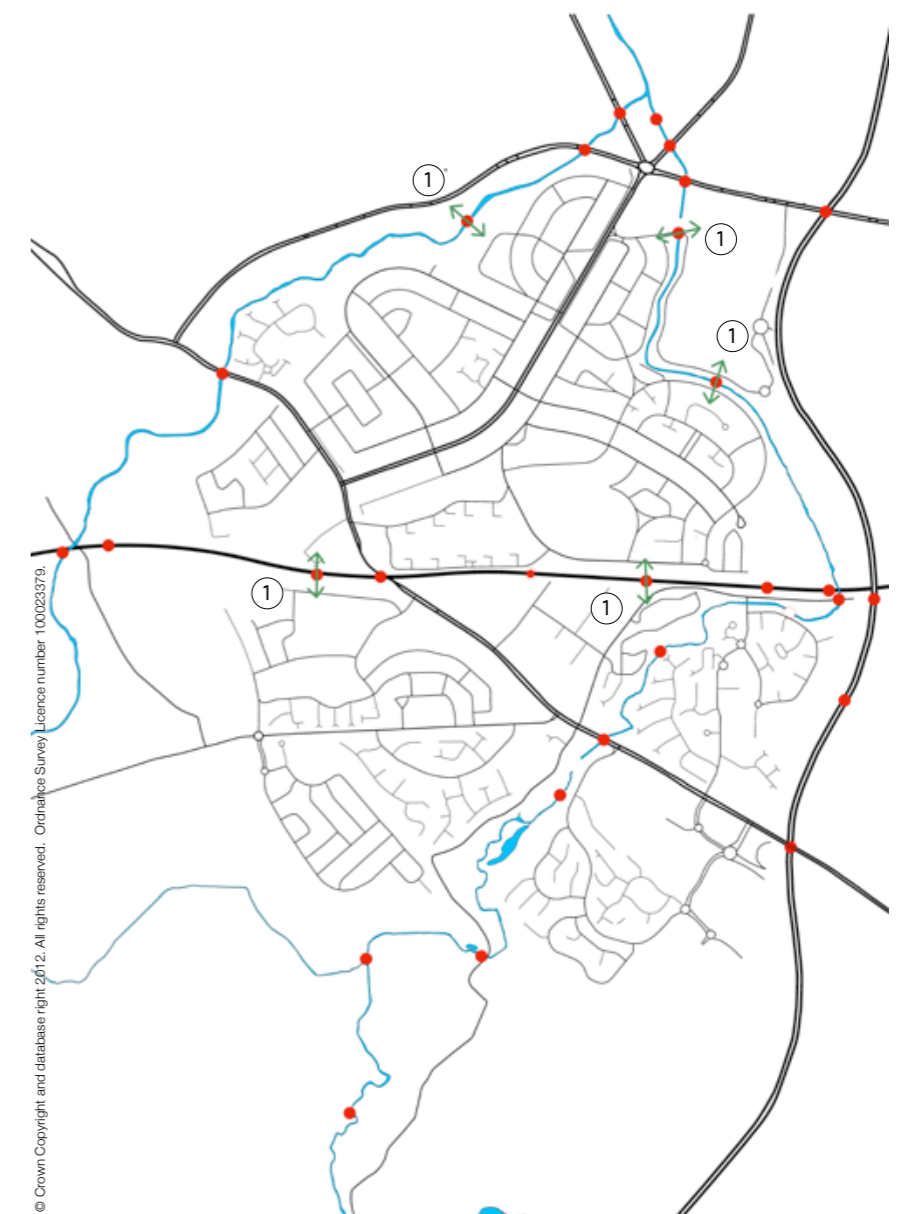
A graphic mapping of steep slopes highlights their extent and correlation with localised higher ground and linear features such as the rail line, major roads & watercourses.

These steep slopes represent a further barrier to movement within the study area.



subdivision of urban area

Overlaying the steep slopes, major transport routes and watercourses highlights the sub-division of the urban area into a series of discrete residential areas divided by these features.

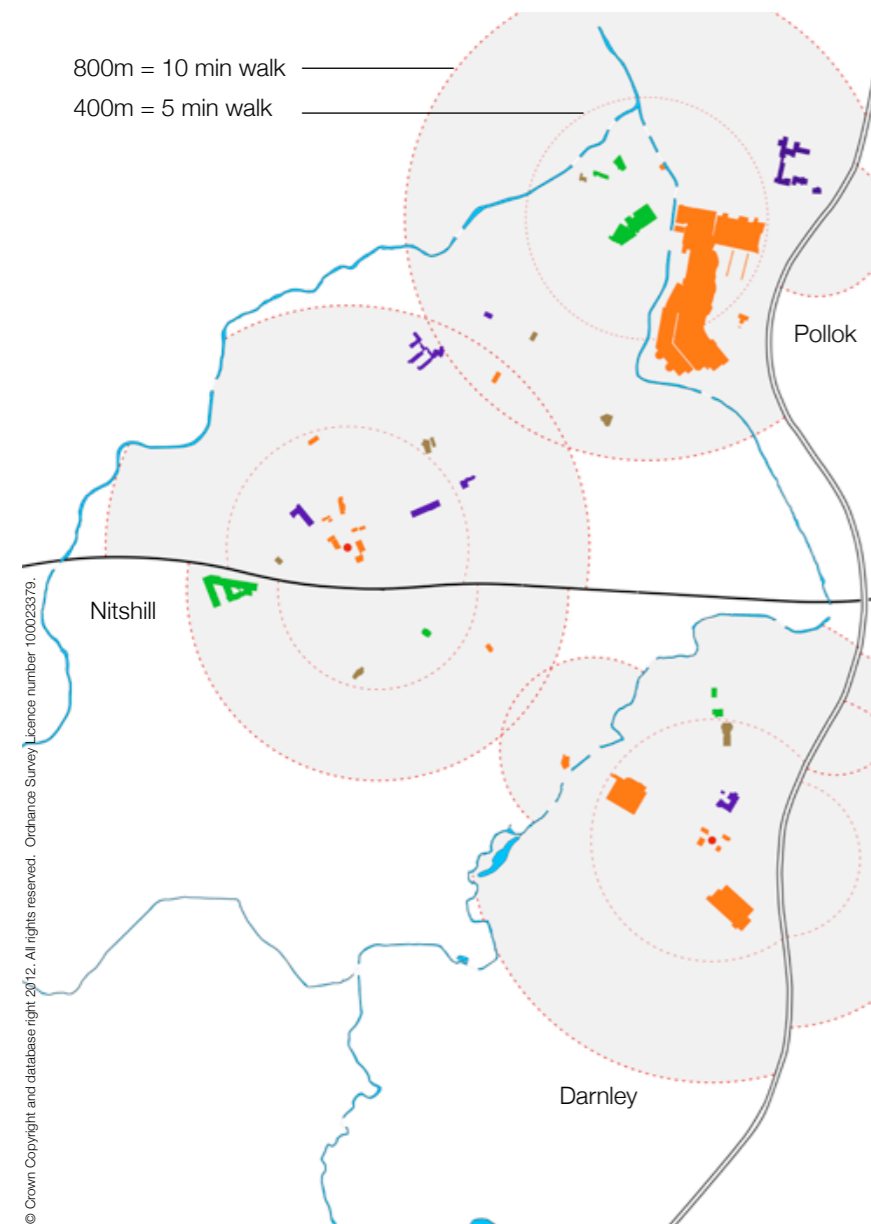


subdivision of urban area

- crossing points
- 1. crossing points which directly link sub divided areas

A review of the street layout highlights that the area is made up of a series of inward looking residential areas. There is a lack of legibility and connection within the urban structure, highlighted by few crossing points which directly link the sub divided areas.

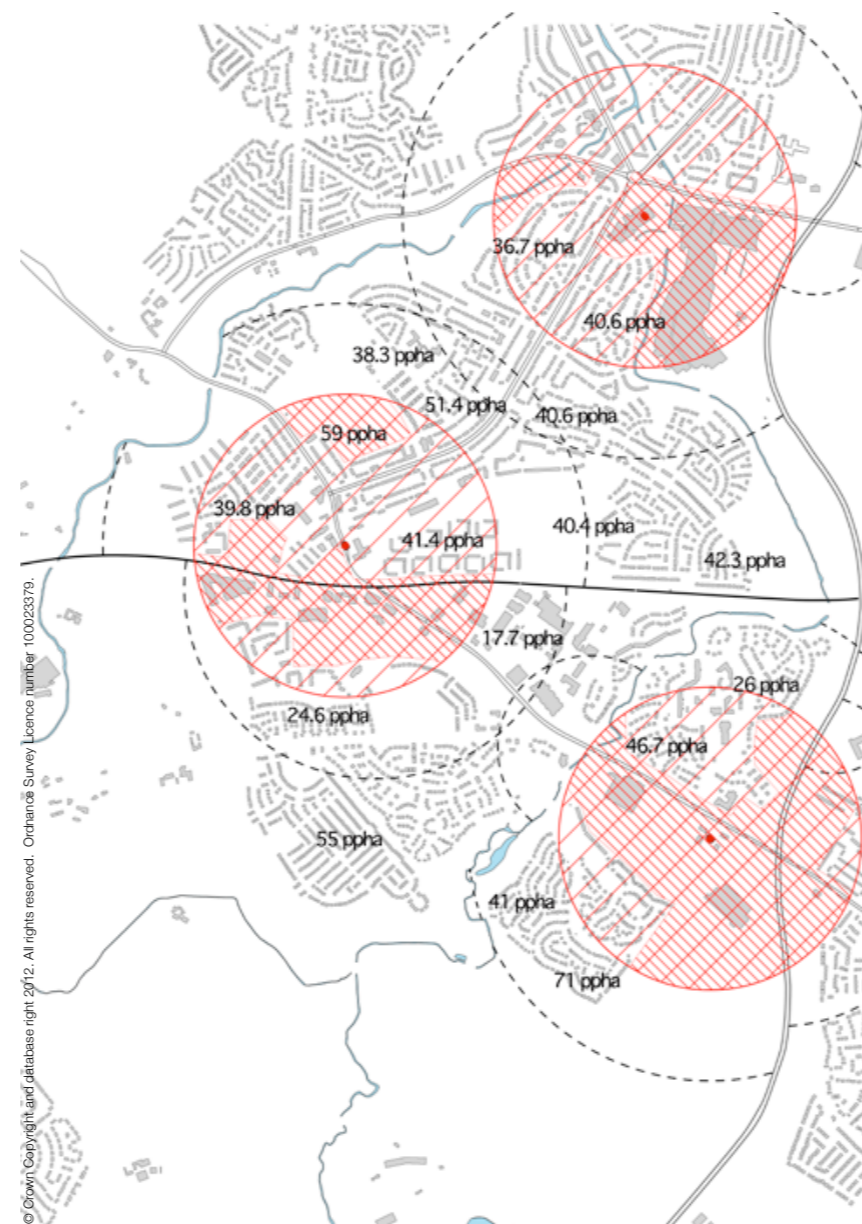
# urban structure: 2. structure / movement



## public buildings & walking distance

- retail
- community facilities
- schools
- places of worship

- community facilities (health centre, library, swimming / leisure centre etc.) are focused at Pollok
- community facilities are remote (in terms of walking distance) from Darnley & Nitshill
- Pollok & Darnley are hubs of 'out of town' car based retail (with direct access from the M77)
- schools & places of worship are more evenly distributed
- there is limited / poor local retail / servicing in Nitshill



## density, distance & viability

The residential neighbourhoods in the study area have an average population density of around 40 people per hectare.

The overall population of the study area is approximately 8450 north of the rail line with a further 7800 people to the south of the rail line.

A viable neighbourhood centre is thought to be dependent upon a catchment of roughly 6000 people to support local shops and services. (Barton et al, 2003, Shaping Neighbourhoods, Spon Press, London)

The inner hatched circles identified on the adjacent plan (focused on the 3 centres of Nitshill, Pollok and Darnley), at the typical density of 40 ppha would generate a 'catchment' population of around 3000 people. However, notably 50-75% of the 3 core areas are unpopulated.

This suggests that there is an issue for all three centres, as they have too small a residential population within easy walking distance to support local shops and services.

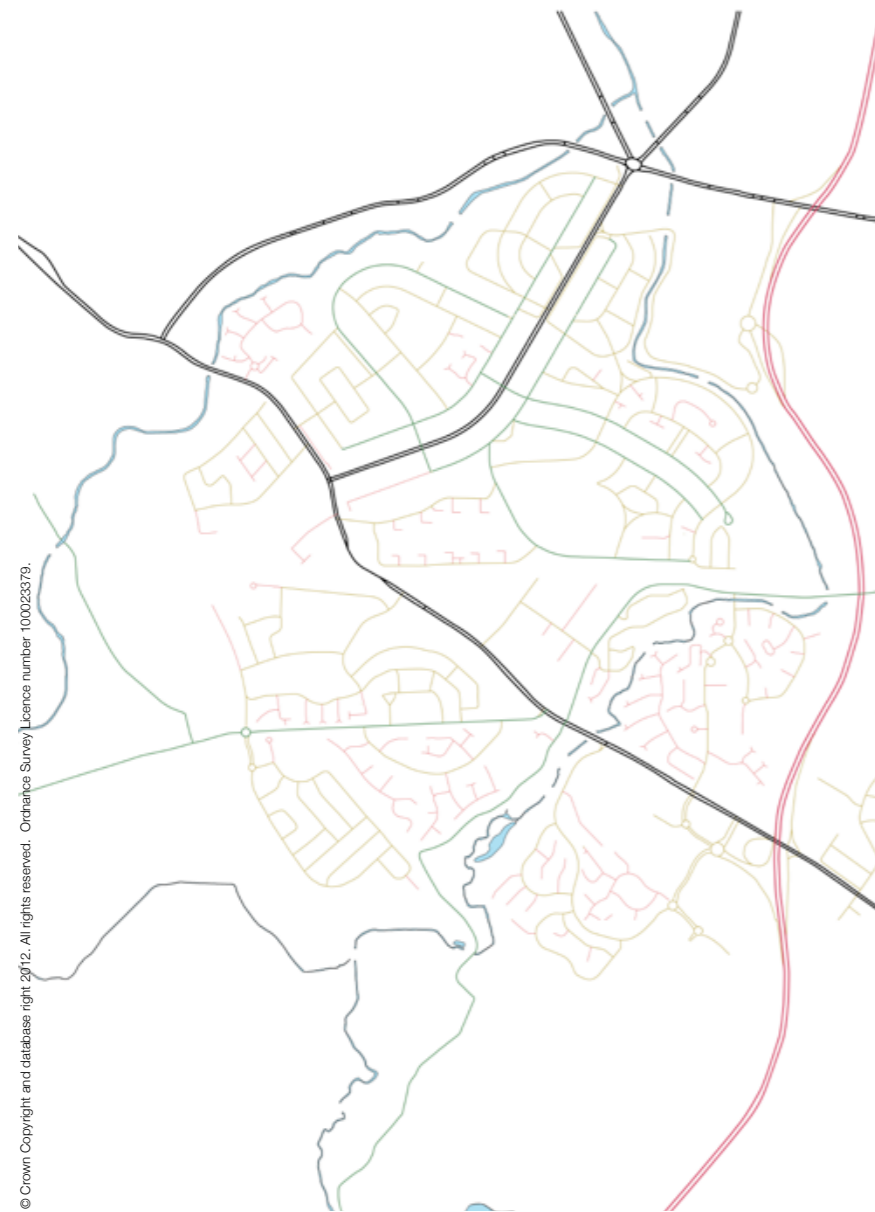
For Pollok & Darnley centres this is arguably not an issue as they primarily act as car based retail centres, accessed from the M77 and serving a wider population.

Nitshill by contrast does not function as a car based retail centre and would be unlikely to meaningfully compete with Pollok and Darnley in these terms. Additionally, it is disconnected from its wider residential hinterland by barriers to pedestrian movement and has a small residential population in the immediate core area.

To make Nitshill viable as a local centre there is a need to:

- improve accessibility on foot from the wider residential area

# urban structure: 2. structure / movement



street connectivity / legibility

- routes linking thro' area, main connecting roads
- localised loop / link roads
- dead ends / cul-de-sac

The plan above describes the relative 'connectedness' of streets in the study area.

The road / street layout is focused on car use / movement, with dual carriageways forming key links between the neighbourhood centres.

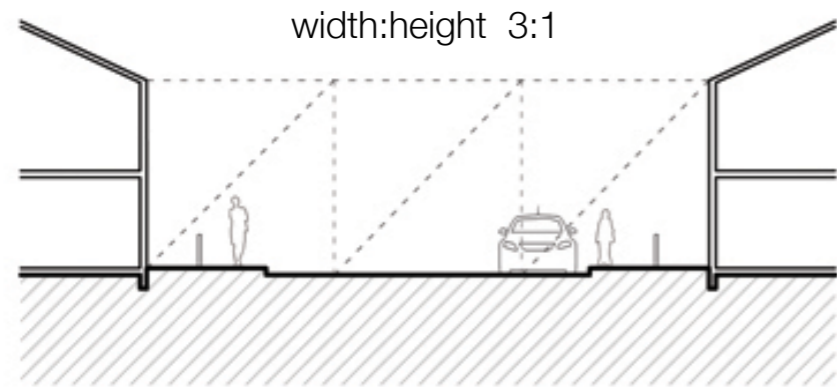
Beyond this, roads / streets thro' residential neighbourhoods lack legibility and do not form clear direct links for pedestrian movement or safe cycle routes.



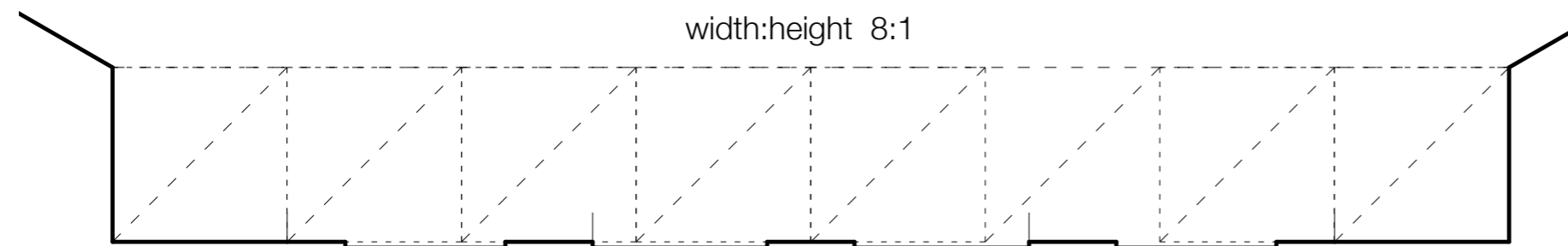
street: scale / walkability

The main roads through the urban area (Peat Road & Nitshill Road) form the main legible, direct routes to and between community facilities. However, these routes are of a scale and character that discourages pedestrian use. The routes are focused on vehicular circulation, are dominated by traffic infrastructure and offer an extremely poor pedestrian and unsafe cycle environment.

# urban structure: 2. structure / movement



typical section thro' street:  
taken from Urban Design Compendium: guidance on street sections



typical section thro' northern section of Peat Road

## street: human scale

The Urban Design Compendium provides guidance on the scale / proportion of space that feels comfortable for people to be in. This suggests a width: height ratio of around 3:1. As described above, the cross section through Peat Road demonstrates a width:height ratio of around 8:1. The major streets in the study area are dramatically out of scale in terms of human scale and comfort.

## urban structure: structure / movement - summary

The urban area is sub-divided by major roads, the rail line, watercourses & steep slopes. There are limited crossing / access points and where they exist they are often of poor quality.

Nitshill neighbourhood centre has significant challenges in terms of viability. It is disconnected from its wider residential hinterland by barriers to pedestrian movement and has a small residential population in the immediate core area.

The layout of residential areas is focused on car movement and there is a lack of legible / coherent non vehicular routes through residential areas connecting to community facilities.

The dual carriageway roads (primarily Peat Road) form key links to community facilities, but lack human scale, are of poor character and discourage pedestrian use.

There is a need for good quality, legible and safe walking and cycling routes connecting residential areas to community facilities.

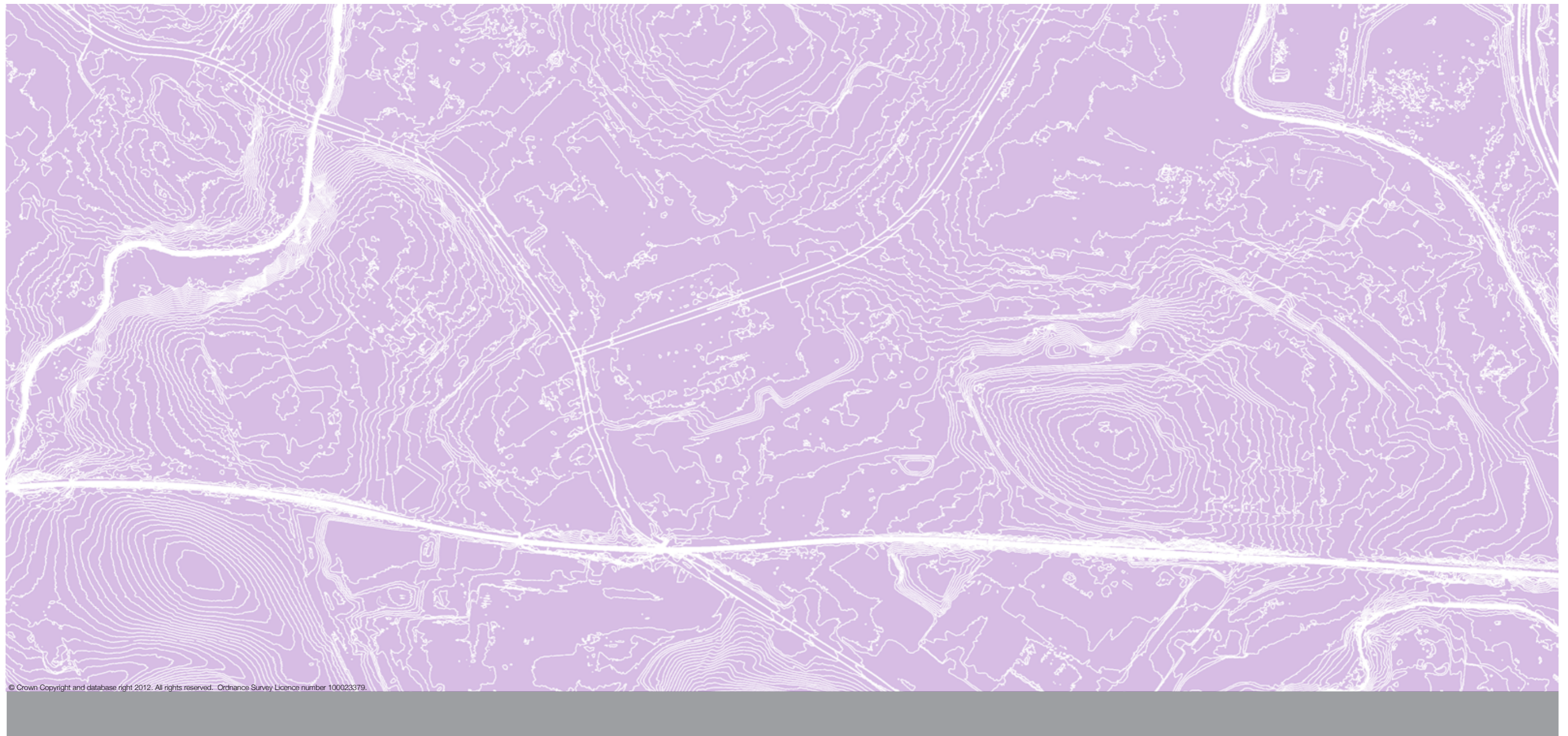
There is also a need to increase the residential





analysis

urban structure: 3. unused land / anticipated change



B

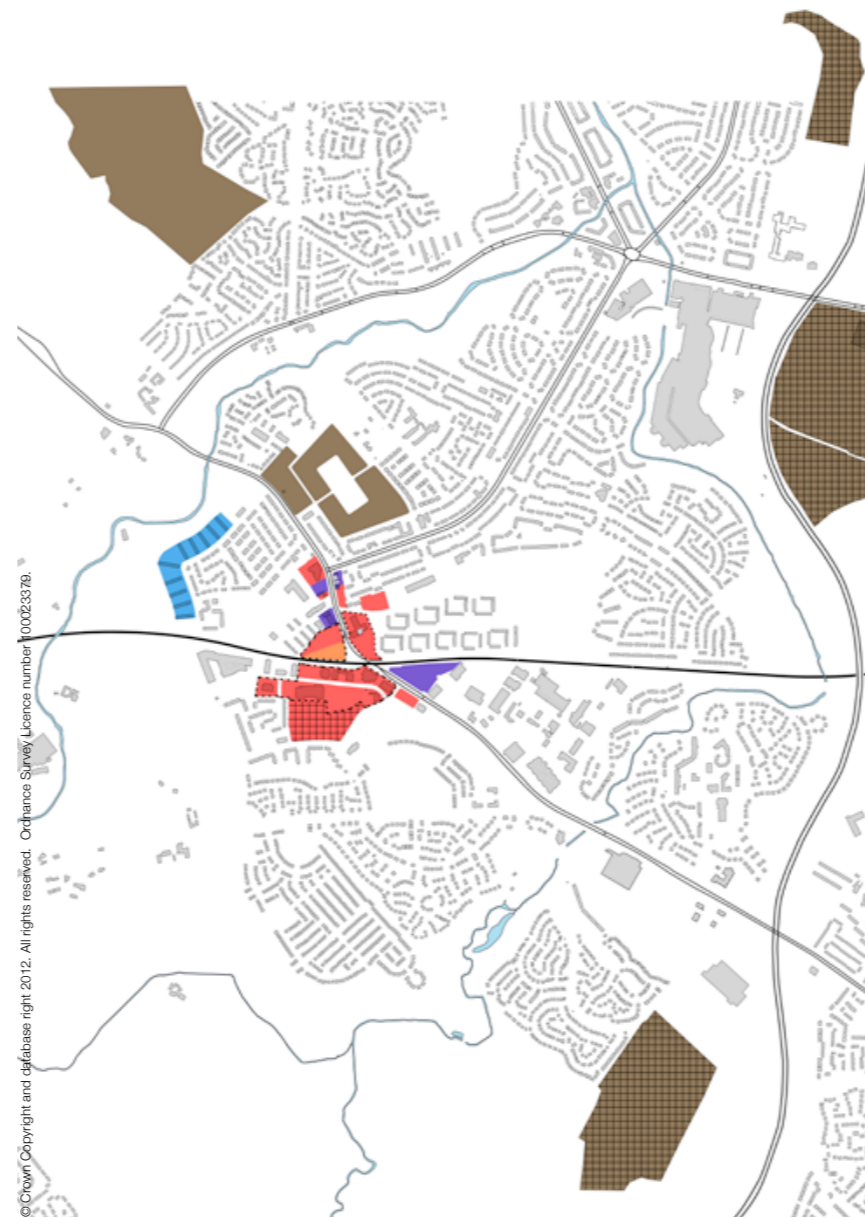


# urban structure: 3. unused land / anticipated change



derelict & vacant land

GCC mapped derelict land



anticipated change

- Identified for housing/development in City Plan 3 LDP
- council ownership
- strathcarron ownership
- development proposal in place
- GHA potential change
- private ownership/ development potential
- development potential

## anticipated change

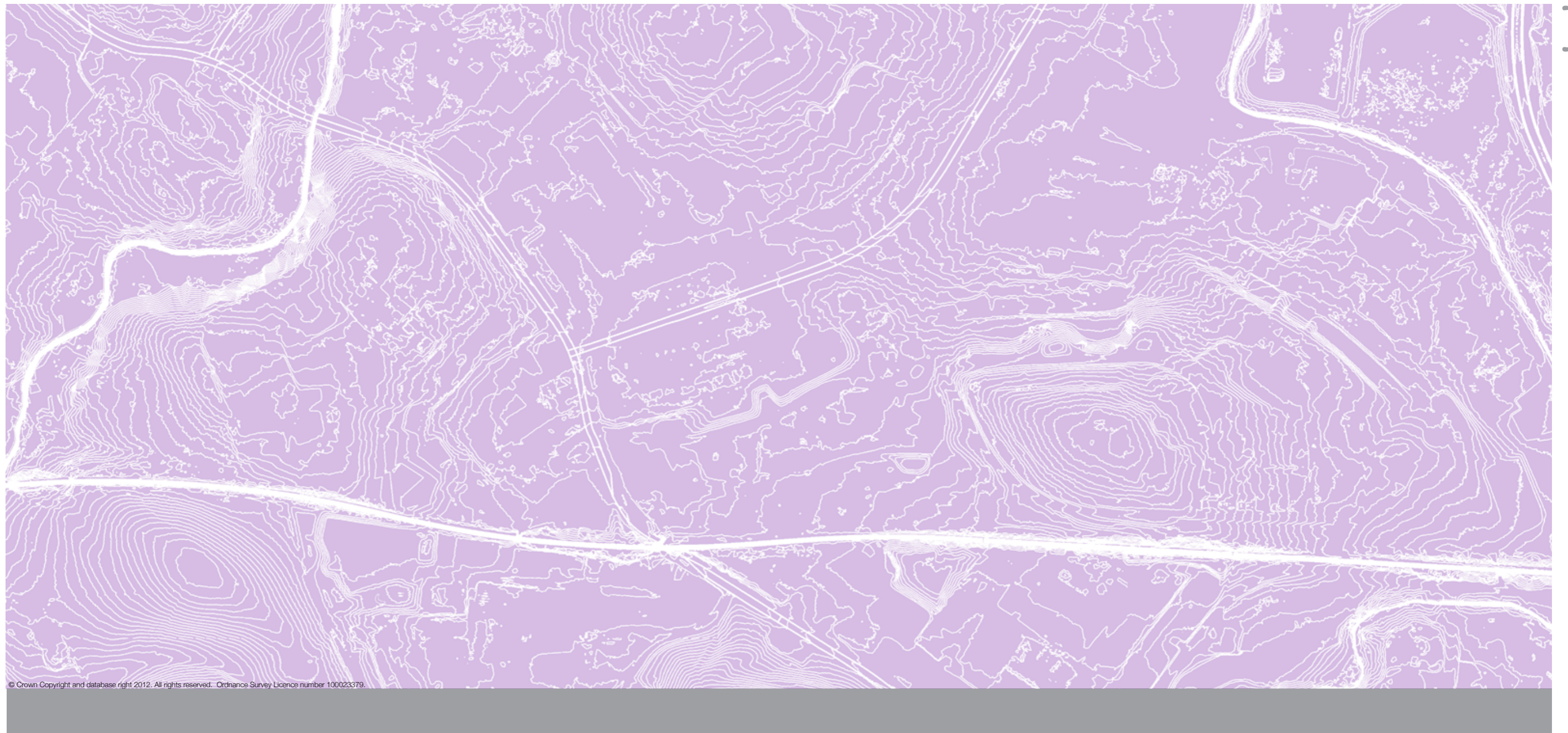
There is a significant amount of derelict and vacant land present within the study area.

Of these un-used sites a number have been identified as having potential for development or proposals for redevelopment are in place.



analysis

urban structure: 4. the green network routes and spaces



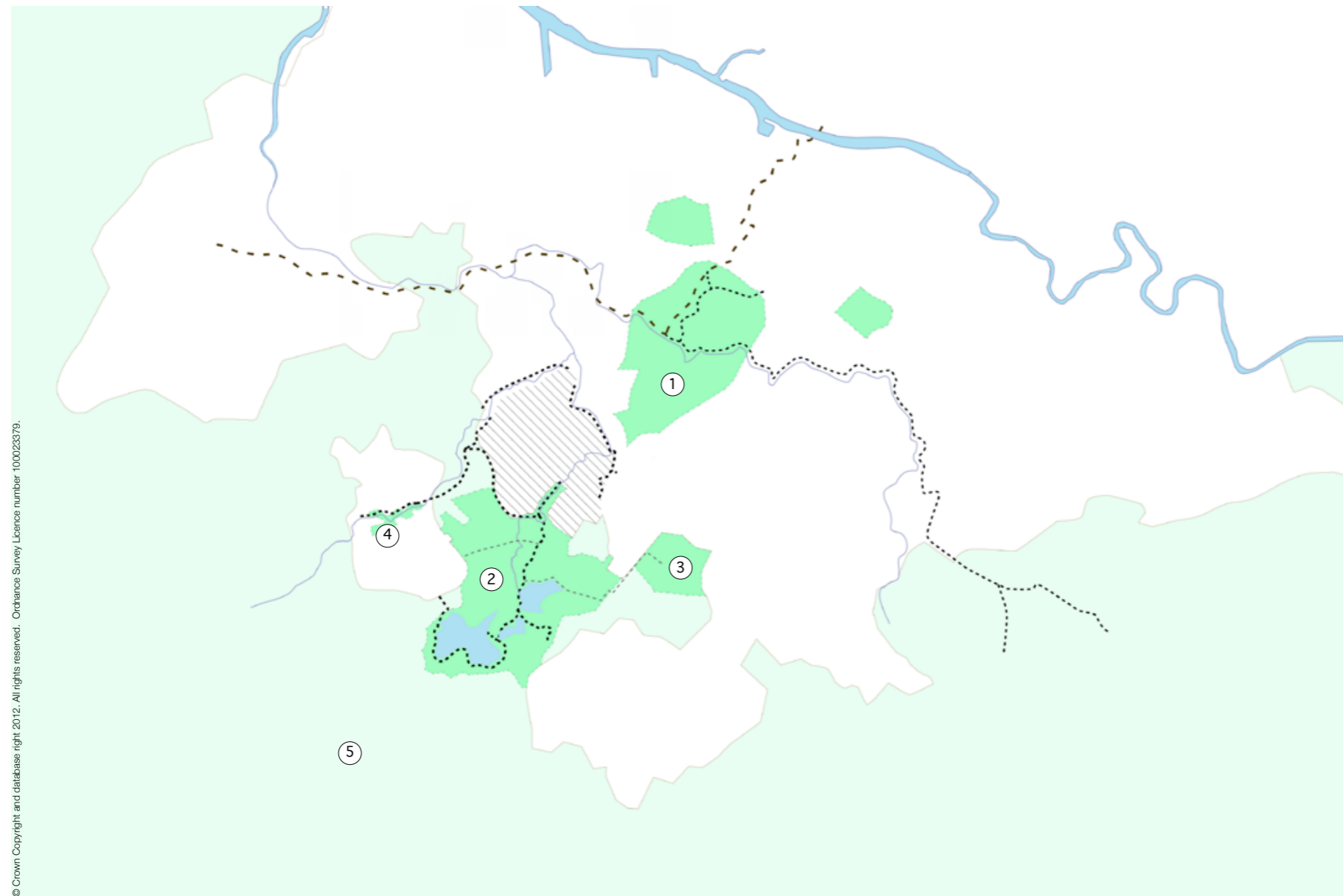
B

# urban structure: 4. the green network routes and spaces

## existing green network: south-west Glasgow

The existing green network in south-west Glasgow includes significant large scale and high quality public greenspace, including Pollok Country Park and Dams to Darnley Country Park. The National Cycle Route runs to the north of the study area and there are significant off street core path routes within the study area. However, the existing network is disconnected and fails to realise its potential.

The study area has the potential to form a key linking piece to create a coherent, connected green network in south-west Glasgow.



## existing green network: south-west Glasgow

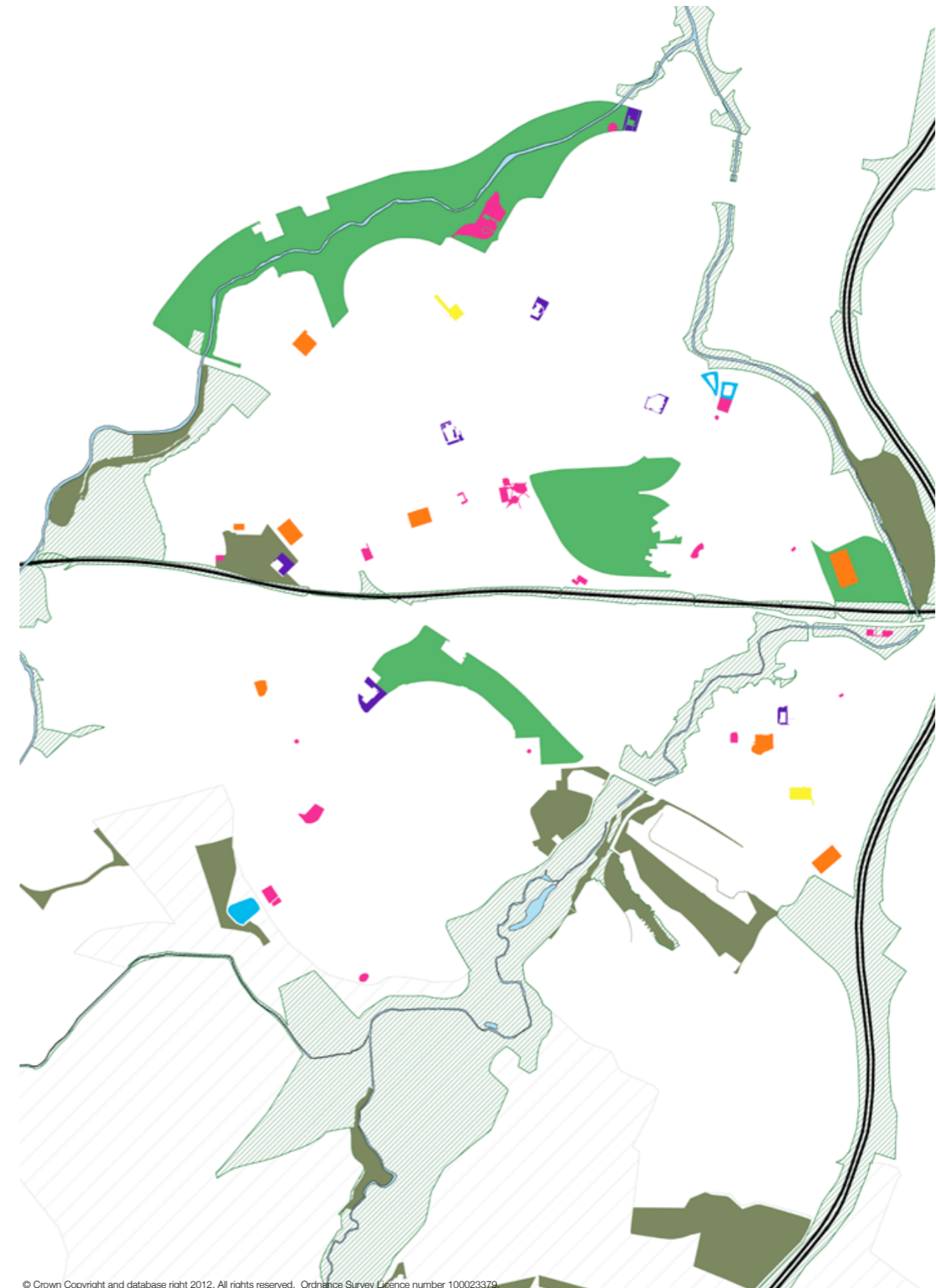
- national cycle route NC7
- - - core paths (off street)
- ..... aspirational / planned links
- 1. pollok country park
- 2. dams to darnley country park
- 3. rouken glen park
- 4. carlibar / centenary park
- 5. green belt

# urban structure: 4. the green network routes and spaces

## existing green network - spaces

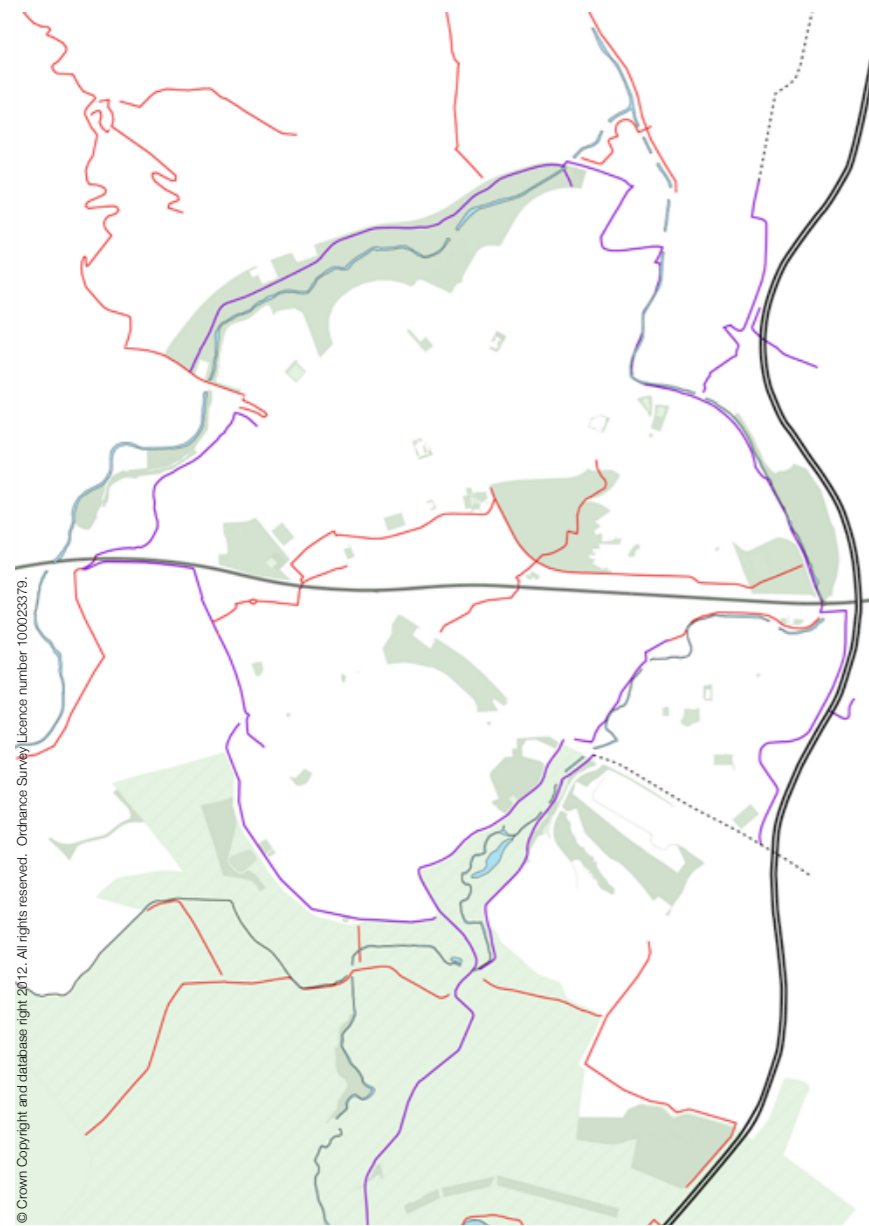
- parks / public open space
- woodland
- sports pitches
- play areas
- school grounds
- SUDS
- church grounds
- green corridors
- Dams to Darnley Country Park

A review of the existing formally recognised public open spaces highlights that there are significant linear park / green corridors running to the east & west of the core residential areas. Other smaller recreational facilities are isolated and scattered through the urban area.



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# urban structure: 4. the green network routes and spaces



existing green network - routes

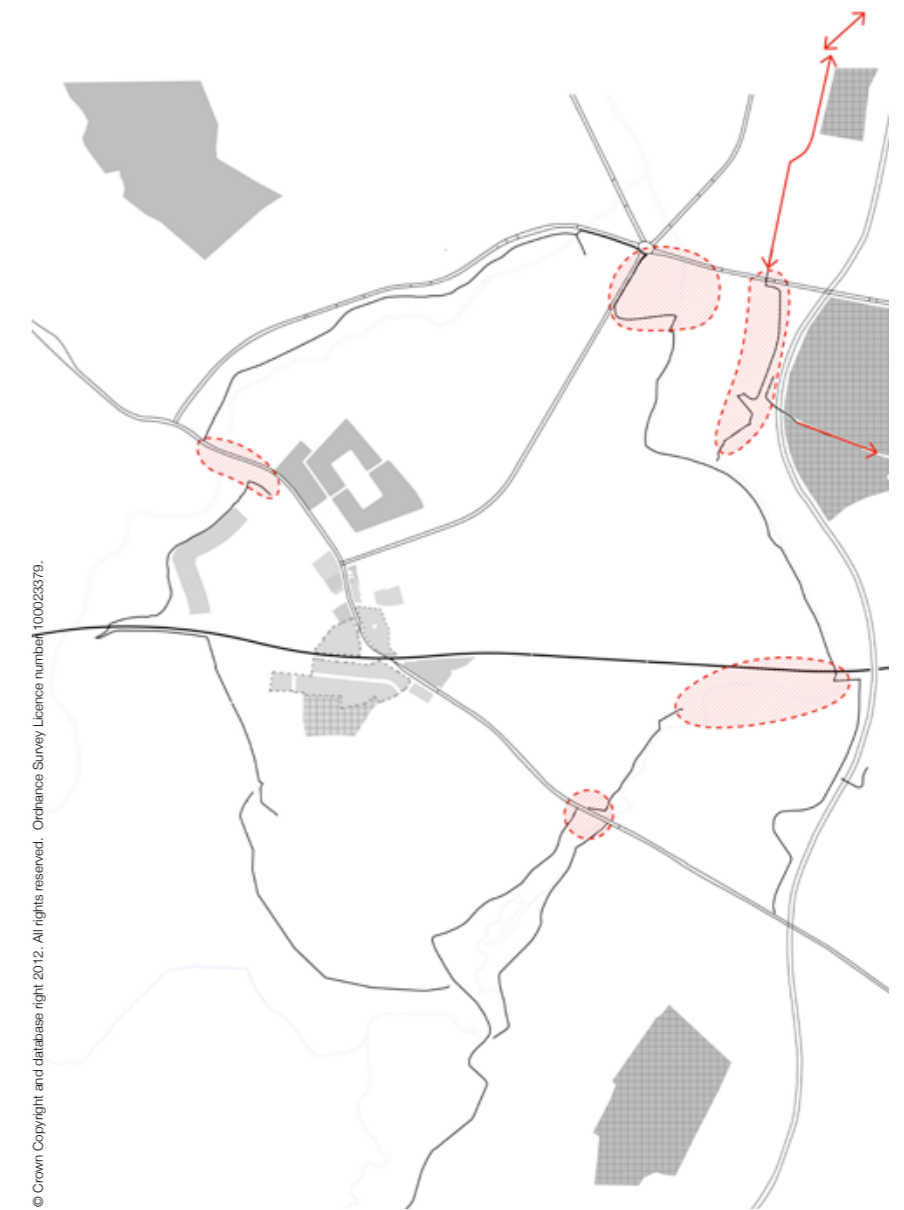
- existing core paths
- aspirational core paths

- existing green network routes / off road core paths are located to the perimeter of residential areas
- these routes almost (but not quite) form wider green network links
- the existing routes are not well integrated into the 'day to day' movement network and urban structure
- the routes are not visible / prominent



existing green network – missing links

- there are key missing links that break the connectivity of the wider green network (highlighted above).
- the breaks in the network are typically where routes become illegible as a result of complex vehicle circulation layouts or are blocked by dual carriageways with no clear or safe crossing points.

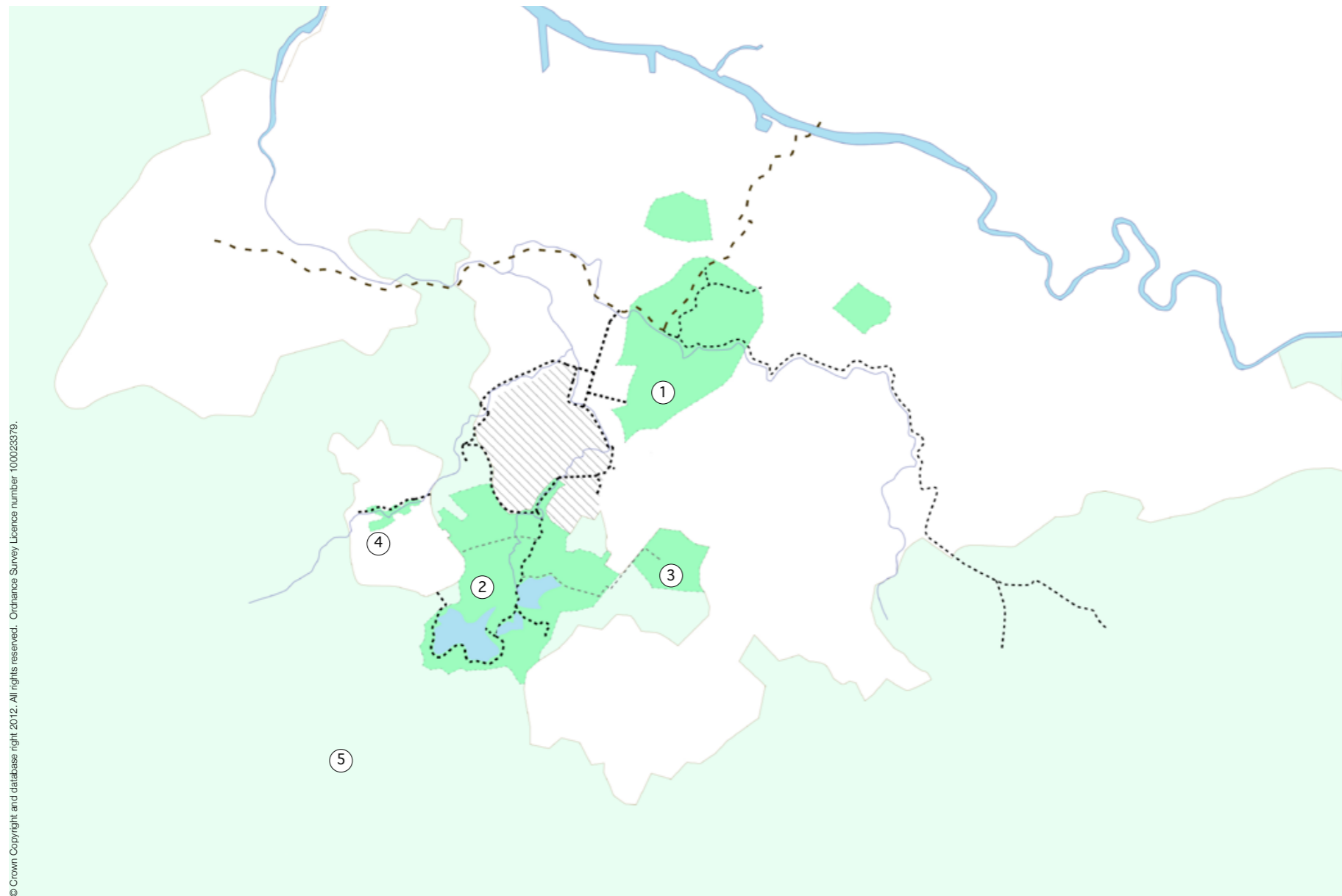


missing links & anticipated change

- opportunities for connection into Pollok Country Park and to the National Cycle Route to the north are dependent upon legible links being formed through sites identified for development. The layout and design of the development on these sites could deliver or rule out the possibility of these links being formed.



# urban structure: 4. the green network routes and spaces



proposed green network: south-west Glasgow

- national cycle route NC7
- - - core paths (off street)
- ..... aspirational / planned links
- 1. pollok country park
- 2. dams to darnley country park
- 3. rouken glen park
- 4. carlibar / centenary park
- 5. green belt

## the green network routes and spaces - summary

There is great potential to create a coherent green network in south-west Glasgow that: connects into the National Cycle Network & incorporates Pollok Country Park, Dams to Darnley Country Park, Rouken Glen Park, Carlibar/Centenary Park and the wider greenbelt

There are key missing links that break the wider network at present.

The ability to connect into the National Cycle Routes & Pollok Country Park is dependent on the layout / master planning of 2 sites identified for development.

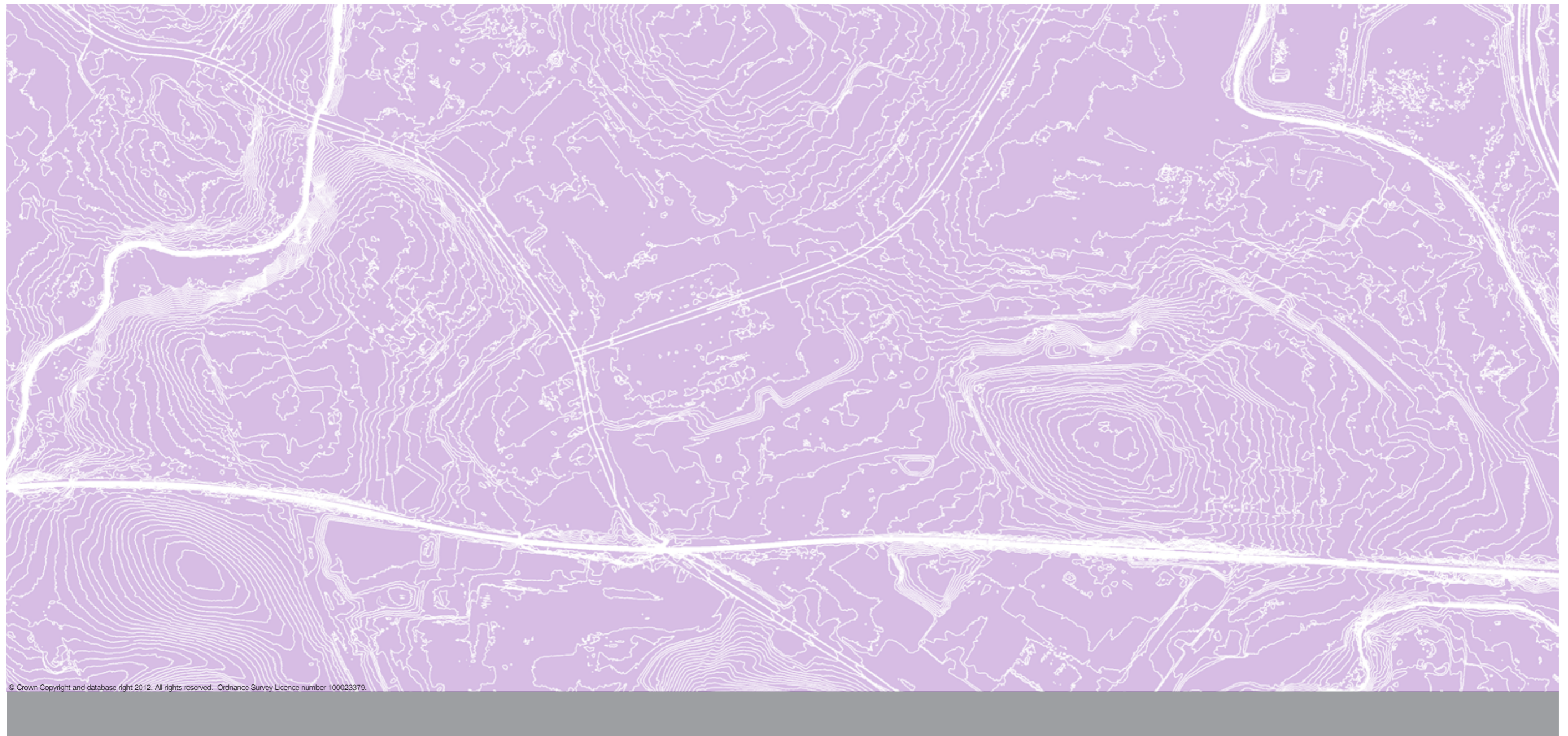
The main green corridors focused along the Lovern Water and Brock Burn lie to the edges of the residential neighbourhoods.

The main green corridors are not tied into day to day activity, are not visible & are a 'latent' asset that could help to redefine the identity of the area.



analysis

urban structure: 5. the green network: quality / usability



B

# urban structure: 5. the green network: quality / usability

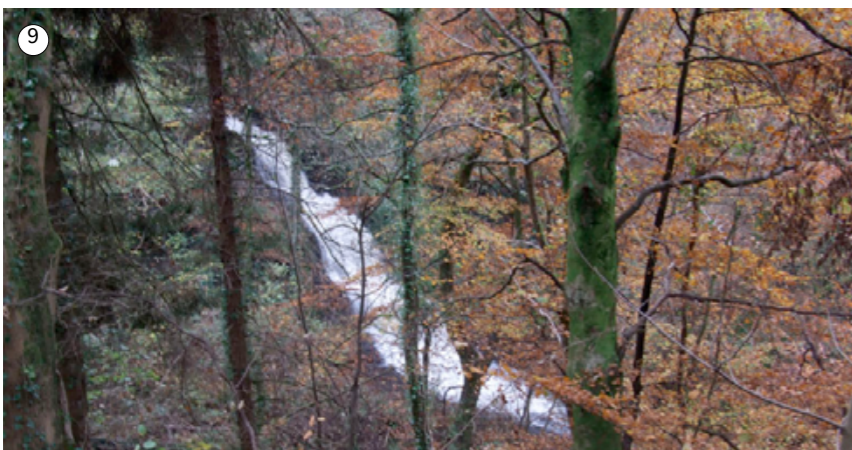


## existing green network

1. The Burrell Collection
2. Pollok House
3. Pollok Country Park
4. Hillhouse Park along the Lovern Water
5. The Lovern Water
6. The Brock Burn
7. Dam and associated infrastructure at Dams to Darnley Country Park
8. Woodland within Dams to Darnley Country Park
9. outflow / waterfall, Dams to Darnley Country Park



# urban structure: 5. the green network: quality / usability

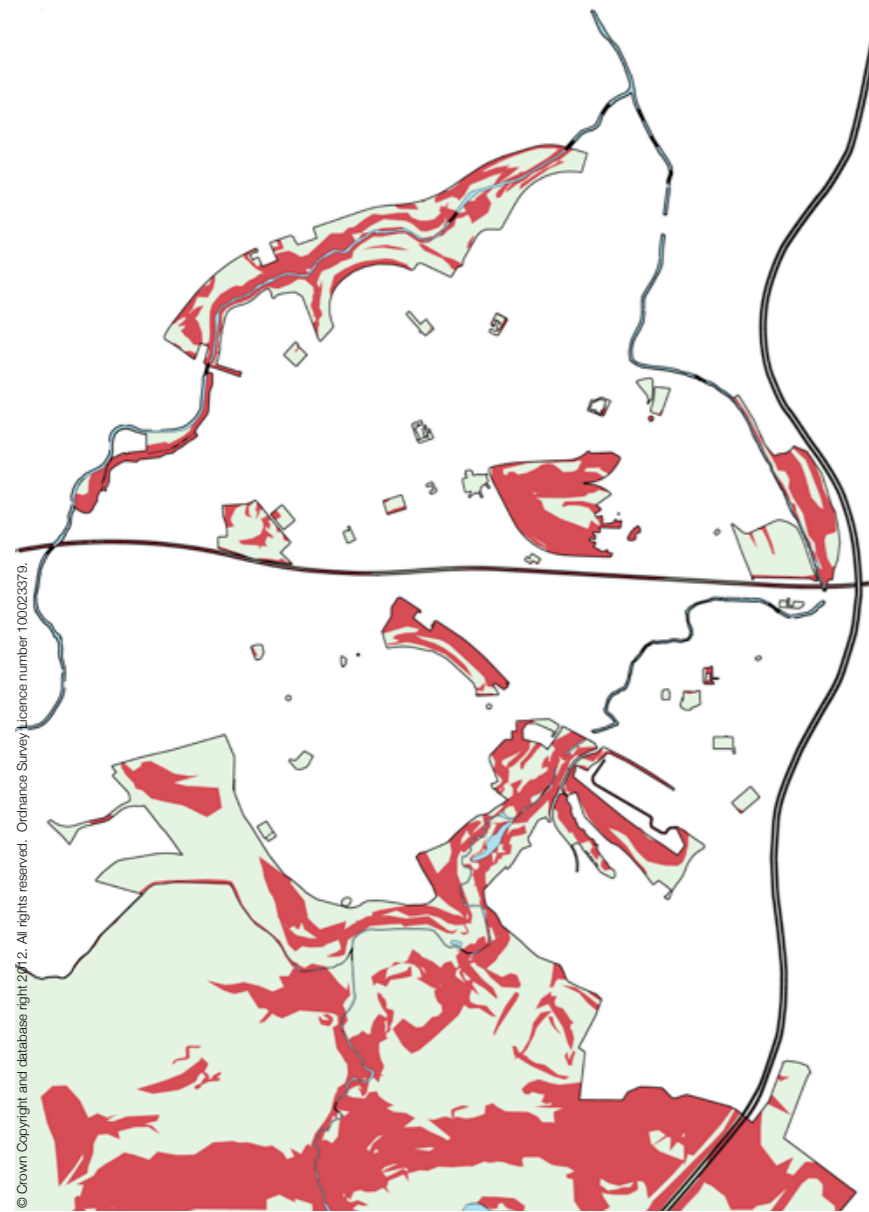


green network: quality / usability

The existing green network in and around the study area includes spaces of a high quality. Pollok Country Park, Dams to Darnley Country Park and sections of the Lovern Water and Brock Burn corridors represent a fantastic landscape resource.

However, the inconsistency in the quality of the green network and public realm is at times remarkable. Sections of the same route can vary wildly and the lack of confidence that such a drop off in quality generates for users is a significant barrier to access.

# urban structure: 5. the green network: quality / usability



defined open space / steep slopes

- defined open space
- steep slopes greater than 1:5



undefined amenity space

- housing amenity grass
- transport amenity grass



The presence of steep slopes was noted earlier as a barrier to access. It is notable that there is a strong correlation between defined public open space and steep slopes. This presents an issue with public open space having potentially limited accessibility and use.

There are also issues surrounding the character of public open space and other undefined amenity space. The study area includes extensive areas of amenity grassland that has no function or ecological value and is expensive to maintain.

# urban structure: 5. the green network: quality / usability

## the green network quality / usability - summary

There is a lack of management / maintenance of sections of routes that acts as a significant barrier to use and access.

There is a 'poorly focused' deployment of management / maintenance resources: with expanses of cut amenity grass with no function.

Many public open spaces include steep slopes that limit usability.

There are often poor relationships between residential neighbourhoods and the green network arising from poor masterplan / layout decisions.



detailed relationships / layouts

The study area demonstrates a number of poorly conceived or resolved relationships. In a number of instances the right broad components are present, but their inter-relationship undermines their potential benefit.

For example, the Brock Burn corridor is separated from the adjacent residential area by a level change, retaining wall and railings. Access points are infrequent and of poor quality. This unresolved relationship essentially cuts off the public open space from the adjacent community.



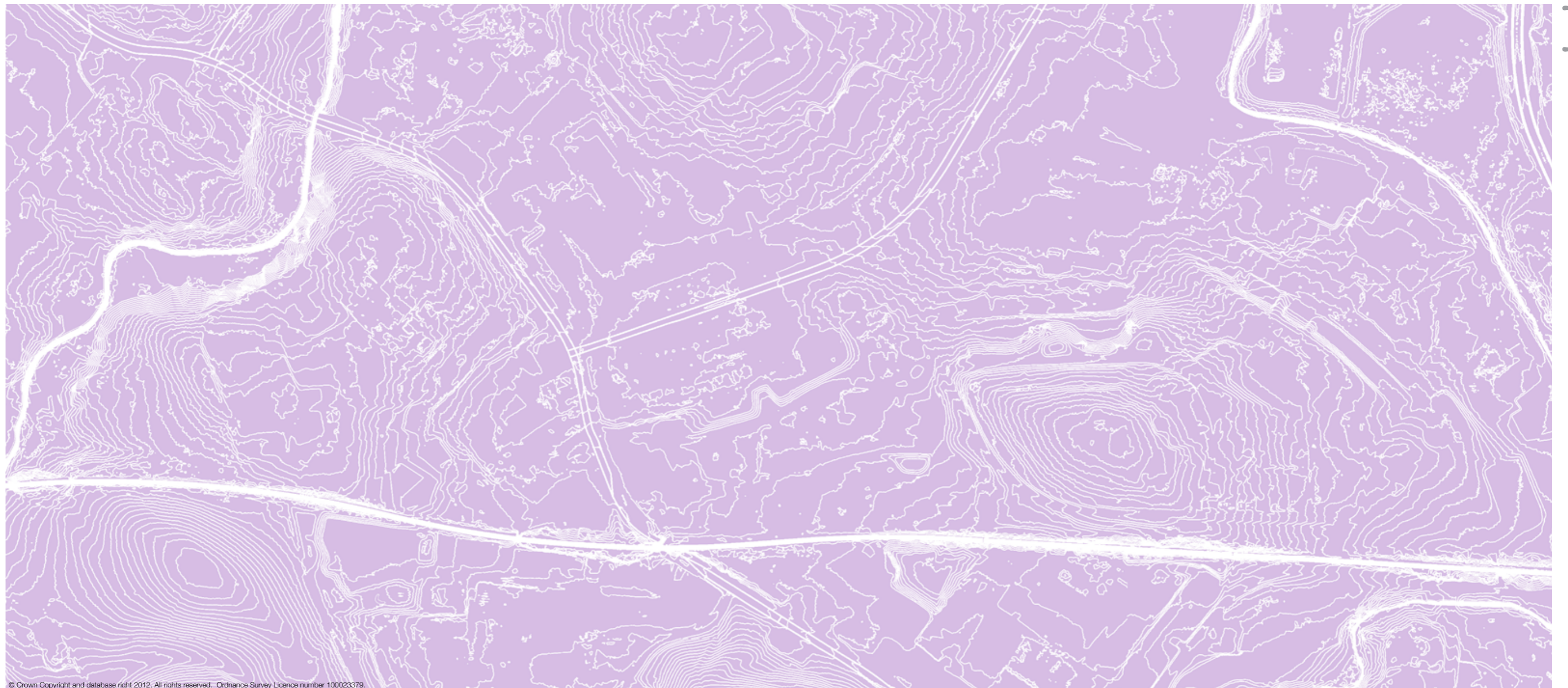
Similarly a water management feature adjacent to the Brock Burn is poorly designed and surrounding housing is organised to turn its back on this potentially positive landscape feature. This demonstrates a profound failure of design and master-planning. The potential of an overlooked, active public greenspace incorporating water management features is not realised. Rather a 'dead' space is created that performs only a water management function.





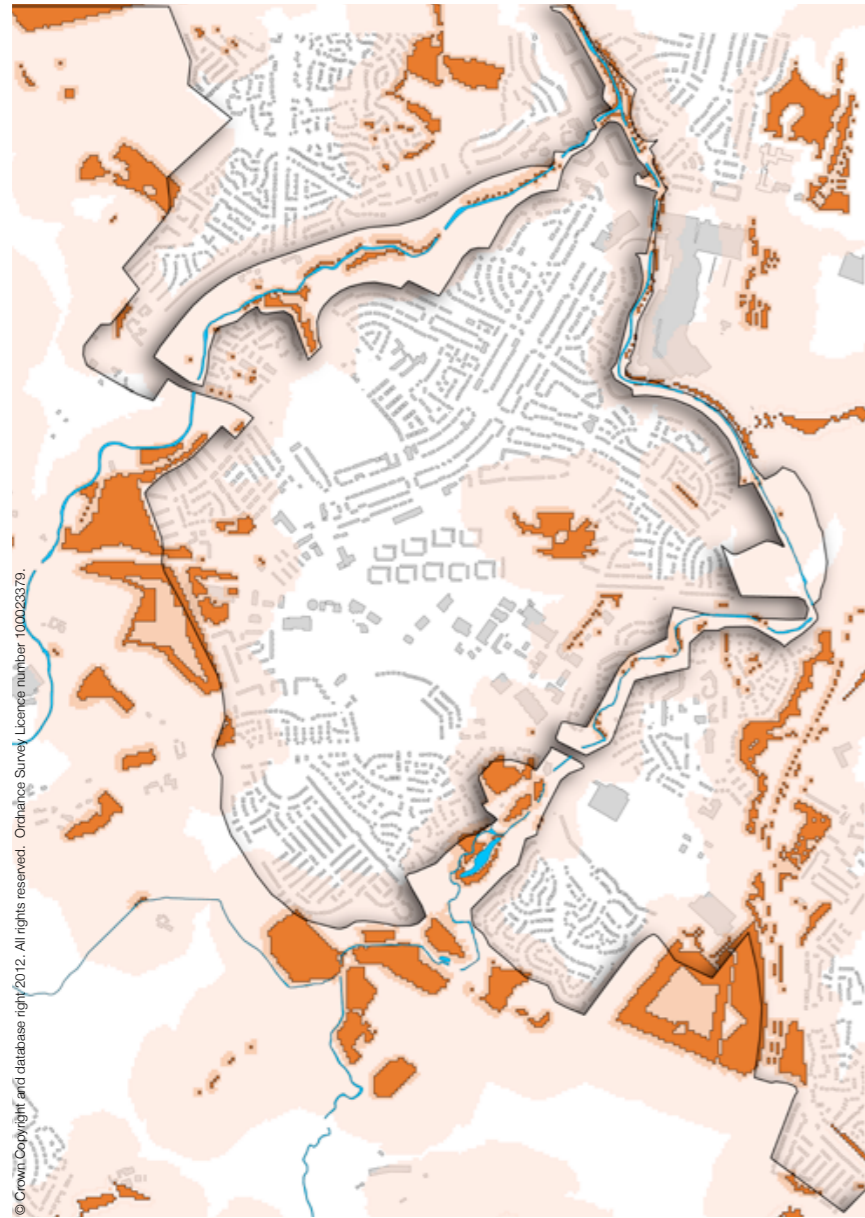
analysis

habitat and ecological systems



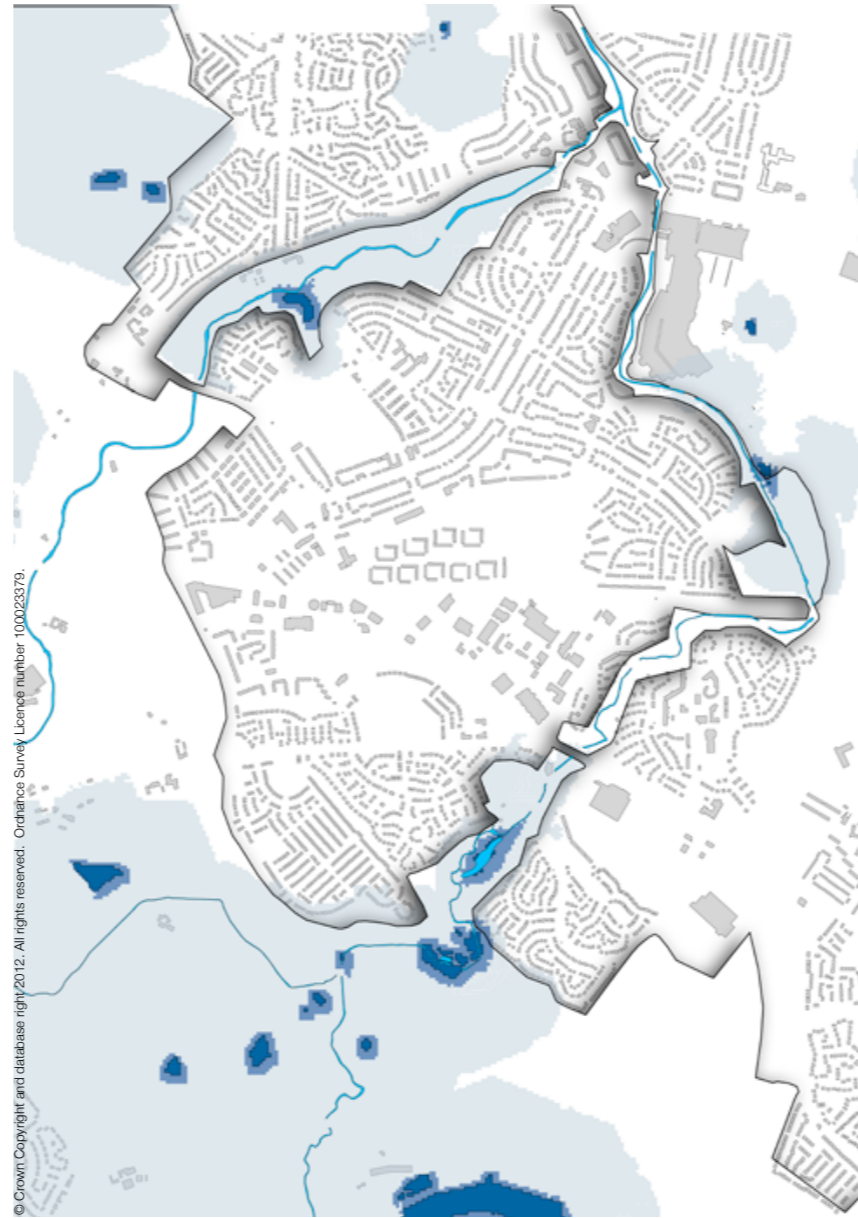
B

# habitat and ecological systems



neutral grassland

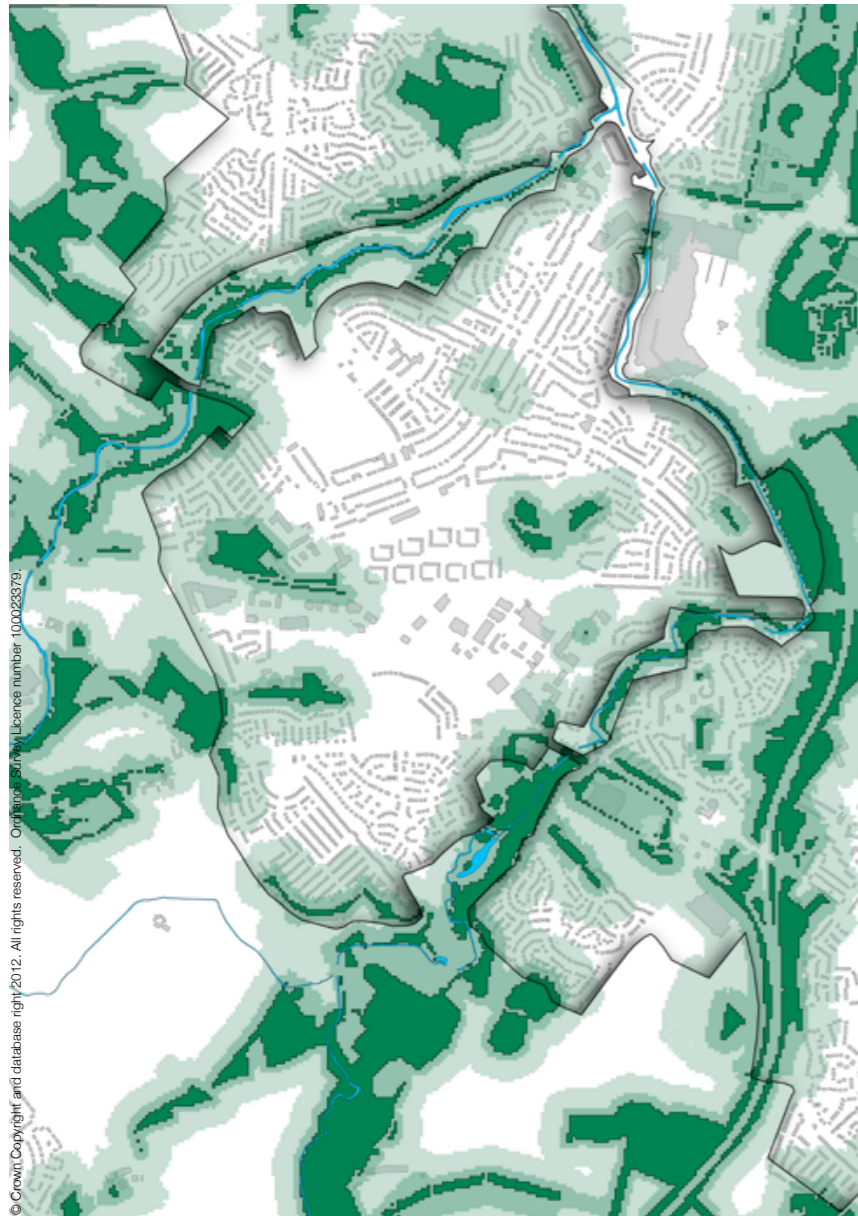
- neutral grassland habitat
- neutral grassland 300m network
- neutral grassland 2km network



fen marsh swamp

- fen marsh swamp habitat
- fen marsh swamp 150m network
- fen marsh swamp 2km network

# habitat and ecological systems



broadleaved & yew woodland

- broadleaved & yew woodland habitat
- broadleaved & yew woodland 500m network
- broadleaved & yew woodland 2km network

## habitat and ecological systems

Nitshill is a highly urbanised area and greenspace habitat is fragmented within the core study area, however there are a series of local and nationally designated sites for nature conservation both within and surrounding the study area that form part of the wider green network.

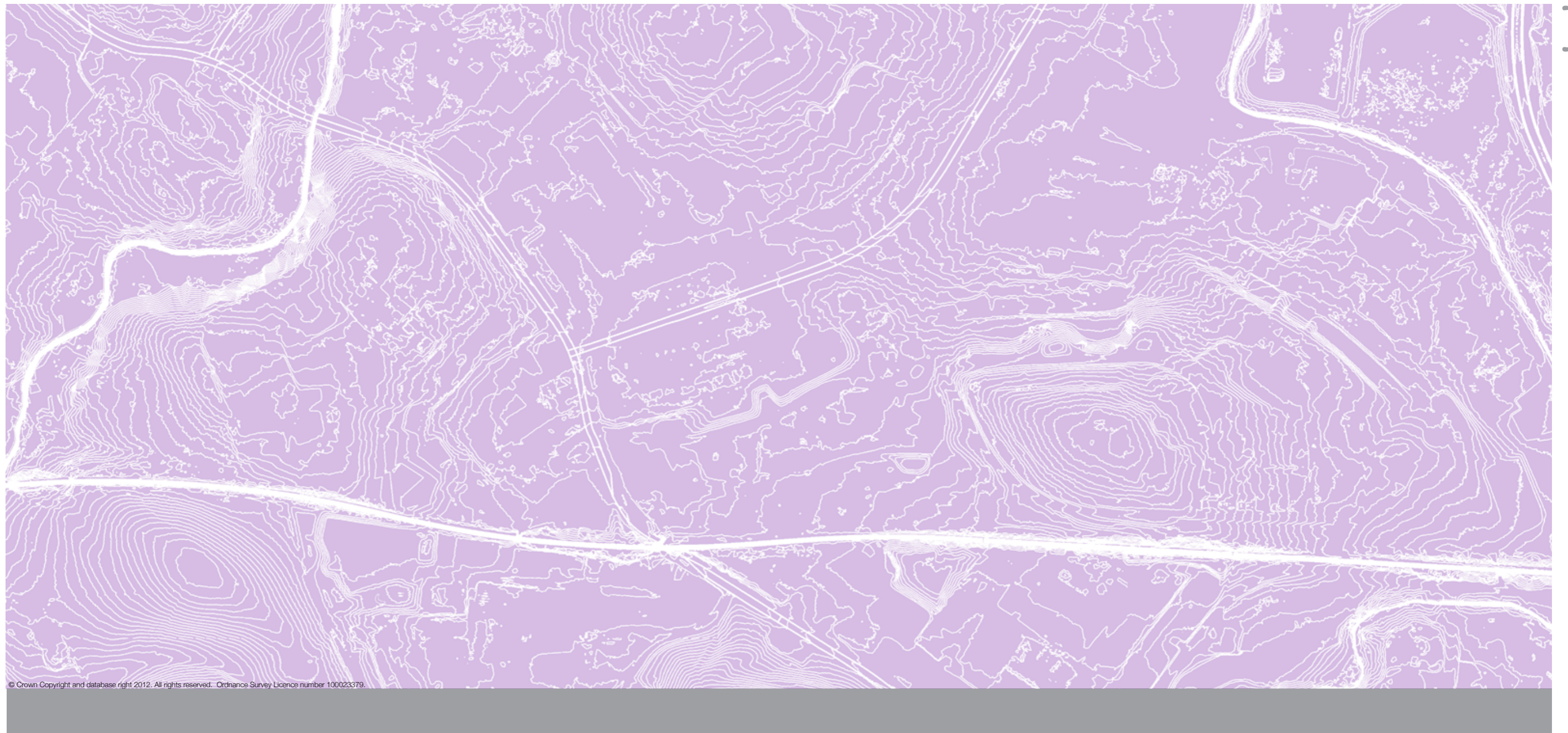
The existing railway and urban greenspace within the area currently provides loose habitat connections from east to west. The dual carriage-way has the potential to provide habitat links from north-west to south-east by enhancing the central reservation for invertebrates. There is opportunity to further develop the habitat networks in the area, however this will be dependant on whether the current vacant/derelict land is brought back into use for development.

Opportunities to improve habitat connectivity to the east of the study area are very limited due to the built-up nature of this area. Un-improved grassland and broadleaved and mixed woodland habitats have been identified within Glasgow Biodiversity Action Plan as priority habitats. The areas identified for enhancement could be managed to encourage the establishment of these habitats.



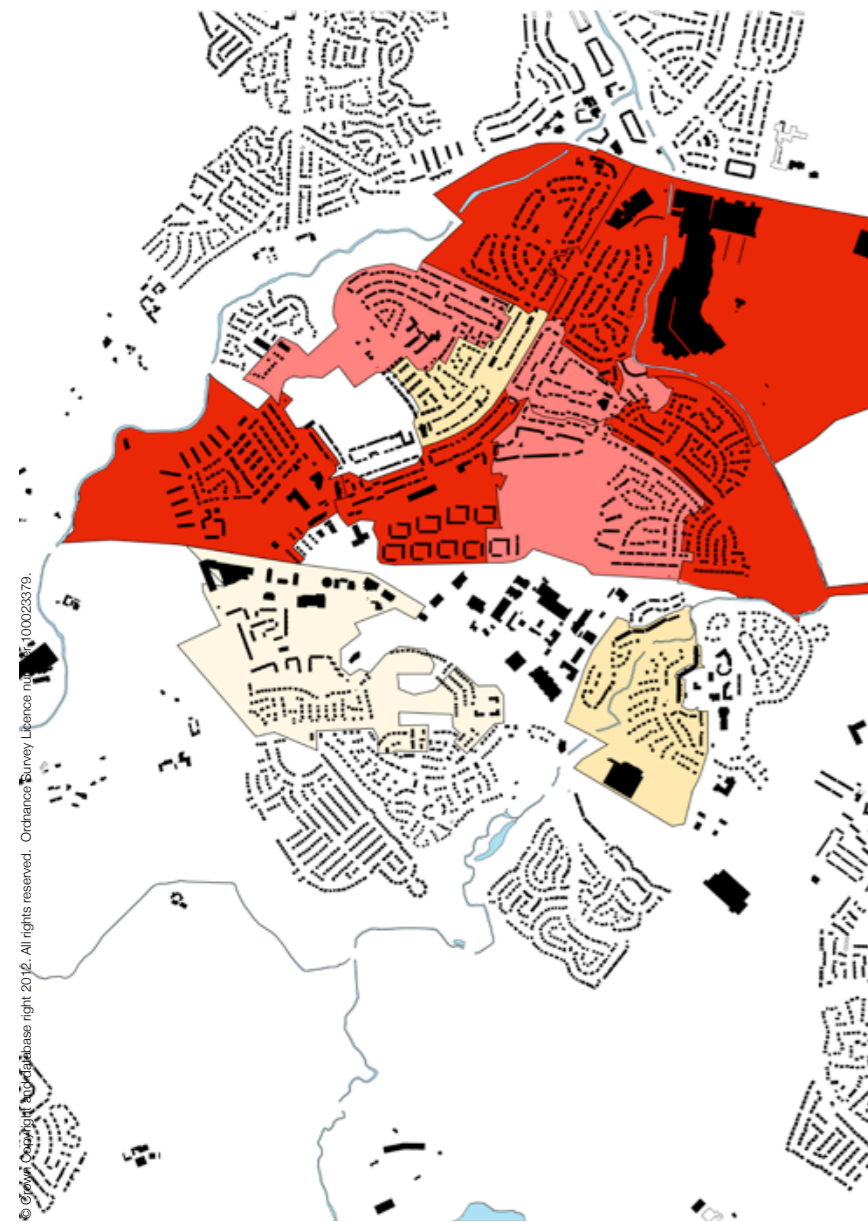
B analysis

social and economic position





# social and economic position



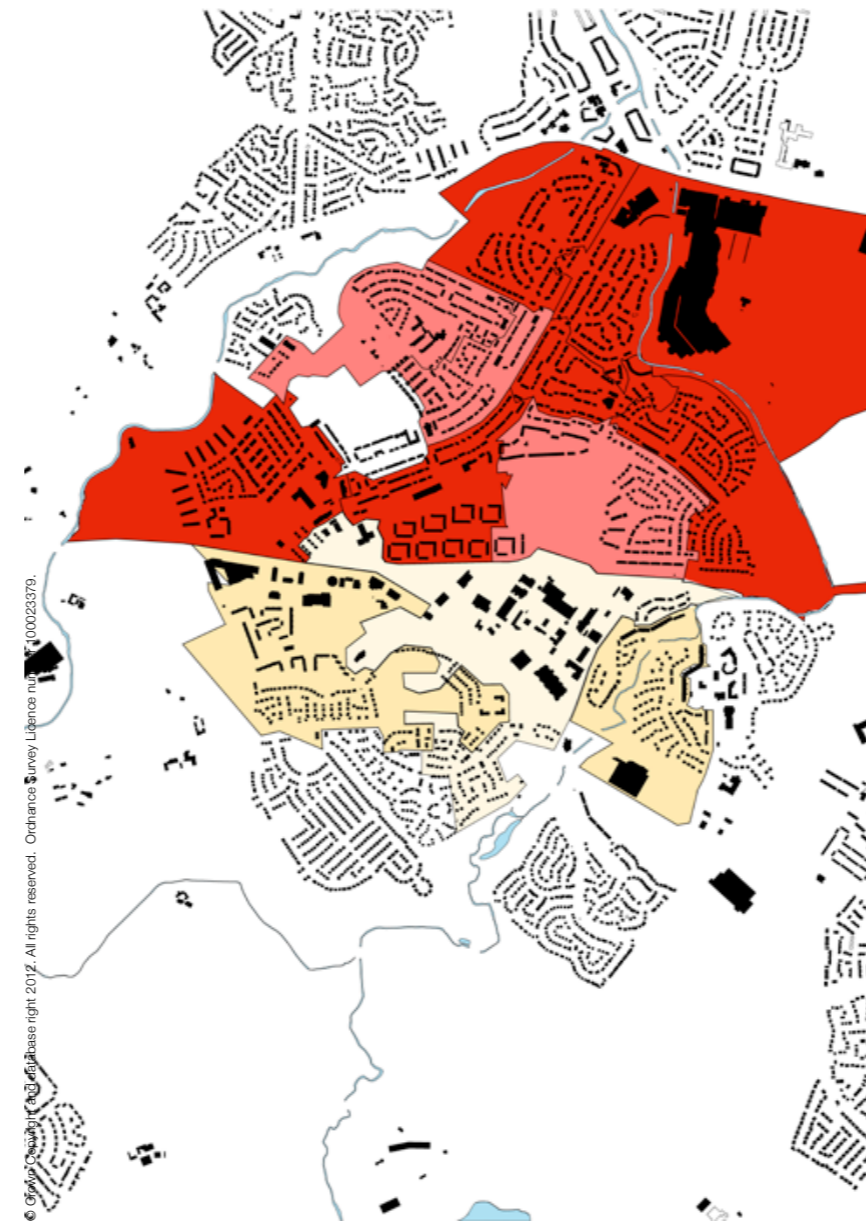
SIMD Rank 2009

- 0% - 5% most deprived communities
- 5% - 10% most deprived communities
- 10% - 15% most deprived communities
- 15% - 20% most deprived communities

NB. SIMD domain Indicators used:

Current Income. Employment. Health. Education, Skills and Training Geographical Access. Crime. Housing.

- the area to the north of the rail line includes some of the most deprived communities in Scotland



SIMD: Health Domain 2009

- 0% - 5% most deprived communities
- 5% - 10% most deprived communities
- 10% - 15% most deprived communities
- 15% - 20% most deprived communities

NB. SIMD health domain Indicators used:

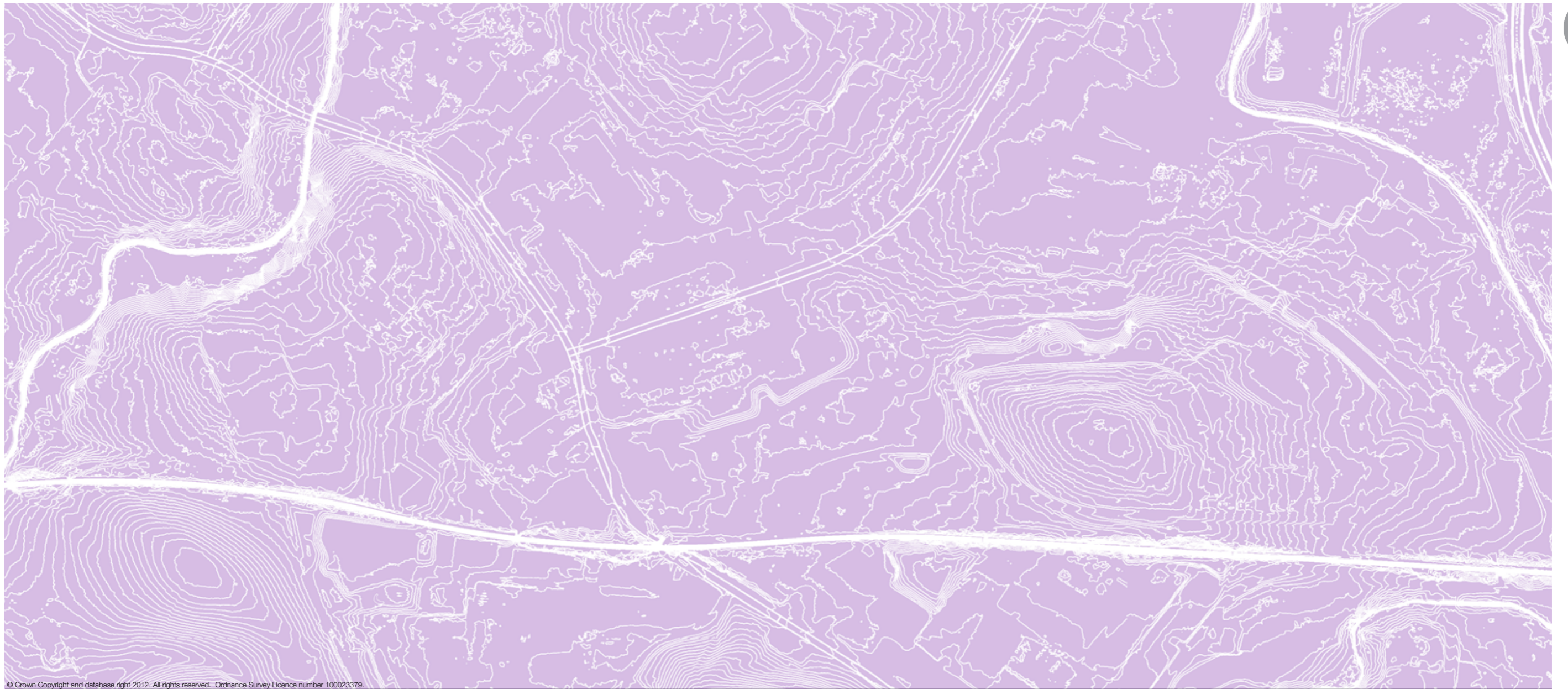
Standardised Mortality Ratio. Hospital Episodes Related to alcohol use. Hospital Episodes Related to drug use. Comparative Illness Factor. Emergency admissions to hospital. Estimated Proportion of population being prescribed drugs for anxiety, depression or psychosis. Proportion of live singleton births of low birth weight.

- the area to the north of the rail line demonstrates some of the poorest health data of all communities in Scotland



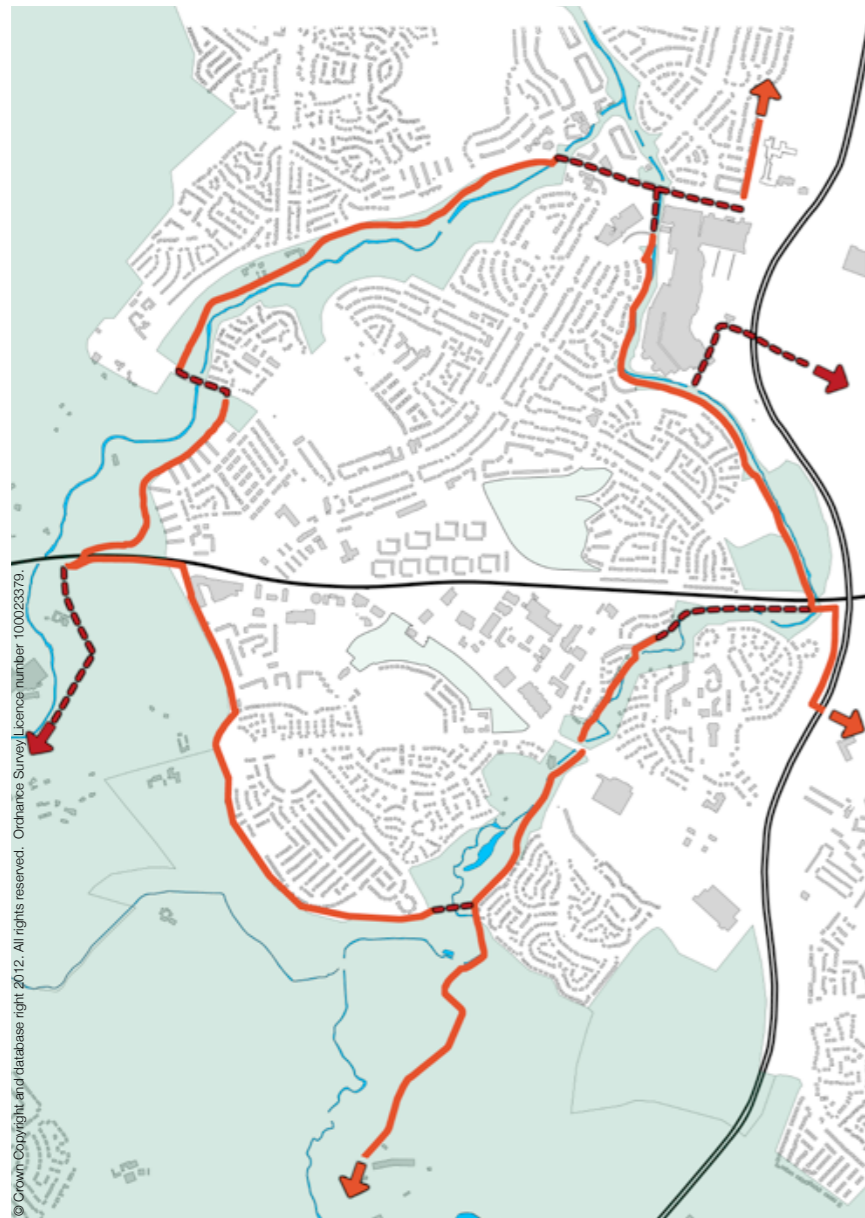


strategy



C

# strategy response:



1. wider network links

intention:

- create a coherent green network in south-west Glasgow that connects into the National Cycle Network & incorporates Pollok Country Park, Dams to Darnley Country Park, Rouken Glen Park, Carlibar/Centenary Park and the wider greenbelt

intervention:

- form missing links in the wider green network/ existing core path network
- form strong links to the north to the National Cycle Routes and Pollok Country Park



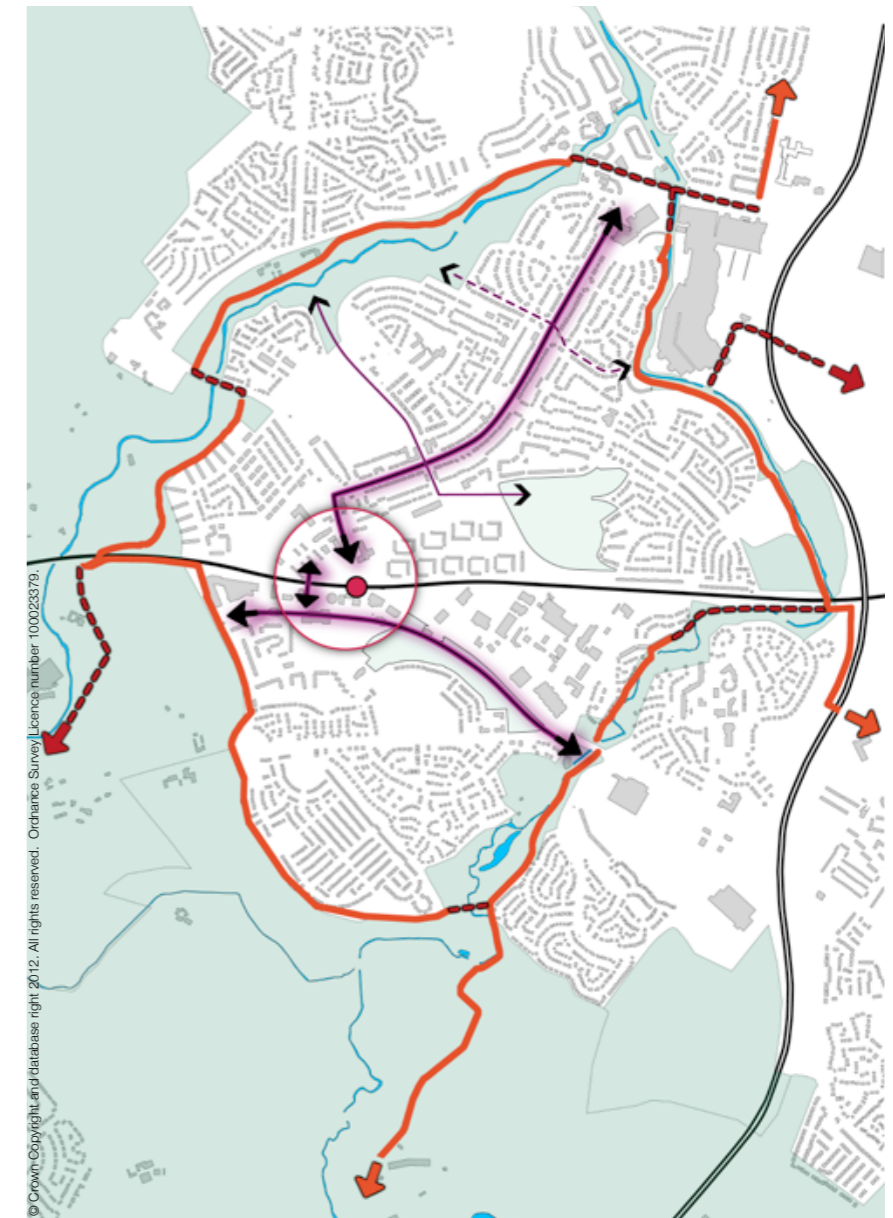
2. green network links within urban area

intention:

- integrate the green network into the urban area
- create legible, walkable and safe routes for pedestrians & cyclists
- connecting neighbourhoods to community facilities
- make the green network visible & redefine the character / identity of the area

intervention:

- redefine Peat Road as a good quality pedestrian and cycling environment: a 'green boulevard'
- form east-west links stitching the boulevard into the wider green network
- form an east-west link between Levern Water and Brock Burn corridors: between Darnley Mill & the Museum Resource Centre



3. connected green network

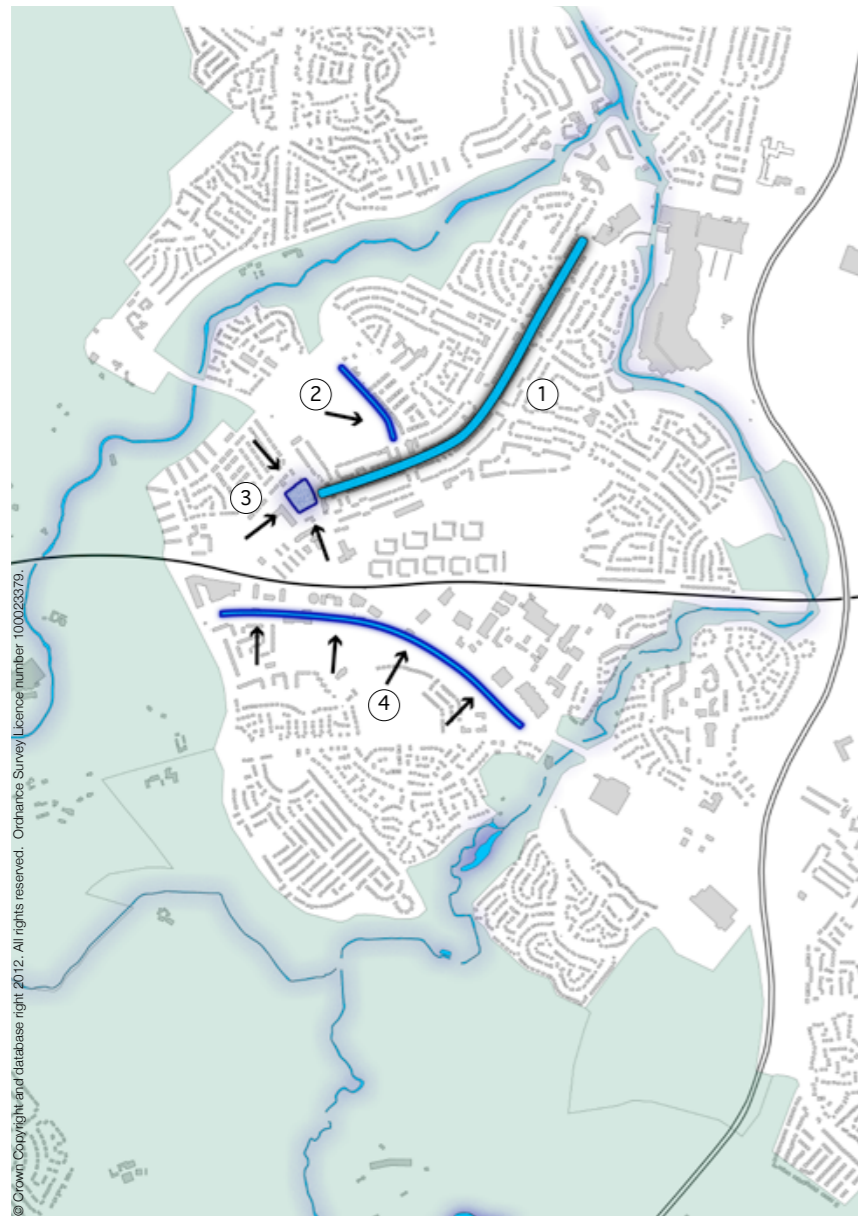
intention:

- make the green network accessible & visible & redefine the character and identity of the area
- a green network that functions on both a local and citywide level
- introduce new and provide enhanced habitat corridors

intervention:

- the centre of Nitshill becomes a hub of the green network & a key point of arrival to Dams to Darnley Country Park and the wider green network
- provide a more varied habitat network in line with the Local Biodiversity Action Plan

# strategy response:



4. integrated water management

## intention:

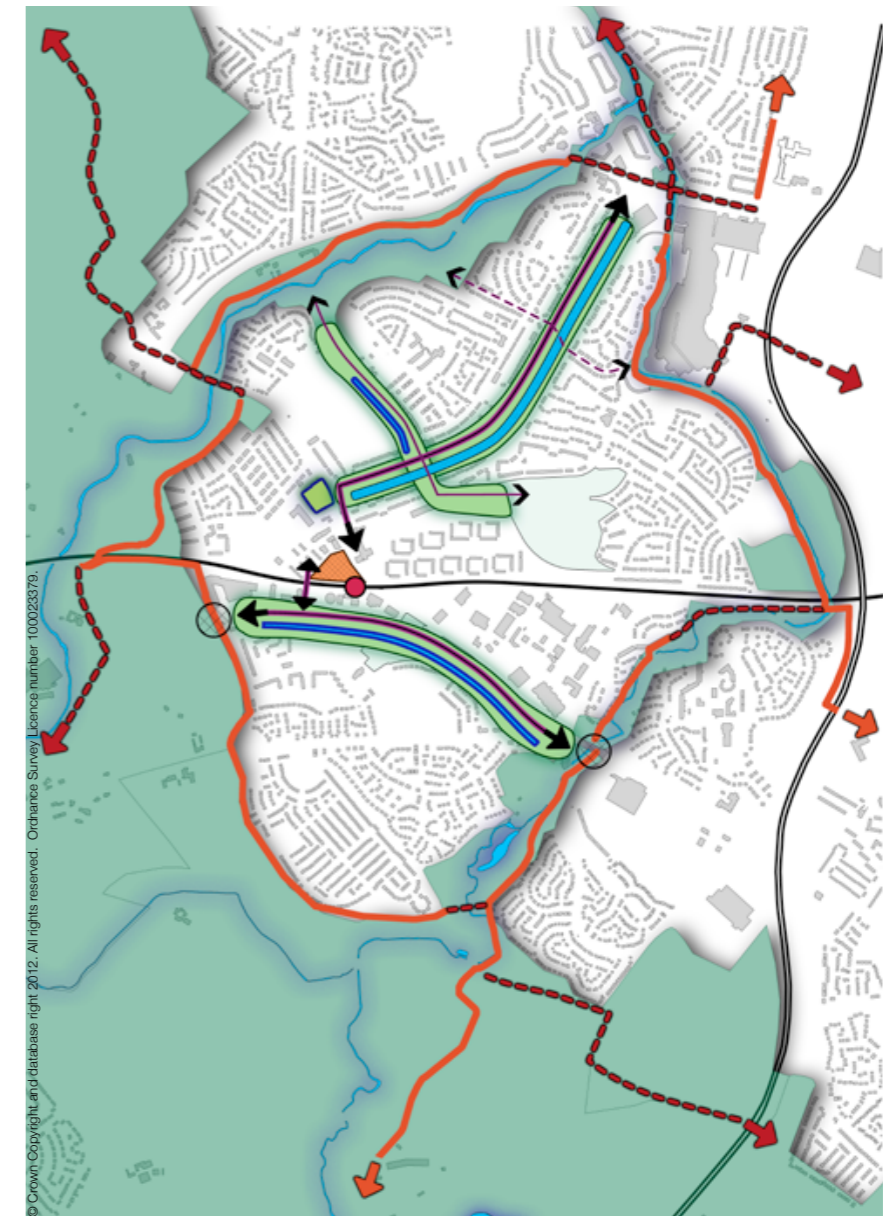
The long term intention is to create a surface water management network which can collect and manage the surface water from source to the confluence with the Brock Burn on or near to the ground surface. This would require a step-change to the present water management where surface water is collected in combined sewers along with foul drainage and conveyed to treatment works outwith the local catchment. It is recognised that achieving this would be a gradual process over an extended time period where works would likely be implemented as areas are re-developed or existing infrastructure requires to be upgraded.

## intention:

- All surface water runoff from local catchment area allowed to drain on/near the ground surface from the source to natural confluence with the Brock Burn
- gradual decoupling of surface water from combined sewer is proposed and local areas for collective SUDS retrofit are provided
- that water management features provide resilience for climate change
- greenspace can be designed and developed for SUDS over time, allowing potential for open water when sufficient connections are in place
- provide local scale treatment as part of wider catchment system
- collect, attenuate and treat surface water connections before discharging back to combined sewer until fully dedicated surface water system in place

## intervention:

1. Peat Road corridor redesigned to manage surface water thro' SUDs features such as: swales, linear wetland, tree planting etc.
2. SUDs features associated with adjacent residential development site incorporated into linear park
3. SUDs feature created as terminus to boulevard on cleared site: addressing water management requirements of surrounding development sites
4. linear swale/wetland SUDs features incorporated into design of green link: management of surface water in upper portion of catchment (south of rail line)



5. combined strategy response

# strategy response:



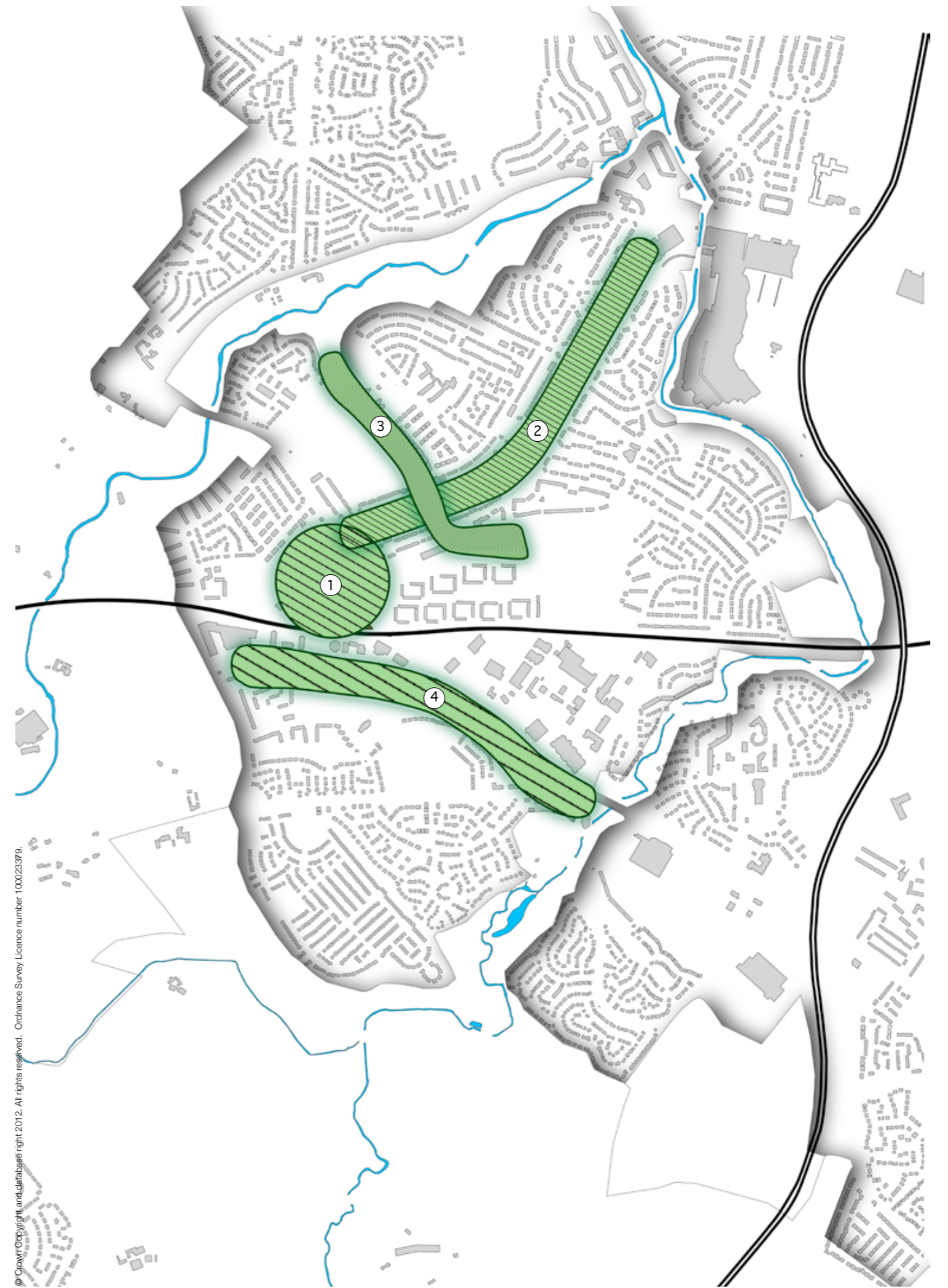
## restructuring existing spaces

1. Peat Road corridor enhanced as a 'green boulevard'
2. residual open space / derelict & vacant land – redesigned to form a green link between the Levern Water corridor and 'Hartstone wood hill'
3. enhancement of 'Hartstone Wood Hill' public open space: developed as a landmark & destination
4. proposed clearance of disused building: school landscape extended
5. creation of a new 'village' centre: mixed use development and civic space adjacent to the rail station
6. enhancement of existing public open space
7. creation of a new green link - improving the approach to and character of the development around the Museum Resource Centre

# strategy response:

## design study work focus:

1. urban framework plan for centre of Nitshill
2. green boulevard SUDS proposals for Peat Road
3. urban framework plan focused along green link from Levern water to Hartstone Wood Hill
4. urban framework plan focused along green link from Darnley Mill to Museum Resource Centre
5. strategy for habitat creation / landscape management across green network



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design studies

Nitshill



D

# Nitshill design studies

## design studies: overview

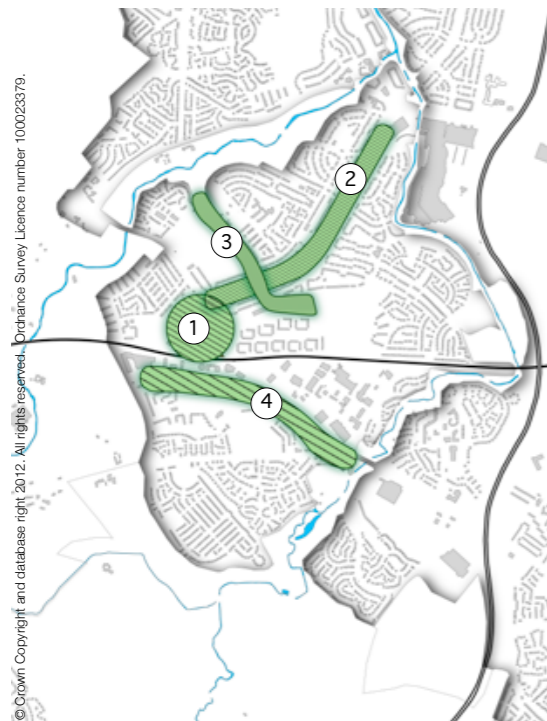
The previous section of the report outlines the key strategic moves to transform the study area through Integrated Green Infrastructure.

The design studies explore the core components of the strategy in greater detail.

5 areas or topics were identified as the focus for the design studies:

1. the development of an urban framework plan for the centre of Nitshill
2. the development of green boulevard and SUDS proposals for Peat Road
3. the development of an urban framework plan focused along the green link from Levern water to Hartstone wood hill
4. the development of an urban framework plan focused along the green link from Darnley Mill to the Museum Resource Centre
5. the development of an area wide strategy for habitat creation and landscape management across the study area

The following section describes the outputs of these 5 areas of investigation.





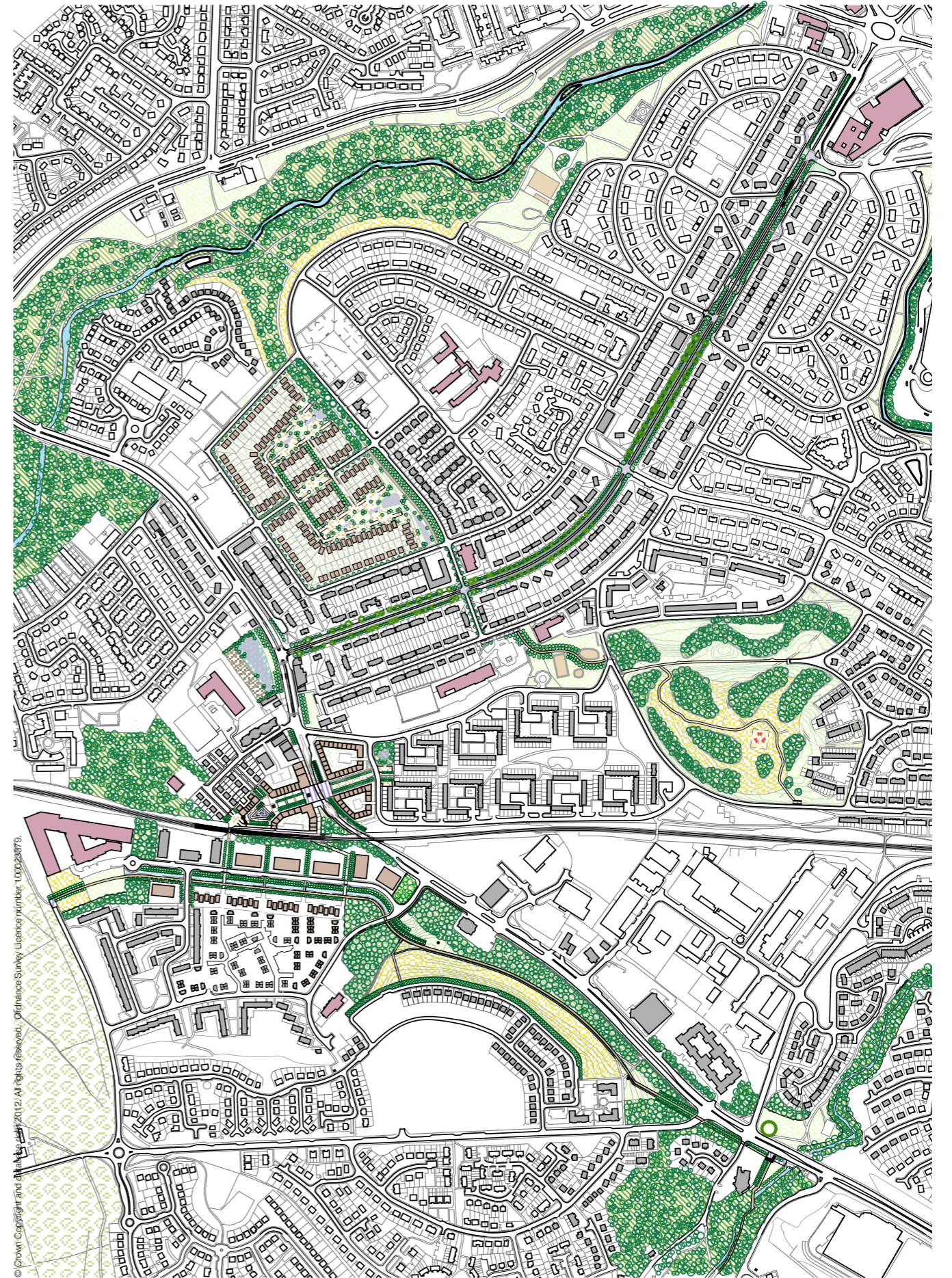
# Nitshill design studies

## design studies: scope

As highlighted at the start of the report, the study does not seek to generate a comprehensive urban regeneration plan for Nitshill and equally does not seek to generate a comprehensive strategy for habitat or ecological enhancement. The study focuses on the opportunities for significant combined effects – where a whole series of positive outcomes can be realised together.

This is carried through to the area specific design studies. These do not seek to generate a fully detailed master plan for each area. This is not their role or intent.

The design studies are focused on the opportunities for ‘combined effect’, which we would suggest should form the backbone of any urban regeneration or ecological enhancement strategy. If you are going to start anywhere, this offers a framework for meaningful change that will deliver maximum benefit from the investment.

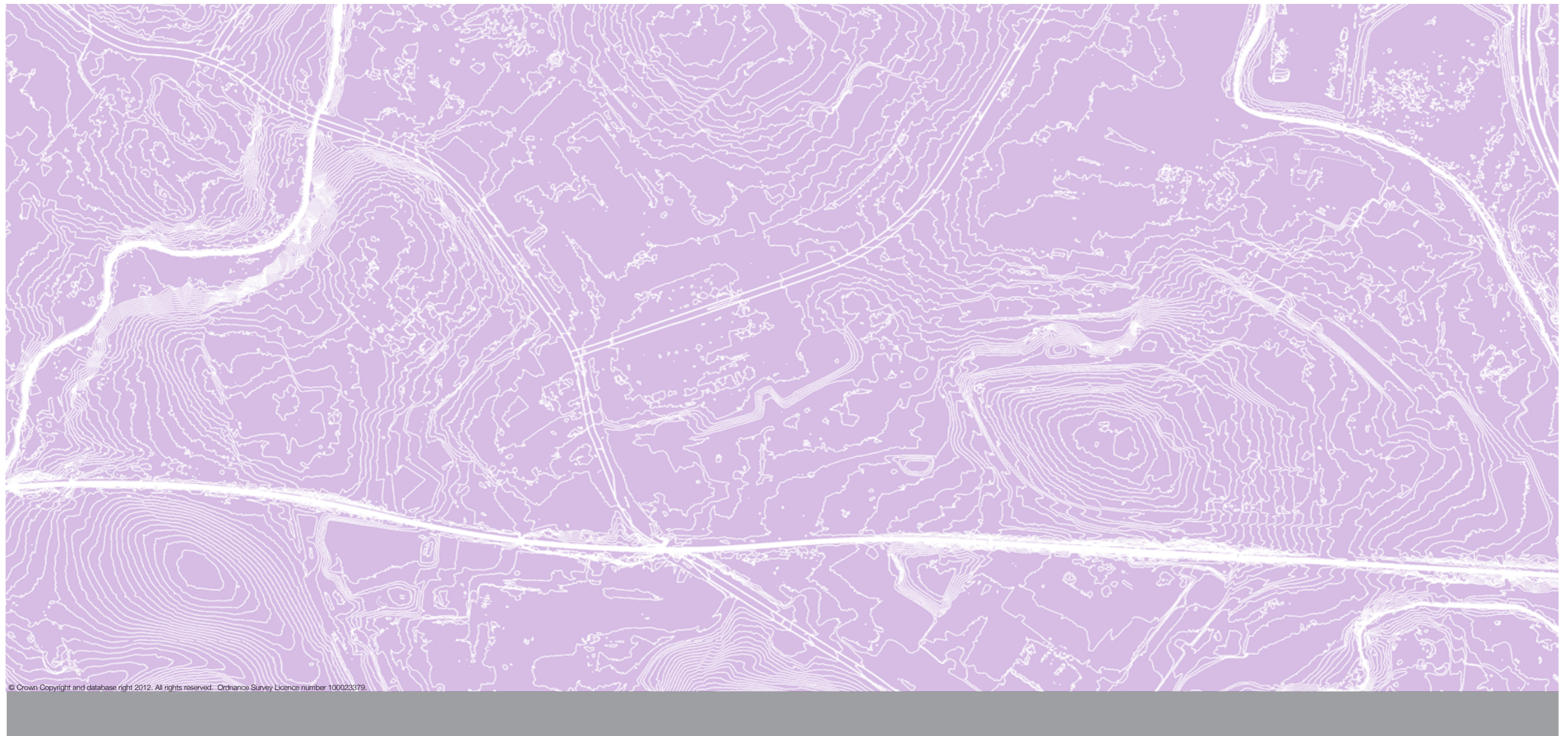






design study

Nitshill neighbourhood centre



D



## Nitshill centre - existing situation

The centre of Nitshill is of exceptionally poor environmental quality. It has a strongly negative character that effectively defines the identity of the area in these terms.

The area is divided by the out of scale dual carriageway of Nitshill road around which are scattered a number of disparate fragments of built development. There are extensive areas of derelict and vacant land at the core of the area. A major asset and key point of arrival is the rail station. However all movements to and from the station are through or past the derelict and vacant sites.

There are existing shops and facilities scattered along the edge of the dual carriageway. There is a lack of human scale or a safe or connected pedestrian environment.

The poor condition of the centre of Nitshill and its high visibility must act as a major drag on any development or investment possibilities.

There is a total lack of 'public realm' or any positive expression of a 'sense of place'. The only cultural or historic markers (the mining disaster memorial and war memorial) are located in a disconnected space at the edge of the dual carriageway.



# Nitshill neighbourhood centre

## key

1. Good Quality Urban Realm surface
2. Relocated pedestrian crossing / transition space
3. Homezone style shared surface space
4. high quality expressed water management feature
5. greenspace with integrated water management and play features
6. private / backcourt spaces with integrated parking
7. bus stop (layout / location indicative)
8. cycle lanes
9. gate feature
10. relocated war memorial
11. improved tunnel under rail line
12. new south entrance to rail station



## Nitshill centre - development plan

The proposed approach to the regeneration of Nitshill neighbourhood centre aims to create a human scale, vibrant neighbourhood centre of a distinctive character that is not dominated by vehicular traffic.

It is proposed that new development is focused around a pedestrian / shared surface precinct emphasising access from the rail station and linking into local and longer distance pedestrian and cycle routes.

This new neighbourhood centre concentrates activity in the vicinity of the rail station, in contrast to the current arrangement which demonstrates a scattered, linear arrangement along the dual carriageway.

The proposal creates a hub space as a focus of arrival, civic and social activity and as a positive gateway to the wider green network, notably acting as an arrival point to Dams to Darnley Country Park.

The proposed organisation of new development stitches together the currently fragmented urban structure: completing blocks and emphasising key routes. The proposed built development is slightly higher density than the housing immediately surrounding the site. The development must present a continuous built edge to the public spaces and generate a sufficient level of activity to animate and offer surveillance over the public realm.

The proposals include extending the narrowed 2 lane portion of Nitshill Road from the rail bridge northward. This narrowing of the road is intended to slow traffic through this important section while the existing pedestrian crossing point is moved to an appropriate location. This alongside other co-ordinated moves such as the potential for surface material changes and reconfiguring bus pull in bays has the potential to substantially redefine the neighbourhood centre as an attractive place to visit and live - something that would be hard to achieved along a dual carriageway.

The public realm includes a strong structure of street tree planting to generate a human scale and to increase the biodiversity of the local area.

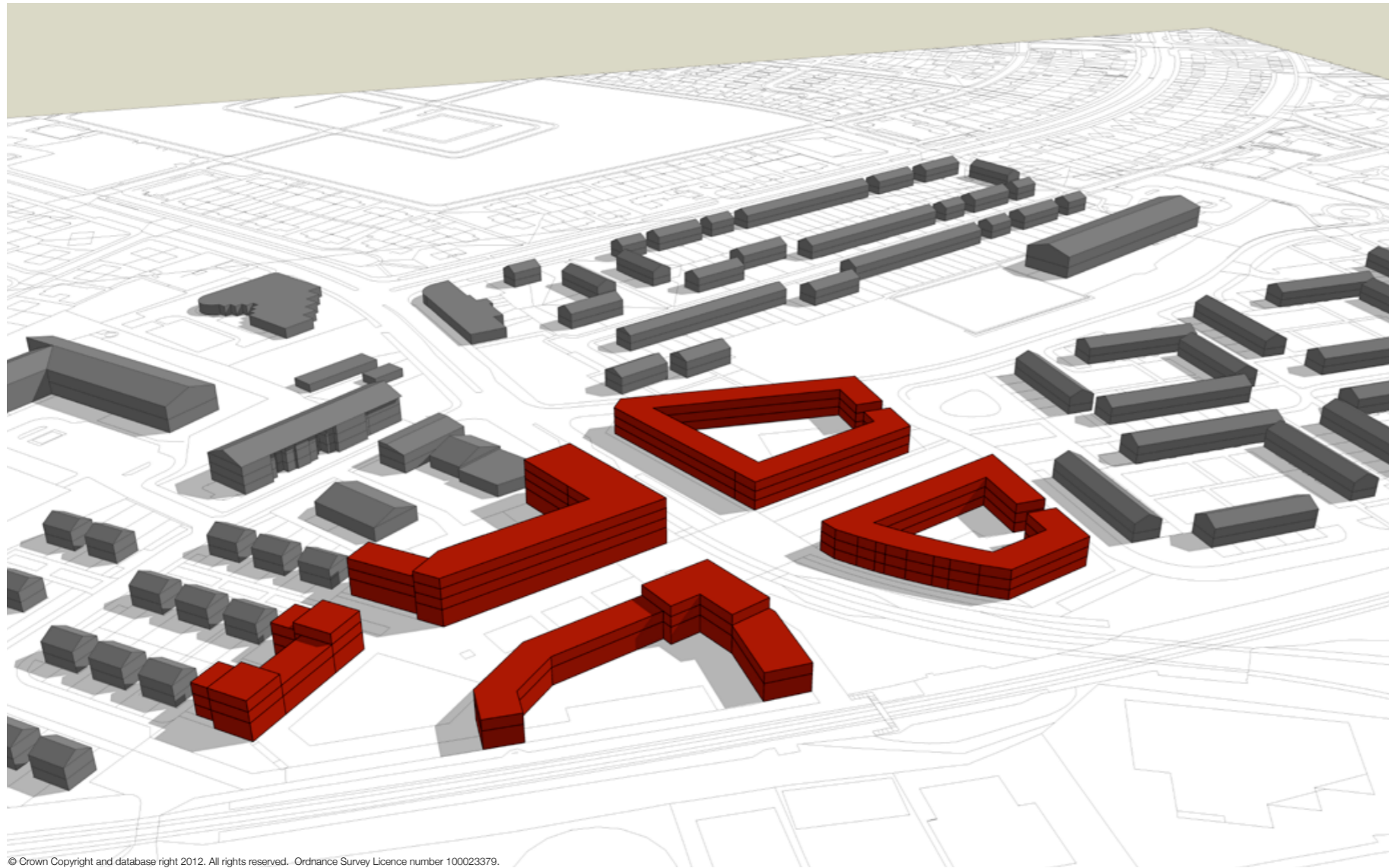
The proposed approach is described through a series of topic specific diagrams in the following pages.

# Nitshill neighbourhood centre



Nitshill Neighbourhood Centre: new civic space, highlighting new development, active frontages and opportunities for high quality outdoor environment (water management feature, integral play features, strong street tree planting etc).

# Nitshill neighbourhood centre



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massing model

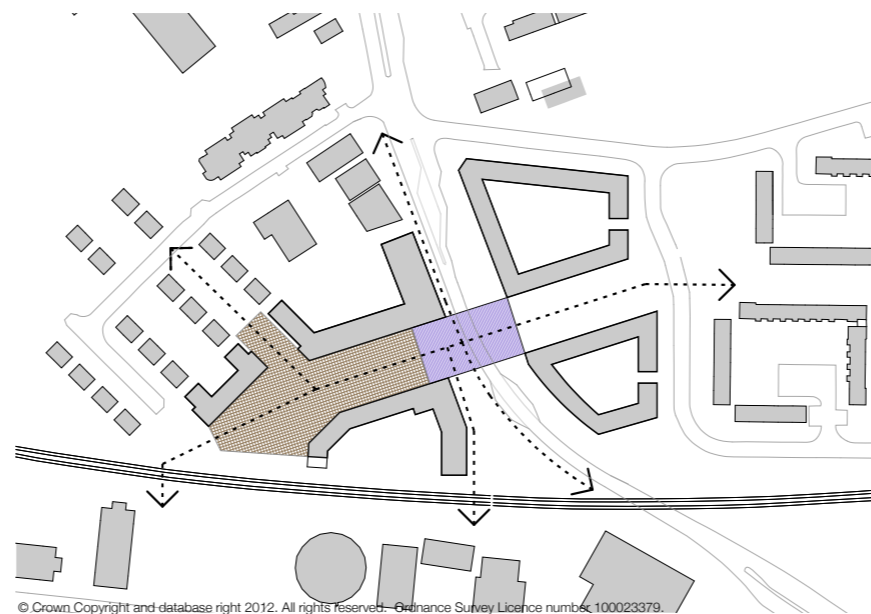


### design principles: built form

The proposed arrangement of new built development in the core of Nitshill is focused around a new pedestrian / shared surface public realm space.

The built development completes existing blocks and generates a coherent urban structure in the core of Nitshill, which is presently completely lacking.

The proposed development is predominantly residential, with retail and commercial space at street level in the blocks to the west of Nitshill Road. The proposed scale of retail development is approximately equal to the current provision that is spread along the dual carriageway.

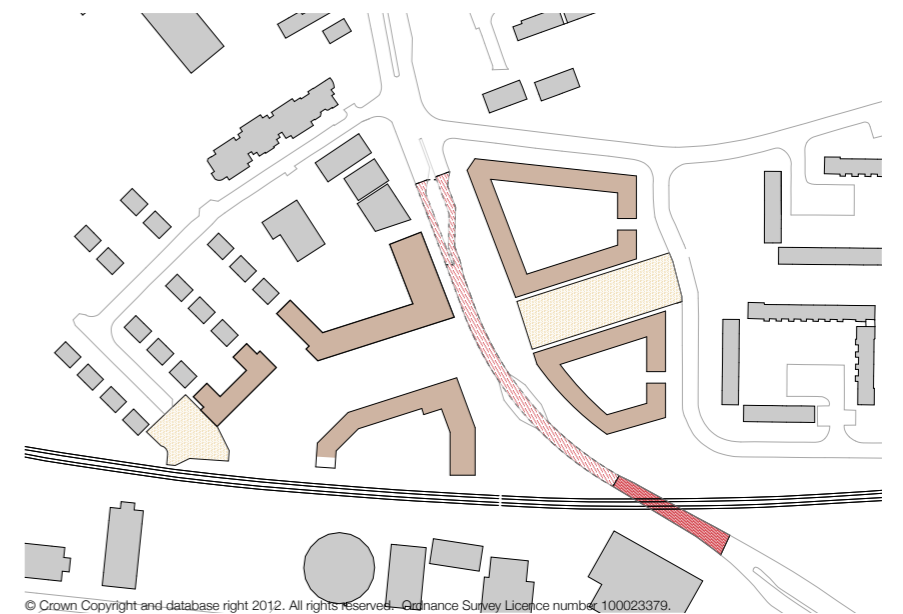


### design principles: movement

The organisation of the built form and design of the public spaces emphasises links into local and wider path networks.

This includes: the route along Nitshill Road, access to the rail station, the link to the south of the rail line (ultimately to Dams to Darnley Country Park), the route eastward to Hartsone Wood Hill and more locally the link to the north to St Bernard's Primary School.

All key immediate links and wider path networks are focused through the core public realm space. They should be designed for safe use by both pedestrians and cyclists.



### design principles: traffic calming / shared surface

To reduce the conflict between pedestrian activity and the dual carriageway, it is proposed that the section of Nitshill road to the north of the rail tunnel, where it passes through the core precinct, is reduced to 2 lanes. This in conjunction with moving the existing traffic lit pedestrian crossing to tie in with the new development and the option of surface material changes at the main crossing point substantially redefines the neighbourhood centre as an attractive place to visit. All proposals would have to be designed in line with recognised road traffic regulations. Safe cycle lanes should also be incorporated.

The continuation of the civic space to the east of Nitshill Road, takes the form of a 'homezone' shared surface space. To the west of the civic space lies a further small shared surface area to facilitate turning.



# Nitshill neighbourhood centre



## design principles: parking

To realise the ambitions of a pedestrian or shared surface public realm, it is proposed that the main development blocks are either fully or in part 'core' serviced. Discrete vehicle access can be realised as suggested to provide servicing and parking to the core of the blocks.

It is suggested that the residential blocks to the east of Nitshill road should have in curtilage parking to the eastern edges of the blocks and have parking within the shared surface space between the 2 blocks to help animate the adjacent streets and spaces.

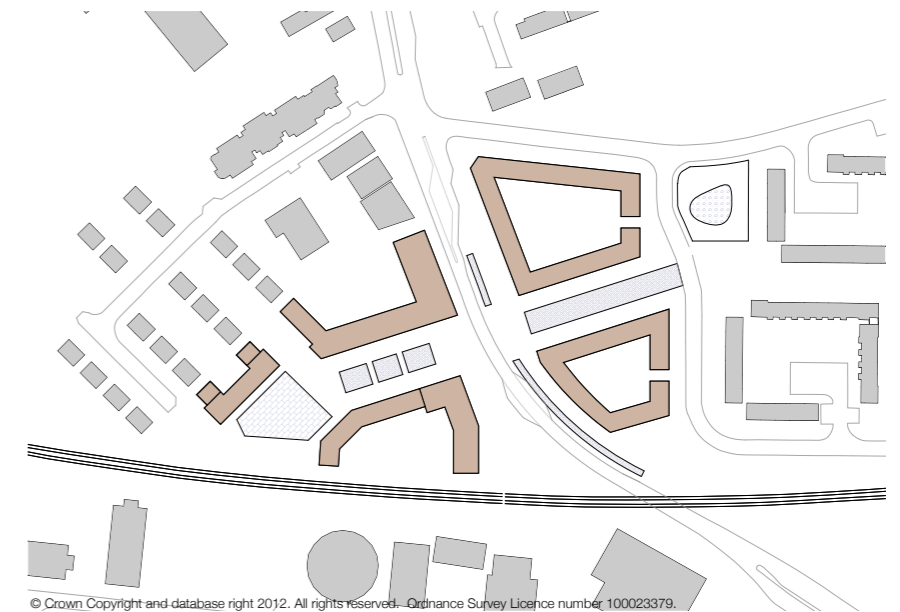


## design principles: markers / civic monuments

Two monuments of considerable significance to the area are presently located in an isolated space beside the dual carriageway, beside the rail tunnel.

It is proposed that these monuments are relocated to the core civic public realm space. The monuments deserve to be seen and given a more dignified setting.

A third monument / feature is proposed at the western end of the civic space - to form a gateway to emphasise the route south under the rail line.



## design principles: integral water management

The public realm spaces include a series of integral hard and soft water management features.

These are proposed as both a functional series of elements to service the core urban precinct and as features to define and reinforce the unique character of the area. Some examples of such features, to illustrate the intention are included in the following pages.





public space: Hauming new town - China

### international precedents

Internationally, there are a growing number of built examples or proposals for integrated water management strategies / features in public realm spaces.

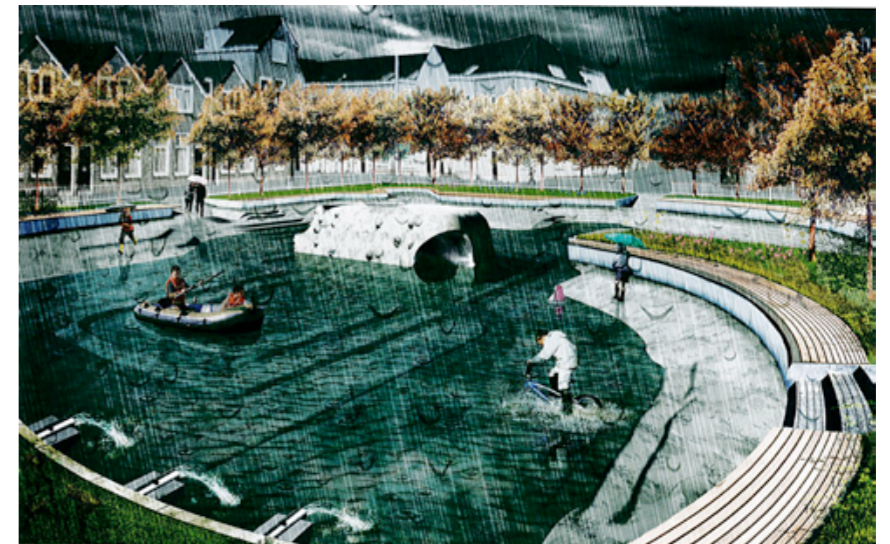
Most notably perhaps the sequence of images for the proposed 'water square' in Rotterdam demonstrate the intention. These images illustrate how an urban space can be designed for varying water conditions and to accommodate flood events. This shows that sustainable water management features can be a positive design opportunity.



Plaza de Espana - Tenerife

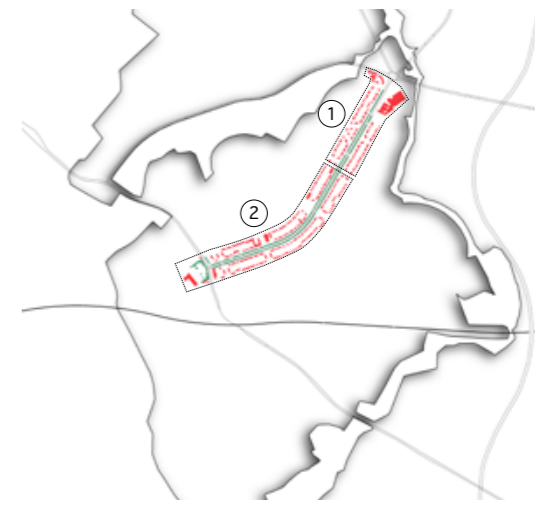


Fornebu - Norway by Arcasa Arkitekter



water square proposal - Rotterdam by De Urbanisten

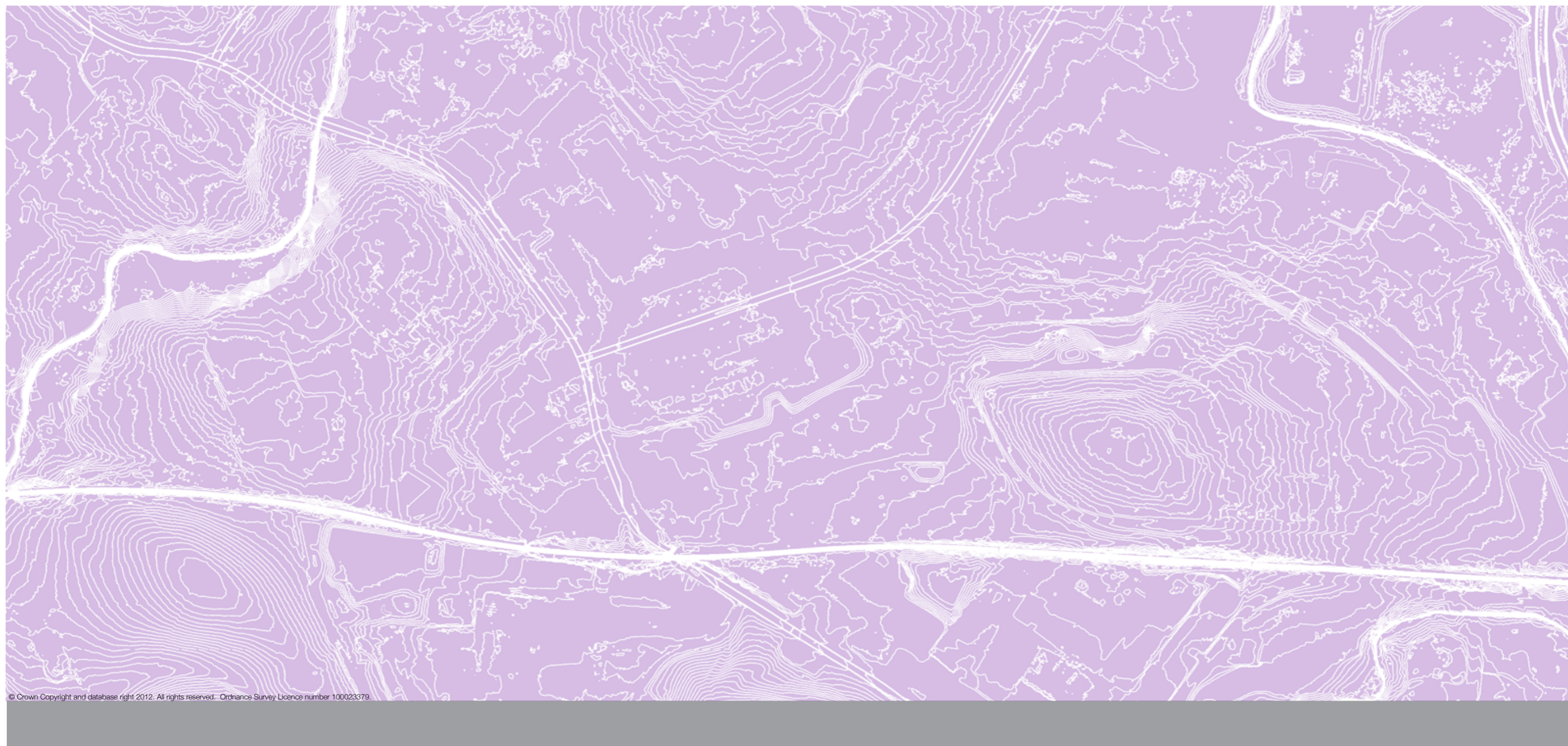




- 1. Peat Road northern section
- 2. Peat Road southern section

design study

Peat Road corridor





### nitshill peat road corridor - existing situation

As discussed in the analysis section of the report, Peat Road is well located to form a key pedestrian link from residential neighbourhoods to key community facilities. As a result of the wider organisation of housing layouts and barriers to movement such as steep slopes, there are few other opportunities to create legible pedestrian routes.

However, despite the potential benefits of the route it does not function well as a pedestrian link. The character of the route in various ways acts to discourage pedestrian use.

The overall street section is exceptionally broad and particularly in the northern portion where street trees are completely absent, it lacks a comfortable human scale. The route is dominated by vehicular traffic and crossing points are poor.

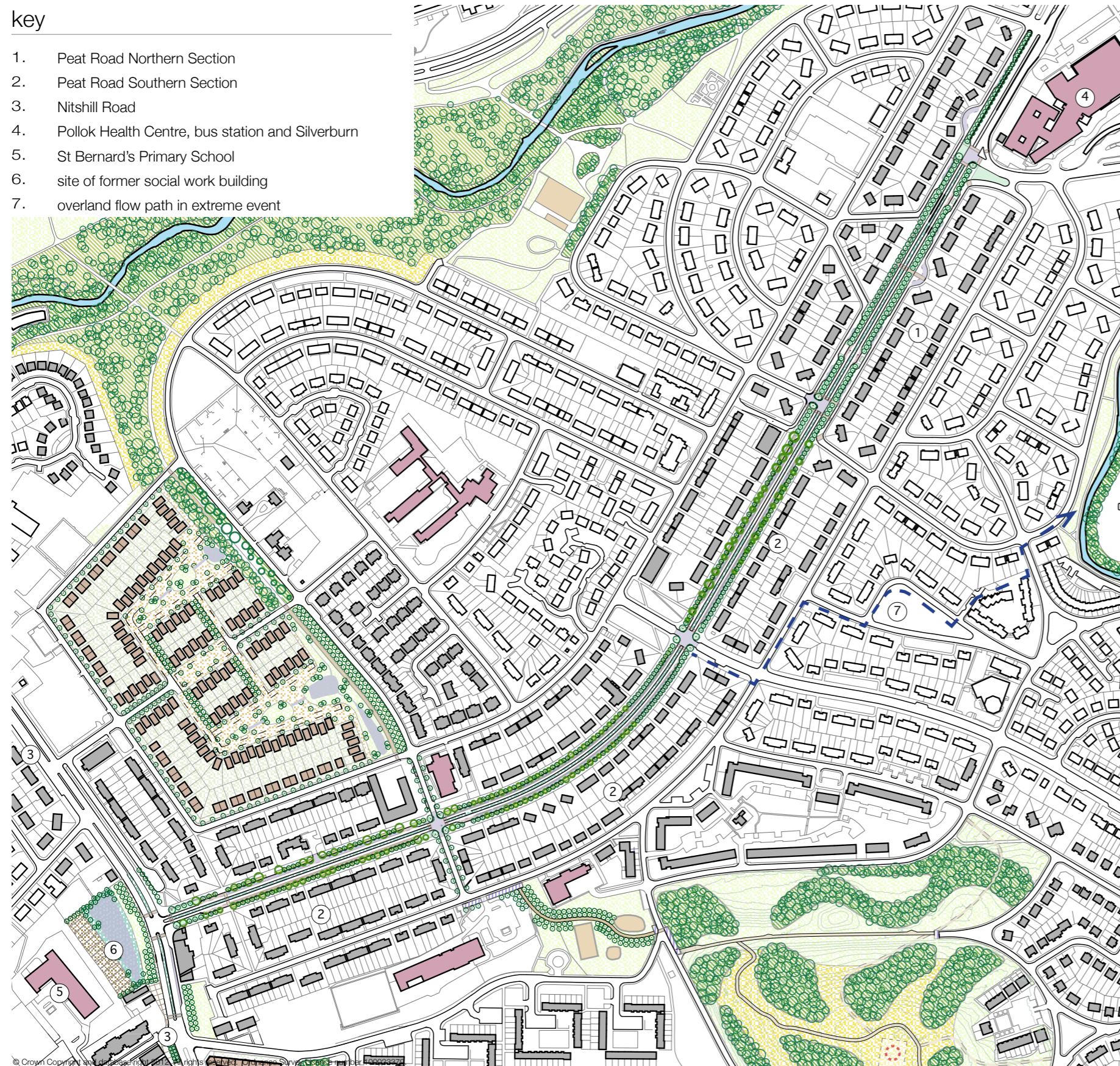
Mapping of pluvial flood risk demonstrates a concentration along the Peat Road corridor. Peat Road also overlies the course of the former John's Burn. The review of mapped flood events and pluvial flooding suggests that there would be considerable benefit in integrating water management features into the Peat Road corridor.



# Peat Road corridor

## key

1. Peat Road Northern Section
2. Peat Road Southern Section
3. Nitshill Road
4. Pollok Health Centre, bus station and Silverburn
5. St Bernard's Primary School
6. site of former social work building
7. overland flow path in extreme event



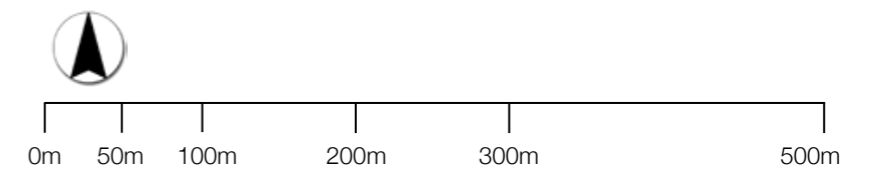
## Peat Road corridor- development plan

The proposal for Peat Road is primarily focused on redefining it as a comfortable, 'green boulevard' that invites and encourages pedestrian use.

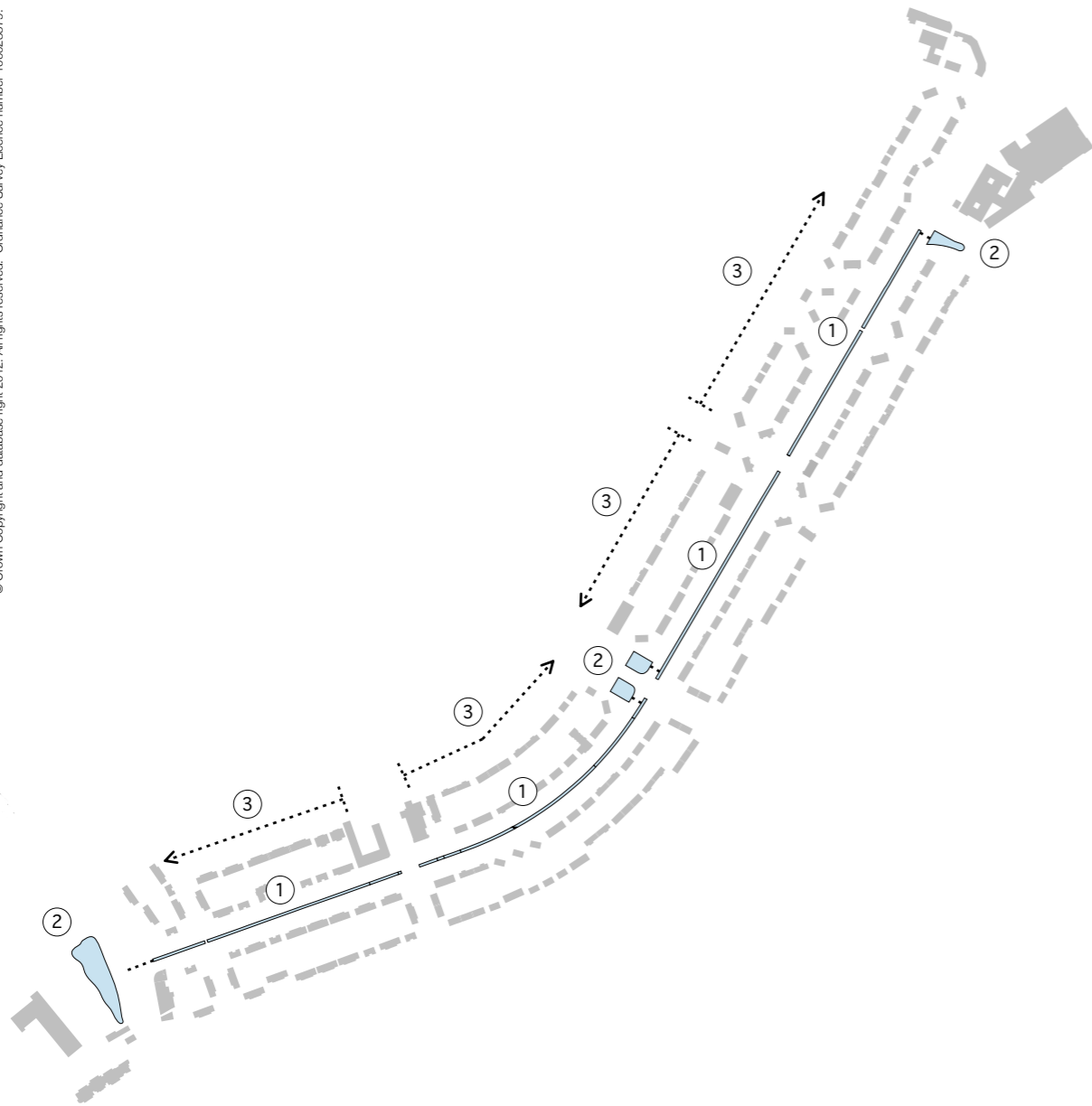
To achieve this, a number of specific interventions have been identified:

- to reinforce the street tree planting where it exists and to implement a strong planted structure where it is absent
- to formalise the narrowing of the dual carriageway to a 2 lane street. This reflects the current functioning of much of the street, but formalises on street parking and narrows the road elsewhere.
- to improve pedestrian crossing points, in conjunction with other narrowing works.
- to create a linear wetland and other associated SUDs features to locally manage surface water

The specific nature / scope of the proposals is outlined in the following pages.



example of integrated water management feature



design principles: surface water drainage enhancement and localised SuDS

- 1. linear wetland
- 2. locations of potential SuDS features
- 3. direction of flow

It is proposed that a linear wetland is created within the existing central reservation of Peat Road, supported by additional SuDS basins or ponds at key locations in adjacent greenspaces. The SuDS can be sized to provide for eventual disconnection of all surface water drainage and offer capacity for the local management and control of all surface water runoff. This will assist in the wider surface water management strategy within the former John's burn catchment.

Through time, should all natural flows be returned to the ground surface, a small permanently flowing burn may return to this area.

These measures will provide an area of wetland habitat which has been absent from this catchment for more than 100 years. The full benefit of this would be realised when it can be linked with the other IGI features across the Nitshill area.



design principles: tree planting

- existing street trees
- proposed street trees
- 1. northern section
- 2. southern section

Street tree planting exists, sometimes sporadically, in the southern portion of Peat Road. It is proposed that breaks in the tree avenues are filled, to create a consistent planted structure.

The northern portion of Peat Road has no existing street trees. It is proposed that as part of the reorganisation of the northern portion of the street that strongly defined plantings of street trees are implemented. Any street tree planting would have to be designed to current streetscape and road acceptable standards.



# Peat Road corridor

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design principles: formalise parking, crossings & cycle lanes

- formalised parking
- pedestrian crossings
- bus stops

A series of specific interventions are proposed to widen verges and change surface materials to formalise on street parking, improve pedestrian crossings and create a safe cycle route. These interventions will assist in reducing traffic speeds and creating a street more appropriate for a residential neighbourhood.

Cycle lanes will increase the width of the carriageway and enable safe access to the central reservation for maintenance while also allowing traffic to pass.

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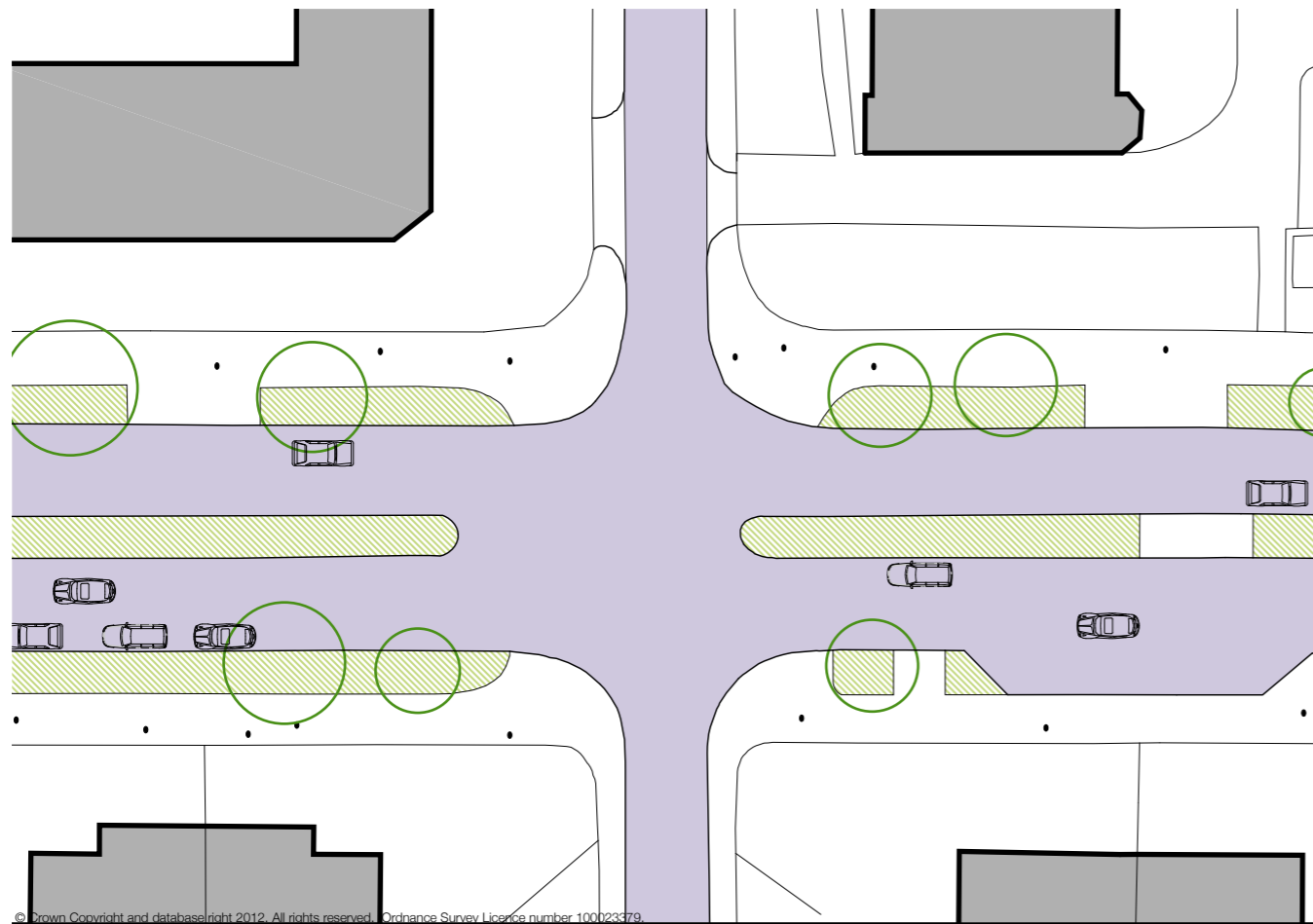


design principles: improved and extended verges

- existing green verges
- proposed green verges
- 1. northern section
- 2. southern section

In the southern portion of Peat Road, localised widening and reconfiguring of verges is proposed, principally to formalise on street parking and to improve pedestrian crossing points at junctions.

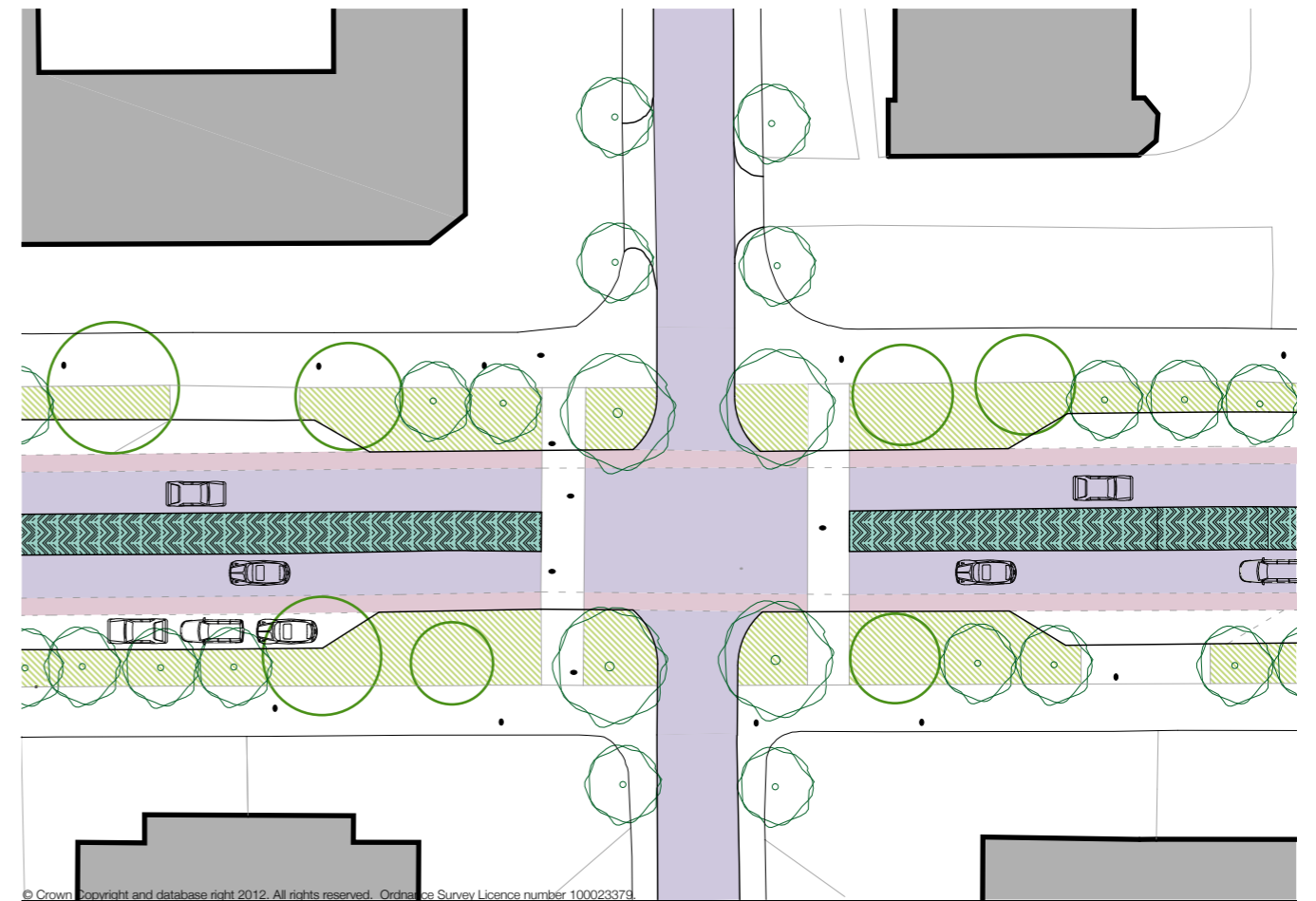
The proposed works to the northern portion of Peat Road involve more significant reconfiguring of the road corridor and the creation of a new, relatively broad verge.



Peat Road southern section - existing situation

This plan extract of an existing part of the southern portion of Peat Road highlights the configuration of the key features including verges and the central reservation.

There is existing street tree planting, although this is intermittent at times, with significant breaks.



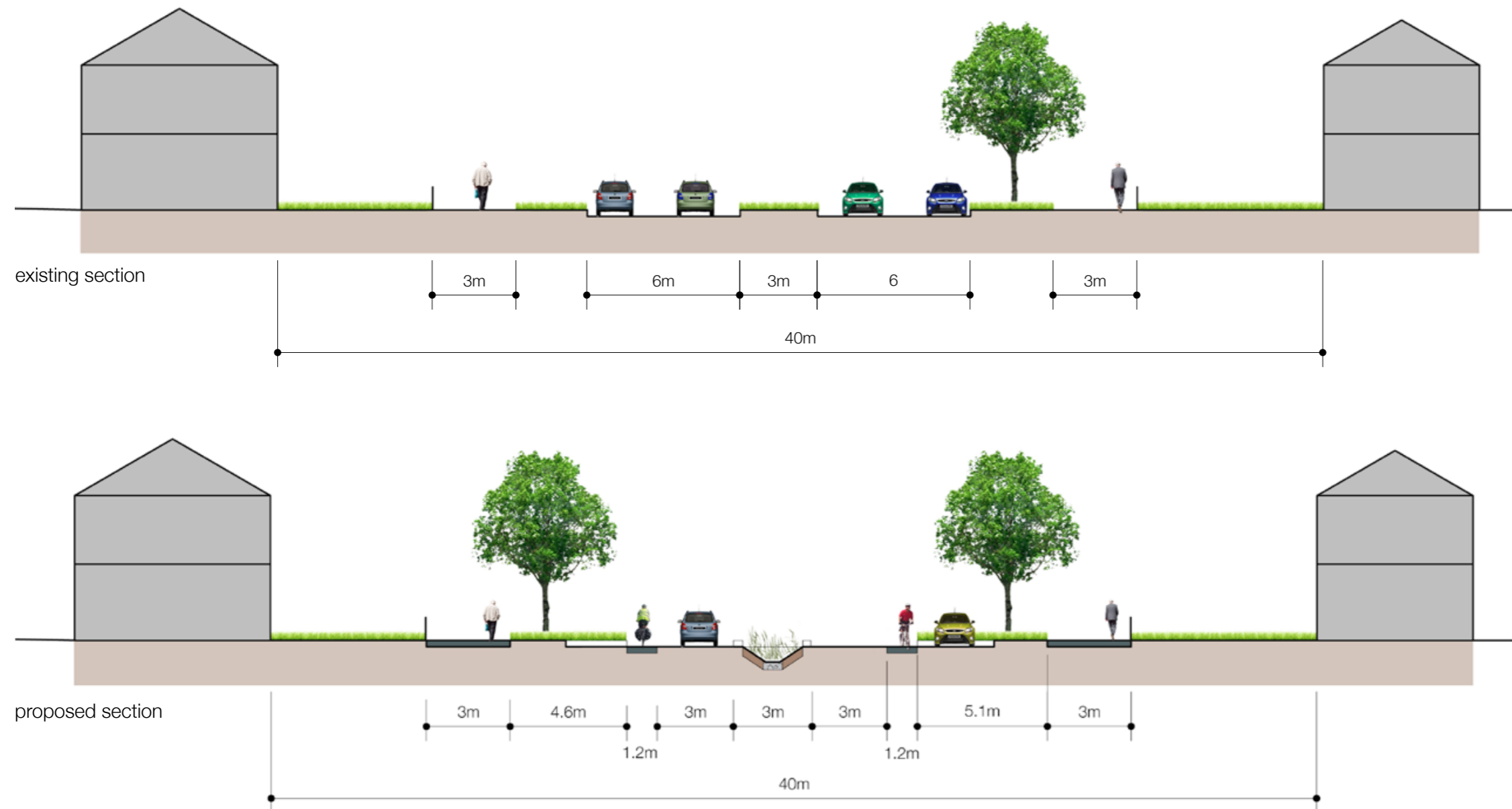
Peat Road southern section - proposed interventions

The proposed interventions include the formalising of on street parking and improvement of pedestrian crossings. These moves involve the localised widening of verges, which also offer opportunities for other green water management features.

The plan also identifies the bulking up of street tree planting and the creation of the linear wetland in the central reservation.

Maintenance of the central reservation can be achieved in the southern section through the use of the parking restrictions along the formalised parking and cycle lanes.

# Peat Road corridor



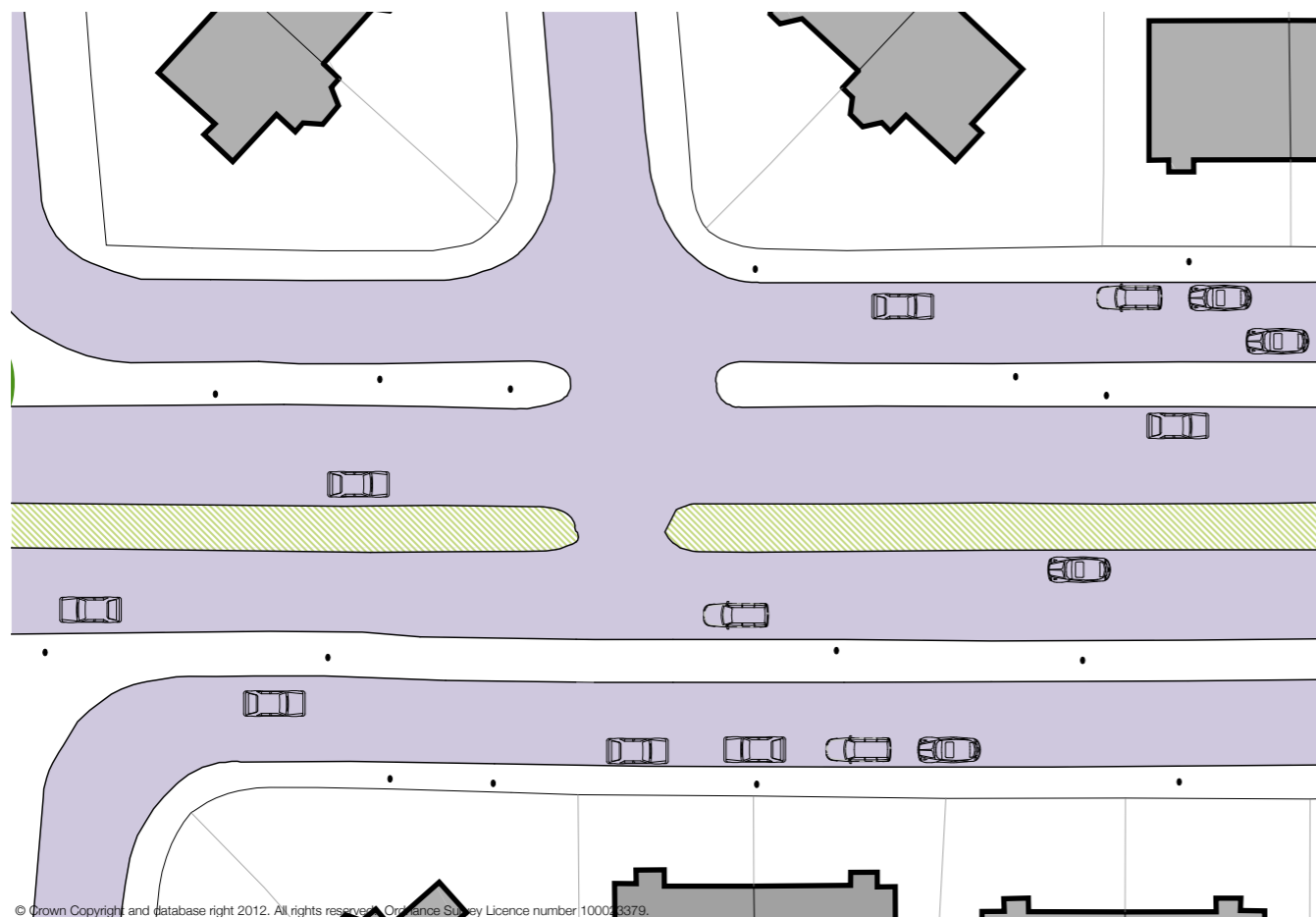
## Peat Road southern section - summary

The sections identify the proposed interventions of: additional street tree planting, localised verge widening and the creation of a linear wetland in the central reservation. Maintenance of the central reservation can be aided in the southern section through the use of the parking bays to allow management of traffic flow.

It is recognised that the layout of Peat Road will require development as the project is taken forward, working with the GCC roads department through the detailed design stage. Based on the available information there does not appear to be a significant risk to the proposals. Notably the generous verges created offer flexibility for planting and other design features.



example of linear wetland within a central reservation



Peat Road northern section - existing situation

This plan extract of an existing part of the northern portion of Peat road highlights the configuration of the key features.

The northern portion of Peat Road is distinct from the southern portion, through the duplication of carriageways - with parallel residential streets to both sides.

Beyond the central reservation, there are no 'green' verges and there is no street tree planting. As discussed earlier in the study, the resultant street space is extremely broad and out of scale to pedestrian use or human comfort.



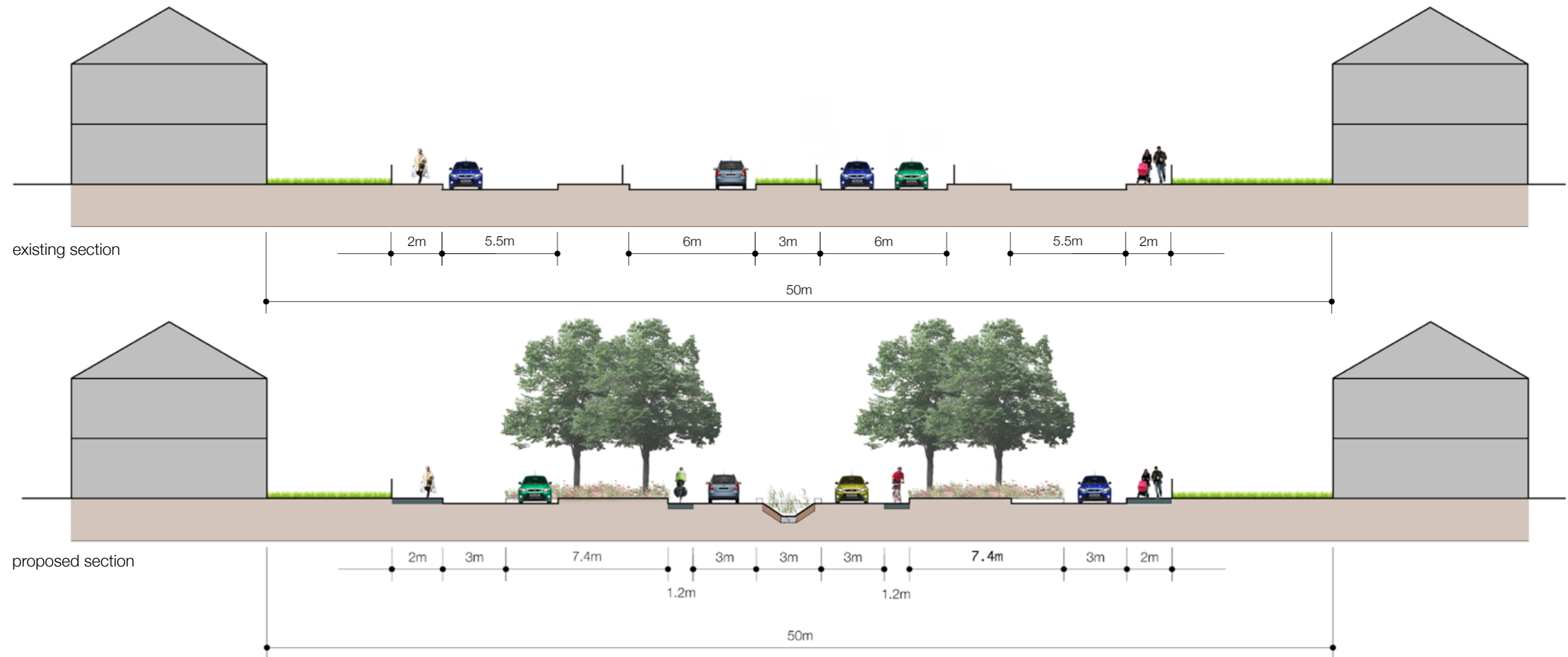
Peat Road northern section - proposed interventions

The proposed interventions aim to make a significant impact on the form and character of the northern portion of Peat Road.

The proposals include the narrowing of the main carriageway to a single lane in each direction and the localised narrowing of the parallel residential streets (to a single lane - with passing places and parking bays).

These moves release sufficient space to create 'green' verges to either side of the main carriageway that can accommodate street tree planting and water management features. Again, a linear wetland is proposed within the central reservation.

# Peat Road corridor



## peat road northern section - summary

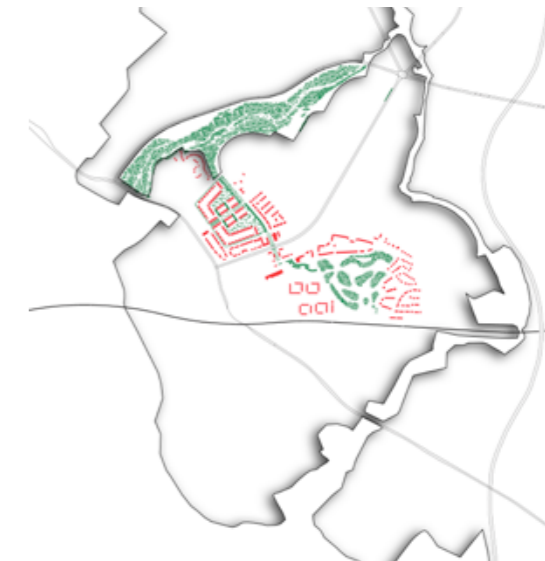
The sections identify the proposed interventions: the reconfiguration of road carriageways to create green verges incorporating street tree planting and the creation of a linear wetland in the central reservation. Maintenance of the central reservation can be aided in the northern section through the use of the cycle lanes to allow management of traffic flow.

It is recognised that the layout of Peat Road will require development as the project is taken forward, working with the GCC roads department through the detailed design stage. Based on the available information there does not appear to be a significant risk to the proposals. Notably the generous verges created offer flexibility for planting and other design features.



example of planting within a linear wetland





design study

Levern Water to Hartstone Wood Hill



D



## Lavern Water to Hartstone Wood Hill - existing situation

As discussed in the analysis section of the report, the existing green network (focused along the Lavern Water and Brock Burn) is located at the perimeter of the residential areas and is not well integrated.

This study area is identified within the strategy as a great opportunity to integrate the green network into the urban area and stitch it into the day to day lives of local residents.

The Craigbank development site is a significant vacant / derelict site (identified for residential development) focused around Newfield Square (bounded to the east by Dunside Drive).

Hartstone Wood Hill is an isolated area of higher ground. This notable public open space has existing path access, but is unmanaged and is not tied into wider path / circulation networks.

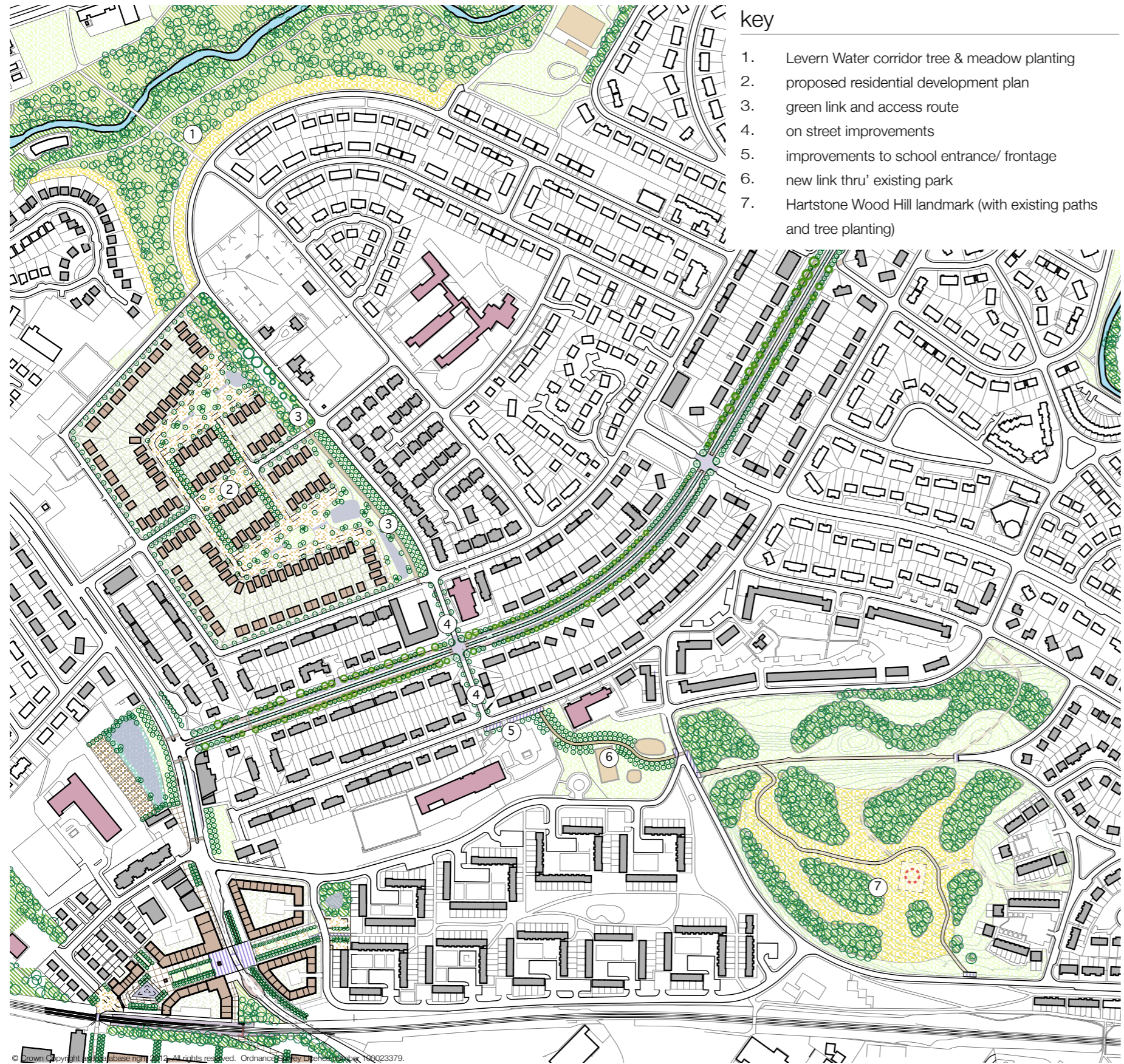
From the top of Hartstone Wood Hill a panoramic view opens up, with a remarkable overview of the city to the north (seen against the Campsie Fells and including views to Ben Lomond) and over the agricultural / green belt landscape to the south of Glasgow.

view north from Hartstone Wood Hill





# Levern Water to Hartstone Wood Hill



## Levern Water to Hartstone Wood Hill- development plan

The proposal for the Levern Water to Hartstone Wood Hill area is focused on integrating the wider green network into the urban area and stitching it into the day to day lives of local residents.

The proposed route links between the Levern Water corridor and Hartstone Wood Hill. The link between these existing spaces is formed by consideration of the organisation of development on the currently vacant / derelict Craigbank site. Otherwise the link is formed by improving legibility and stitching together existing greenspaces / facilities.

Hartstone Wood Hill also offers the potential to create a landmark within the area. A well considered intervention could assist in terms of orientation, create a destination point and help to positively redefine the identity of Nitshill.

The specific nature / scope of the proposals is outlined in the following pages.

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## levern water to hartstone wood hill - housing dev

One of the key opportunities in this part of the study area is presented by the currently vacant / derelict Craigbank site to the west of Dunside Drive. The site is identified for residential development. The master planning of this site offers the possibility to:

- create a new green network link,
- create a positive relationship between the new housing and the proposed route
- further develop and enhance the habitat corridors across Nitshill, connecting the Levern Water and Brock Burn

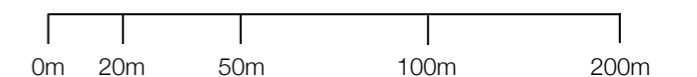
The indicative masterplan seeks to demonstrate the beneficial relationships that can be achieved on the site.

The housing development addresses the streets around the site to the west, north and south in a traditional manner. House types to the perimeter of the site could vary. Within the site, however a higher density, more innovative house type is proposed that generates a more continuous built edge.

The housing within the site is organised around two large spaces conceived as shared surface 'homezone' spaces accommodating all necessary vehicular circulation and parking requirements alongside pedestrian activity. Small scale neighbourhood greenspace is incorporated, providing social and play opportunities. These spaces and the facilities within them have a close relationship to the surrounding homes and benefit from casual surveillance to discourage antisocial behaviour.

The homezone spaces also incorporate SuDS and water management features. The ambition would be for on site management and control of surface water drainage on the ground surface, with larger wetland and pond areas integrated into the adjacent green route leading down towards Peat Road. For further water management details and calculations refer to p123 and p152.

The eastern edge of the site forms a new off street green link that connects from the Levern Water corridor south toward Peat Road. This link is a key component of the overall link to Hartstone Wood Hill. The proposed route incorporates existing mature trees, alongside new avenue tree planting to create a valuable linear greenspace. The route benefits from the relationship to the adjacent homezone spaces, with overlooking and easy access from the new housing to the green route and wider network.



# Levern Water to Hartstone Wood Hill



Levern Water to Hartstone Wood Hill green link: showing integration of water management features and extension of green link into homezone spaces.



# Levern Water to Hartstone Wood Hill





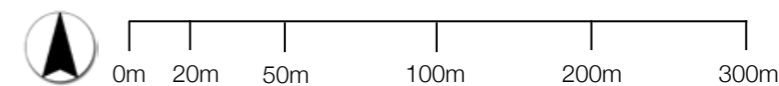
## Hartstone Wood Hill - public open space and landmark

The southern portion of the proposed route is largely formed through modest interventions to existing streets and public open spaces. The key issue is legibility and the need to make the route visible and usable. From Peat road south, modest streetscape works may assist in improving legibility. The school frontage and adjacent proposed park access require to be considered together to create a positive entrance to the school and to emphasise the adjacent route.

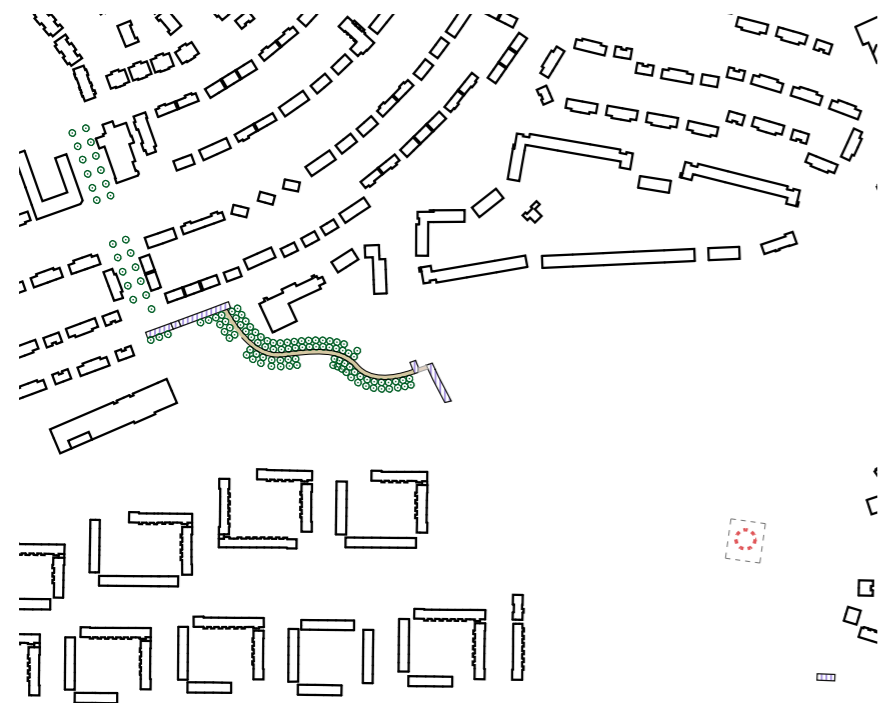
A new route through the existing park / play area is proposed, with earthworks required to overcome localised level changes. the route is reinforced through tree planting. The link between the play area and the existing access to Hartstone Wood Hill is again emphasised and made legible through localised streetscape works.

## key

1. on street link thro' existing housing
2. improved frontage / entrance to school and park
3. new path and avenue tree planting
4. improved frontage / entrance to Hartstone Wood Hill
5. potential location for landmark
6. potential for improved path network thro' public open space
7. existing path network
8. existing tree planting
9. existing off street link to Nitshill Neighbourhood Centre (GCC aspirational core path)



# levern water to Hartstone Wood Hill



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## Hartstone Wood Hill - interventions

Hartstone Wood Hill is an under used asset within the local area and has potential to become a key piece of the local green network. It requires modest interventions to improve existing access routes and in terms of management of woodland and meadow areas.

The limited extent of the proposed interventions are highlighted in the diagram above.



Dream by Jaume Plensa in St Helens, Merseyside



Angel of the North by Antony Gormley in Gateshead, Tyne and Wear

Hartstone Wood Hill also offers the potential to create a landmark within the area. A well considered intervention could assist in terms of orientation, create a destination point and help to positively redefine the identity of Nitshill. 2 examples of successful artist led projects are shown above.

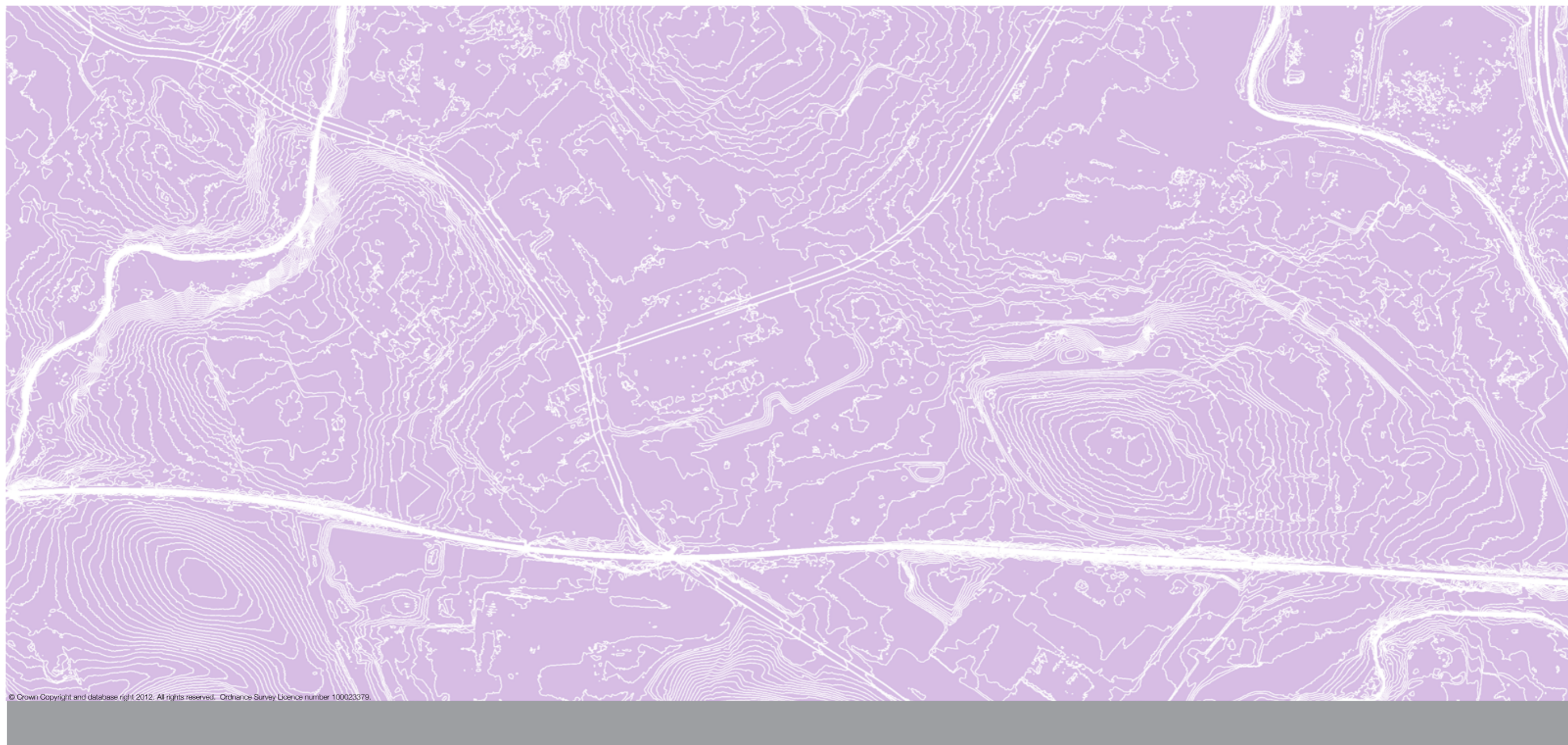




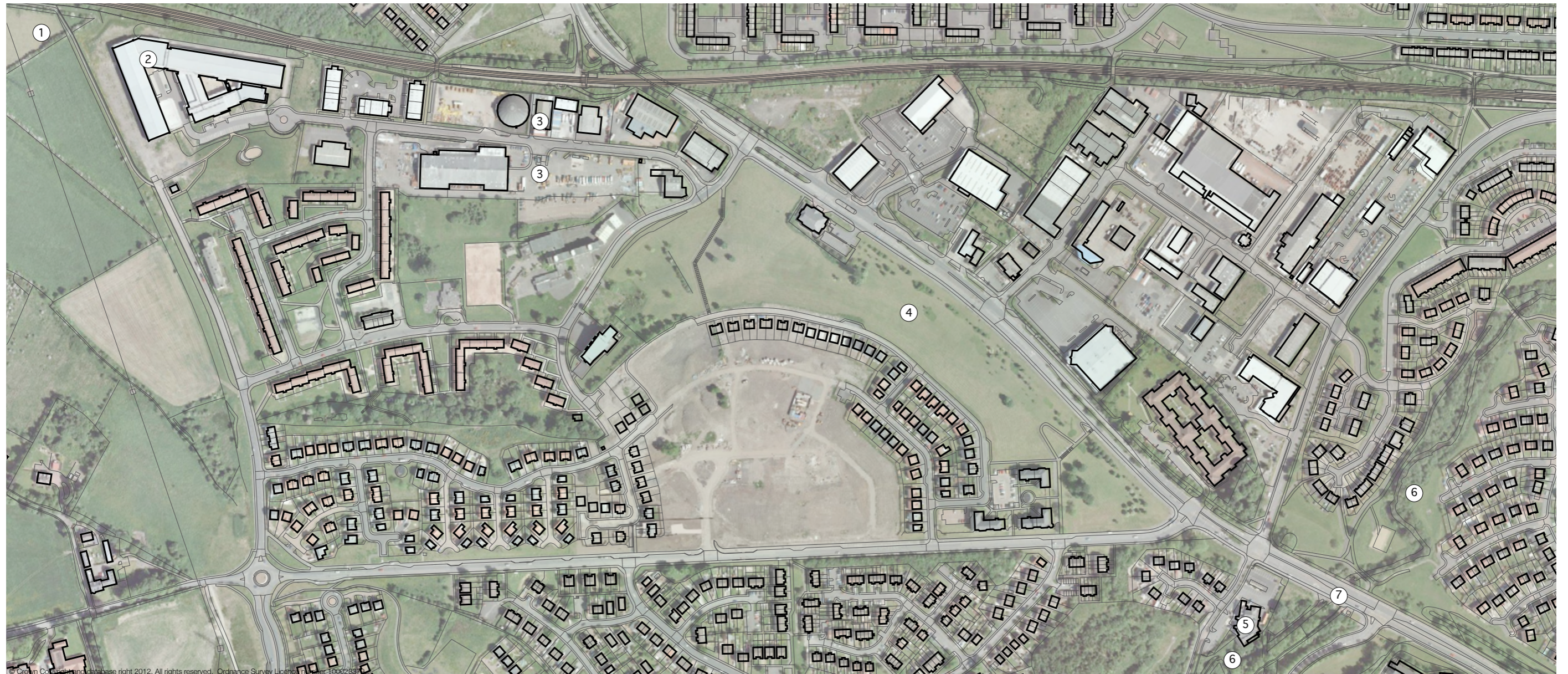


design study

Darnley Mill to Glasgow Museum Resource Centre



D



## Darnley Mill to Glasgow Museums Resource Centre - existing situation

As discussed in the analysis section of the report, the existing green network (focused along the Lavern Water and Brock Burn) is located at the perimeter of the residential areas and is not well integrated. In addition, there are issues regarding access and connections to the Dams to Darnley Country Park to the south of Nitshill.

This study area is identified within the strategy as offering the potential to form a coherent green link between the Lavern Water and Brock Burn.

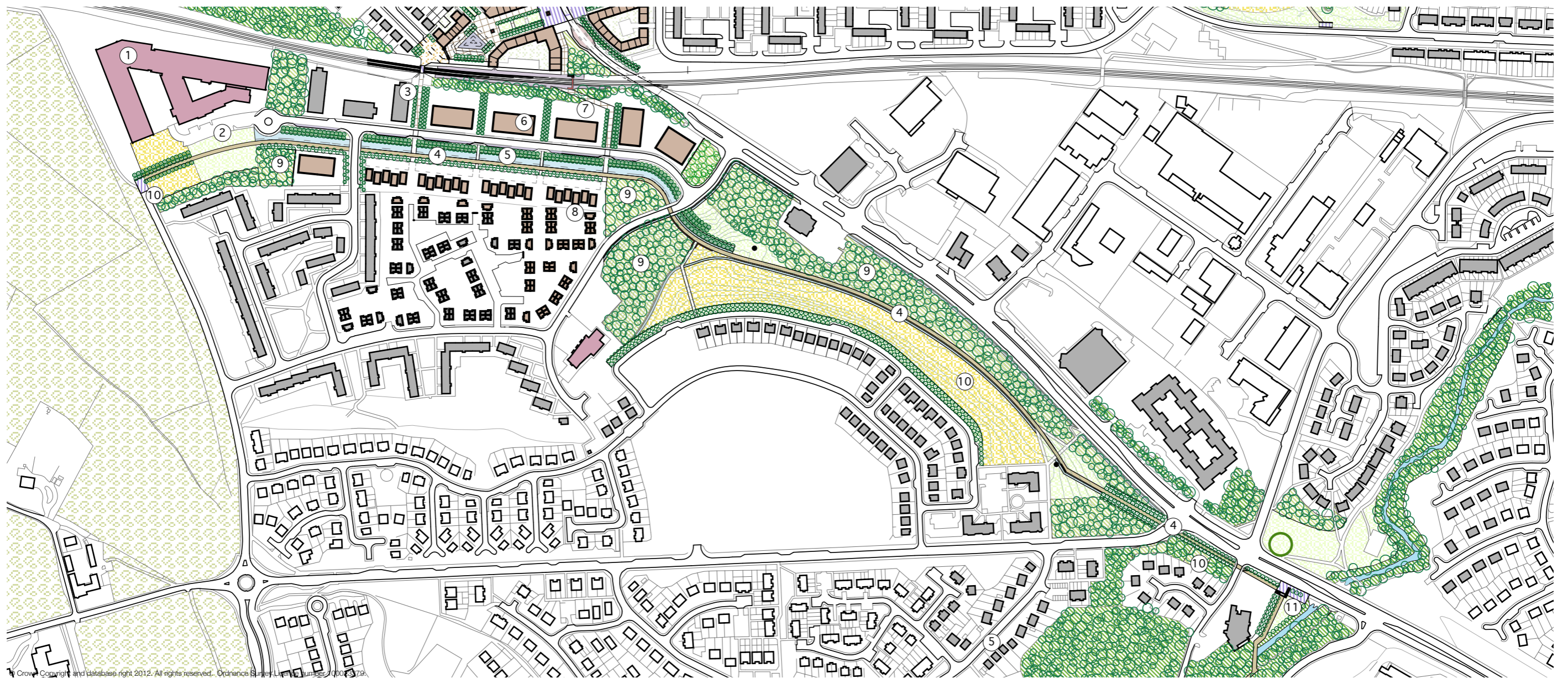
The focus of this detailed study area includes from west to east: a path link to the Lavern Water corridor, the Glasgow City Council

Museum Resource Centre, which sits in the context of a run down industrial estate, a north facing slope of amenity grass (between Wiltonburn Road and Parkhouse Road) and to the east Darnley Mill (now an Indian Restaurant), the Brock Burn corridor and access to the Dams to Darnley Country Park.

1. path to Lavern Water Corridor
2. Glasgow Museums Resource Centre (GMRC)
3. industrial estate along approach to GMRC  
amenity grass to west of Nitshill Road and between
4. Wiltonburn Road and Parkhouse Road
5. Darnley Mill
6. Brock Burn corridor
7. Dams to Darnley Country Park entrance



# Darnley Mill to Glasgow Museums Resource Centre



Darnley Mill to Glasgow Museums Resource Centre- development plan

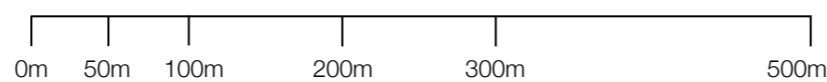
The Museum Resource Centre to Darnley Mill route is focused on integrating the wider green network into the urban area and stitching it into the day to day lives of local residents. The route connects between the main existing green corridors of the Levern Water and Bock Burn.

The proposals include (from west to east):

- the proposed reorganisation of the industrial estate and approaches to the GCC Museum Resource Centre around a green spine incorporating the main pedestrian route and a linear water management feature.

- the forming of a new route across the north facing grass slope and change in the landscape type to woodland and meadow
- the creation of a continuous, legible pedestrian route linking to a reorganised and emphasised gateway / entrance into the Dams to Darnley Country Park.
- An improved and more varied habitat corridor along this route

The proposed approach is described through a series of topic specific diagrams and in further detail over the following pages. For further water management details and calculations refer to p123 and p152.

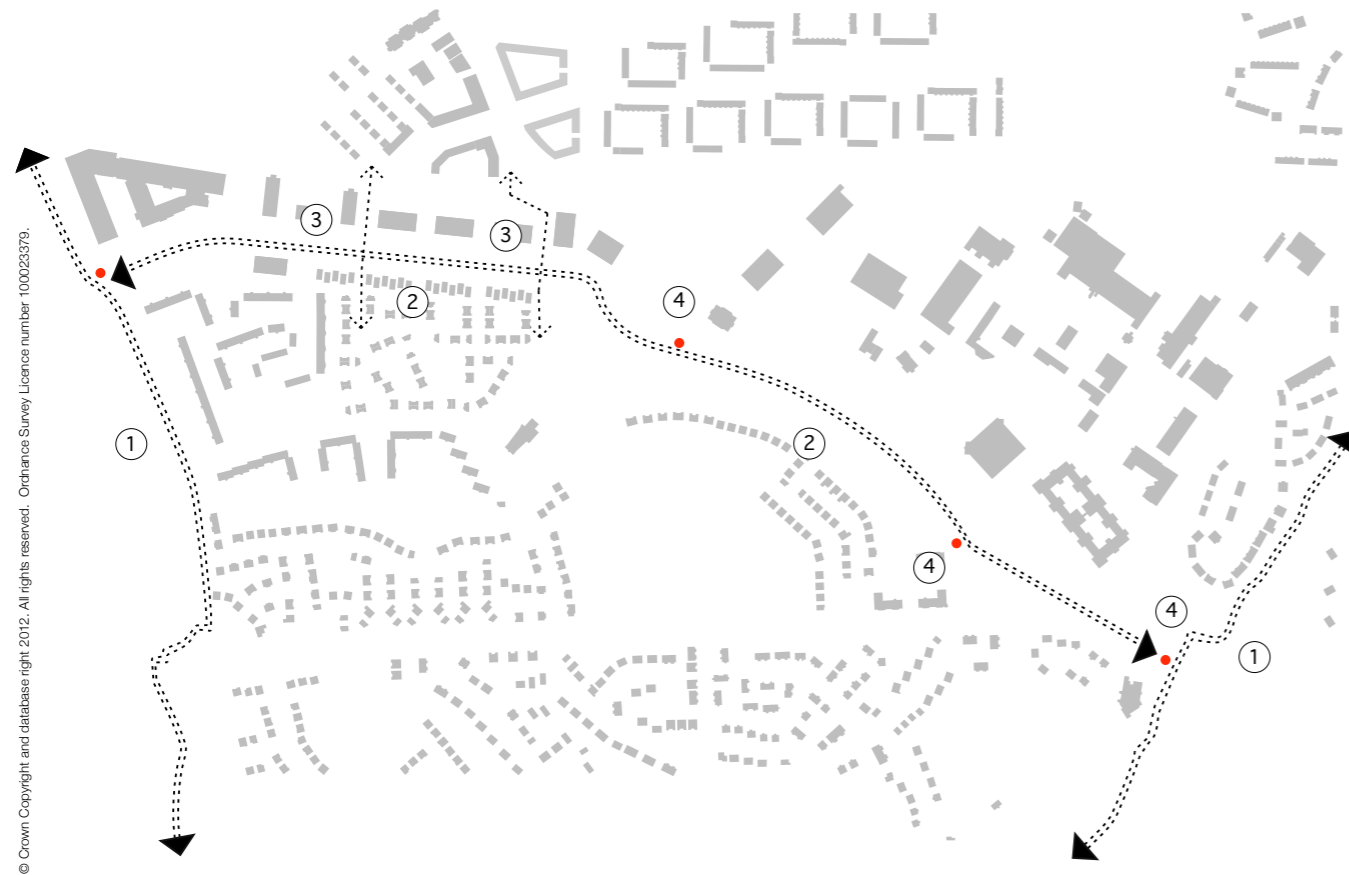


## key

1. Glasgow Museums Resource Centre (GMRC)
2. proposed improvements to immediate setting of GMRC
3. improved access route/ tunnel under rail line
4. new 3m wide multi-use off road route
5. linear water management feature
6. redeveloped business park
7. proposed re instatement of south link to rail station
8. new residential development addressing green spine
9. proposed woodland
10. proposed meadow
11. new access to Dams to Darnley Country Park

## key

1. existing core paths
2. proposed pedestrian link
3. links into neighbourhood centre
4. signage / markers



### design principle: routes and access

The proposed strategy delivers a coherent off street pedestrian / cycle route connecting east-west between the Levern Water and Brock Burn corridors and the associated pedestrian / cycle routes.

This spine route is legible and is reinforced strongly by landscape features including: the linear water feature, woodland belts, avenues of trees and specific markers / gateway features at key decision points.

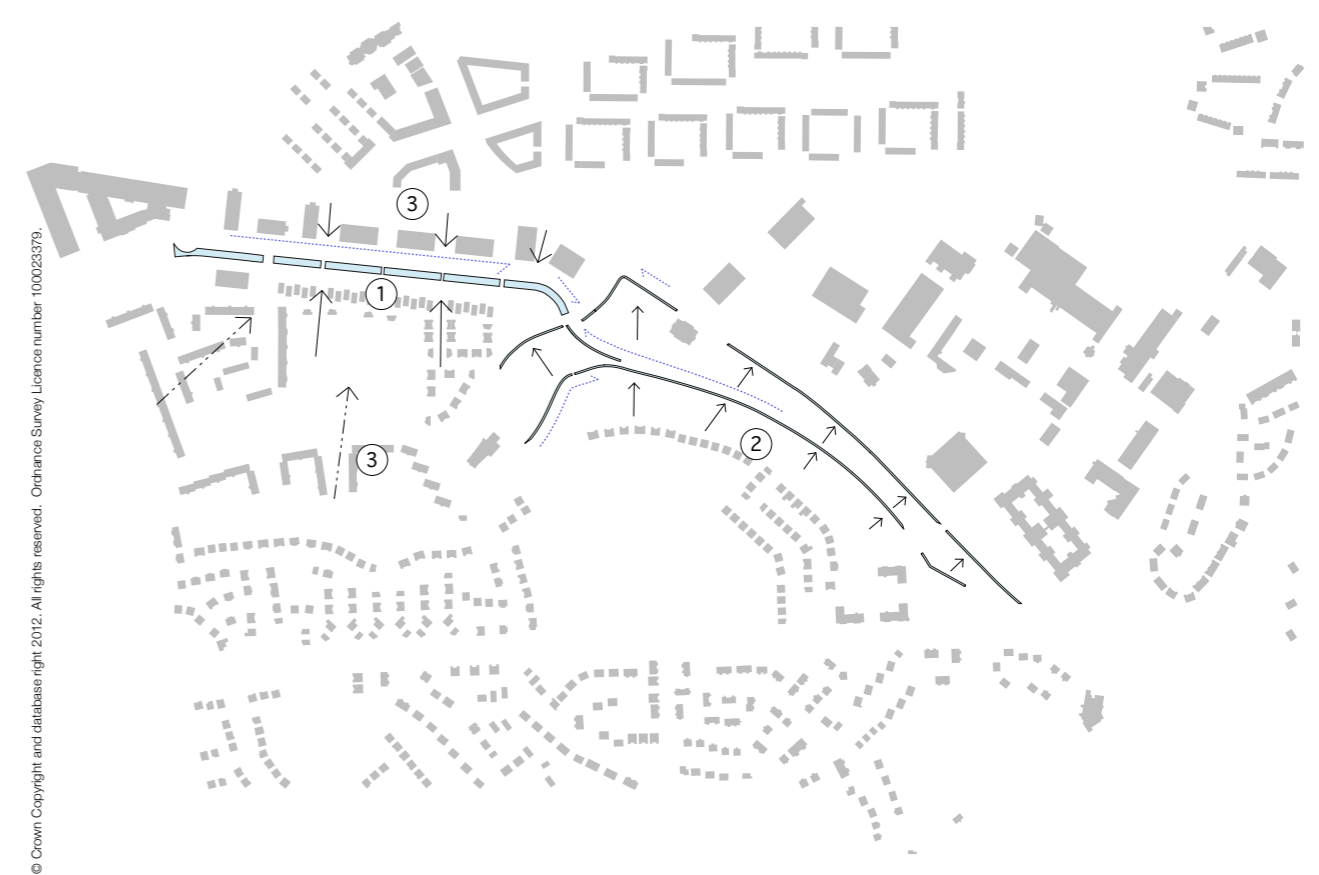
The spine route is stitched into the centre of Nitshill via enhancement of the existing underpass and the formation of the southern access to the rail station.



example of a swale

## key

1. linear wetland feature
2. swales
3. direction of drainage



### design principle: water management

The proposals incorporate water management features integrated into the routes / spaces. The most identifiable feature is the linear water feature / wetland through the core of the industrial / business park. This feature provides storage capacity and SUDs treatment within the upper reaches of the John's Burn catchment and can service surrounding development (existing and proposed).

Surface water is proposed to be kept out of the piped system as much as possible and swales are incorporated within the proposals for the north facing grass slope between Wiltonburn and Parkhouse road. This will generally improve the usability and drainage of the currently boggy slope.

# darnley mill to museum resource centre

## key

- 1. existing woodland
- 2. proposed woodland



## design principle: woodland creation

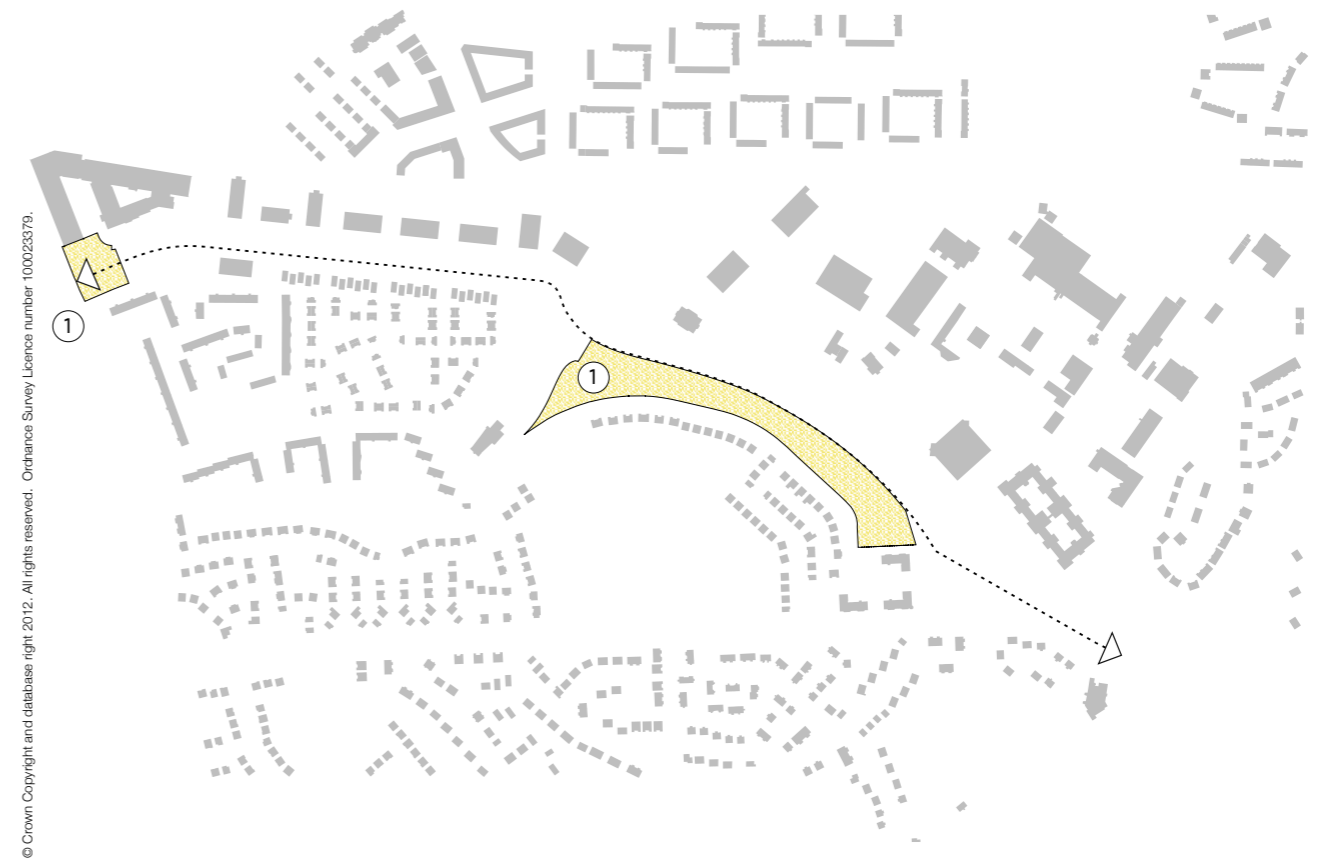
Substantial woodland creation is proposed associated with the proposed link. The proposed woodland will help to define the green link and create a stronger and more positive edge to Nitshill Road.

The proposed woodland creates a connection between the Levern Water and Brock Burn corridors and in both human access and habitat terms helps to form a better connected network.

Any woodland creation carried out should be designed to ensure it is safe and legible, including adequate sight lines etc.

## key

- 1. proposed meadow creation



## design principle: meadow creation

As part of a wider strategy to redefine extensive areas of amenity grassland as other landscape types (discussed in detail in the next section) it is proposed that the upper portion of the main grassed slope is transformed to meadow. This offers benefits in terms of: reduced maintenance costs, increased habitat value and increased interest and visual quality for local residents and other users of the green network.



proposed section A:A



proposed section B:B

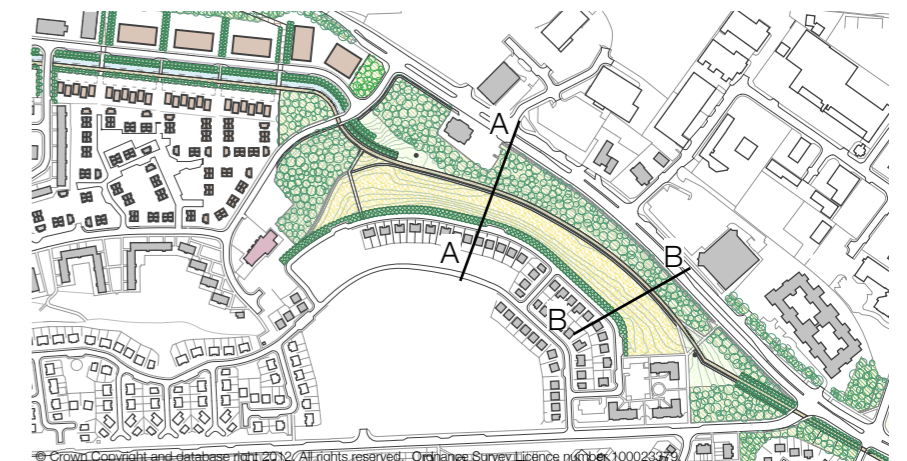
### design principle: woodland and meadow creation on north facing slope

The sections above identify the proposed configuration of woodland and meadow creation on the presently grassed north facing slope. The 'spine' pedestrian route is located midway up the slope and broadly follows the upper edge of the proposed woodland belt.

The swales in this area are designed primarily as an infiltration system to hold and prevent surface water from flowing onto the path/ road. The swale would only provide conveyance to the west in a larger event as a high level overflow. An additional alternative would be to isolate the swale from the slope and only take drainage from the road. The eastern portion of the north facing slope could be configured to have the swales connect eastward into the Brock Burn (subject to piped connections under road crossing points).



example of a drainage swale



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# darnley mill to museum resource centre

## key

1. proposed developed public open space



## design principle: developed public open space

The broad strategy to change the extensive areas of amenity grassland to a more varied series of landscape types (including woodland and meadow) enables a focusing of more intensively maintained public open space in key locations.

As identified above, more intensively maintained spaces of amenity grassland with developed park facilities are focused in key locations, that are visible, active and accessible.

## key

1. proposed street tree planting



## design principle: street tree planting

Beyond the more extensive landscape moves of woodland creation, edges and routes are strongly defined in the proposals through structural avenue / street tree planting. This assists in making routes legible, defining spaces and creating a more human scale.

key

1. green spine
2. temporary meadow
3. water management feature (phase 1)
4. former GCC roads depot site
5. proposed woodland planting



approach to museum resource centre - phase 1

The proposals in the vicinity of the Museum Resource Centre require to be considered in terms of phases - to understand the co-ordinated sequence of steps to realise the outcome described.

Phase 1 is primarily focused on the implementation of the 'green spine' (main east-west path, linear water feature and associated avenue tree planting). This first phase of work is subject to the relocation of the existing Glasgow City Council roads depot. It has been highlighted that relocation is a possibility. This freeing up of the core space is key to delivery of the proposed scheme.

At this stage, the necessary capacity of the linear water feature is limited and only the eastern portion is proposed to be implemented.



key

1. dense built edge to development south of green spine
2. homezone spaces addressing green spine
3. water management feature (phase 2)



approach to museum resource centre - phase 2

Phase 2 demonstrates the proposed expansion of housing development to the south of the green spine. The proposed development would present a denser, more continuous built edge to address the core public route.

The linear water feature is expanded in step with the increase in development. It is proposed that the SUDs / water management requirements of surrounding (existing and proposed) development can be met within the core water feature.

For further information on the water management details refer to p123.



# Darnley Mill to Glasgow Museums Resource Centre



## approach to museum resource centre - development plan

The preliminary phases operate assuming the existing industrial units remain adjacent to the rail line.

It is anticipated that with the uplift in the quality of the physical environment that there will overtime be an uplift in the quality and value of the associated industrial / business development.

It is proposed that at the earliest stage possible, the built development is enhanced and associated with this, associated landscape and public realm works are realised.

A core outcome is the creation of the southern pedestrian access to Nitshill rail station - linking directly to the main spine route.

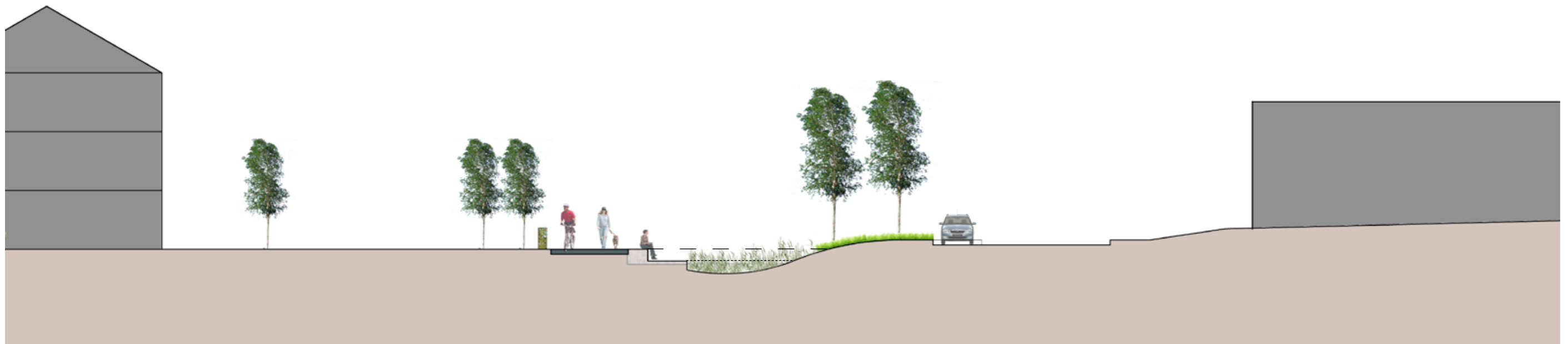
The co-ordinated development plan is described above. This delivers a number of beneficial outcomes including:

- an increased residential population at the core of Nitshill
- a legible east-west green link stitching the wider green network into the urban area and creating a better connected network overall
- an improved setting and approach to the Museum Resource centre
- integrated water management features that help to facilitate future development and help to manage surface water issues in the upper portion of the John's Burn catchment.

## key

1. new industrial/ commercial development
2. southern link to rail station
3. new parking associated with development
4. green spine: tree planting, linear water feature, pedestrian route
5. Willowford Housing existing development proposals
6. proposed configuration of future phases of housing
7. pedestrian bridges
8. woodland planting
9. enhanced public open space at entrance to GMRC
10. meadow creation
11. node space





approach to museum resource centre - cross section: route & water channel

The section describes the scale and relationship of proposed built development and the character of the 'green spine'.

The water channel has 2 distinct edge conditions. The edge to the spine route is proposed to have a more 'constructed' quality - to enable access, to incorporate seating etc. The edge to the business units and tree avenue shelves gradually and incorporates an extended wetland/transitional strip.

- — — indicative extent of 200yr flooding event
- ..... indicative extent of 30yr flooding event

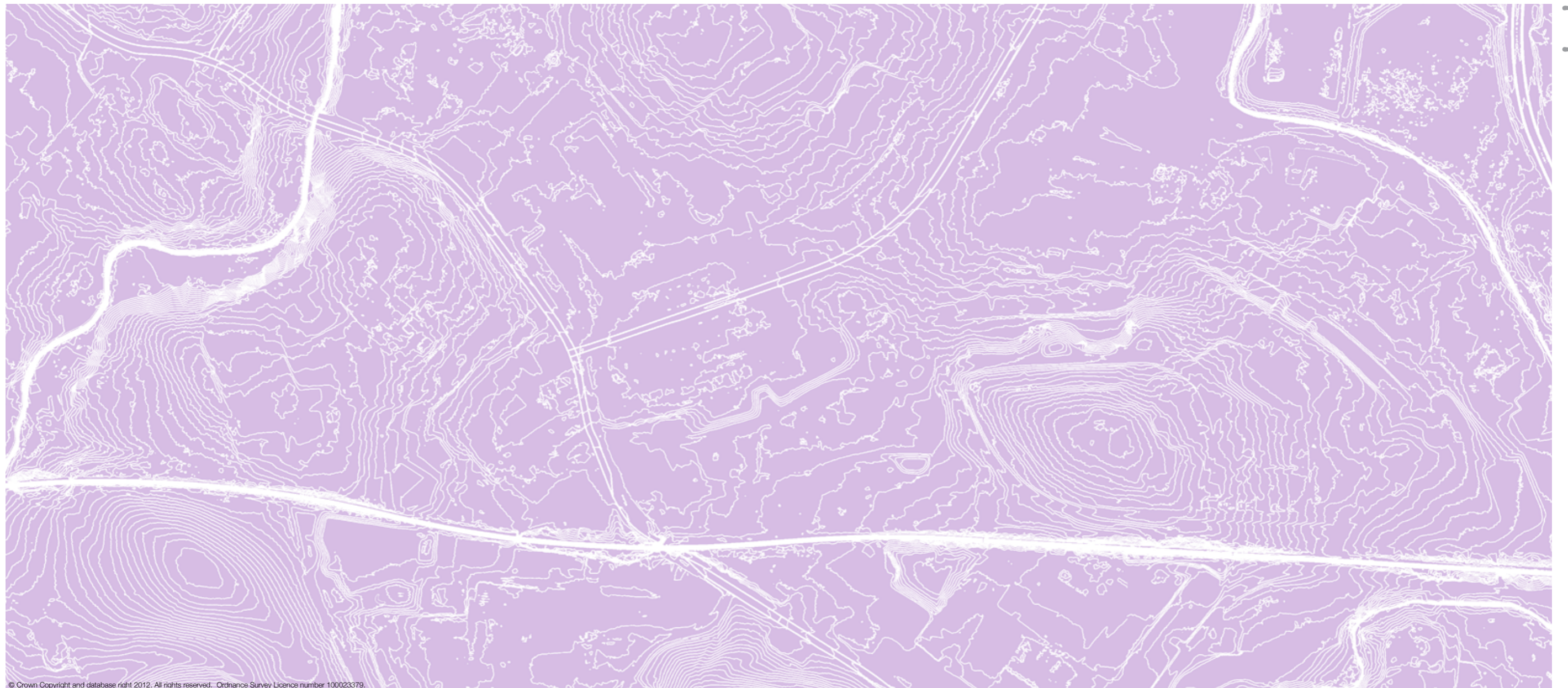


Water Retention Feature - Holland



design study

landscape change / management



D



## landscape change:

In addition to the creation and enhancement of public realm and public greenspace described in the previous design studies, there is also a requirement for an area wide review of the existing green network. The existing formally defined public open spaces include extensive green corridors along the Lavern Water and Brock Burn alongside other large public open spaces.

As noted previously, there are issues around the quality and character of existing greenspaces. Notably, much public open space lacks facilities and is comprised of expansive areas of amenity grass with no function. These areas are of limited value in terms of leisure or recreation, have low habitat value, poor character and yet have an associated high maintenance cost. It is proposed that significant benefit can be realised through a change in landscape type for significant portions of the existing public open space.

By focusing enhanced park facilities and amenity grassland in key areas that relate to neighbourhoods and access, broader swathes of under used amenity grassland can be transformed to woodland and meadow. New landscape types would have to be designed appropriate to their location, for example it is anticipated that the woodland will include open spaces and glades. These different landscape types offer new recreation and leisure opportunities, enhance the character and habitat value of the area and reduce maintenance costs.

The local habitat network will be improved by a combination of providing new habitat and enhancing existing habitat through improved connectivity or its composition. Woodland corridors will be provided across the study area and reinforced around the margins. Large areas of low value amenity grassland will be enhanced to provide a more varied mix including meadow and tree planting. Local wetland areas will be reintroduced to the area with scope for improved habitat network connectivity between the Brock Burn and Lavern Water.

The proposed strategy for landscape change is summarised in the adjacent plan and overall represents the following changes in landscape typology:

- woodland creation: 40.5 hectares
  - meadow creation: 16 hectares
- of existing amenity grassland:
- change to woodland: 14 hectares
  - change to meadow: 11 hectares

Therefore roughly 25 hectares of amenity grassland is changed to different landscape types.

# landscape change / management:

## landscape change - summary

The proposed strategy delivers a better connected and more effective green network – on a city wide and local level, that is of increased landscape quality and habitat value.

Maintenance / management resources are refocused to key locations.

Currently highly maintained areas of grass that contribute virtually nothing in terms of use, character or habitat value – are converted to woodland or meadow.

It is suggested that savings from the current maintenance / management budget are where possible redeployed to maintain key links that will deliver a connected and effective green network. However it is recognised that this is unlikely to be achievable in the current (November 2012) financial climate.

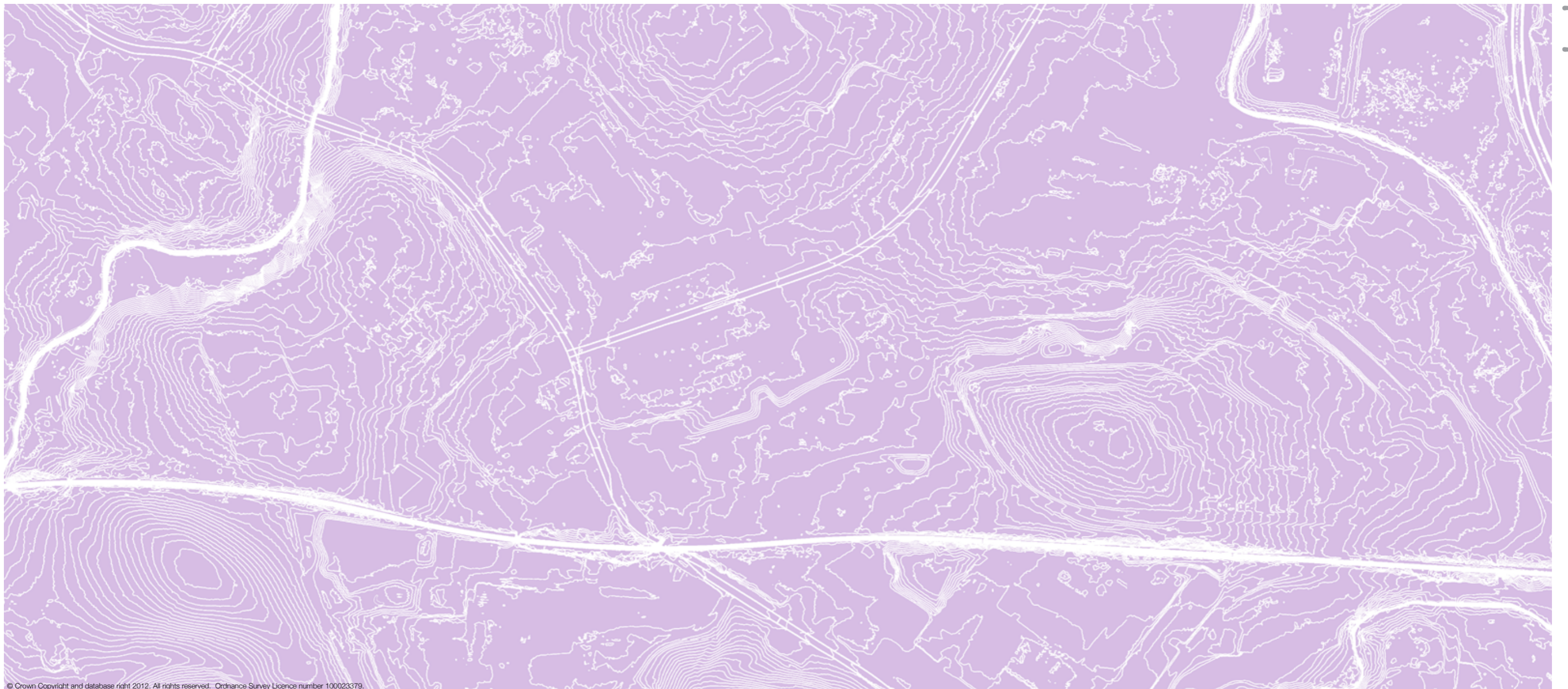
The potential savings are calculated and discussed on page 124.















next steps

outline costing summary




12

# outline costing summary


|   |  |               |   |  |               |
|---|--|---------------|---|--|---------------|
|    | <u>1 nitshill neighbourhood centre:</u><br>road improvements                                       | £247,513.00   |    | <u>6 peat road corridor</u><br>south: road improvements  | £119,550.00   |
|    | <u>2 nitshill neighbourhood centre:</u><br>civic core to west of nitshill road                     | £1,014,673.50 |    | <u>7 peat road corridor</u><br>south: green infrastructure   | £551,353.00   |
|   | <u>3 nitshill neighbourhood centre:</u><br>housing area to east of nitshill road<br>(public realm) | £327,185.50   |   | <u>8 peat road corridor:</u><br>south: community garden  | £125,400.00   |
|  | <u>4 peat road corridor</u><br>north: road improvements  | £87,050.00    |  | <u>9 levern water to hartstone wood hill</u><br>west of peat road: housing development<br>(public realm etc) | £1,704,364.00 |
|  | <u>5 peat road corridor</u><br>north: green infrastructure   | £340,220.00   |  | <u>10 levern water to hartstone wood hill</u><br>west of peat road: public realm works                       | £240,160.00   |

# outline costing summary



11 levern water to hartstone wood hill  
east of peat road: public realm works

£120,151.00




12 levern water to hartstone wood hill  
east of peat road: landmark project

£100,000.00




13 darnley mill to GMRC  
museum resource centre to wiltonburn road:  
business park development

£117,650.00




14 darnley mill to GMRC  
museum resource centre to wiltonburn road:  
public realm works

£783,322.50



15 darnley mill to GMRC  
wiltonburn road to parkhouse road

£585,622.00



16 darnley mill to GMRC  
parkhouse road to darnley country park entrance

119,177.00

## Notes

The following exclusions apply: -

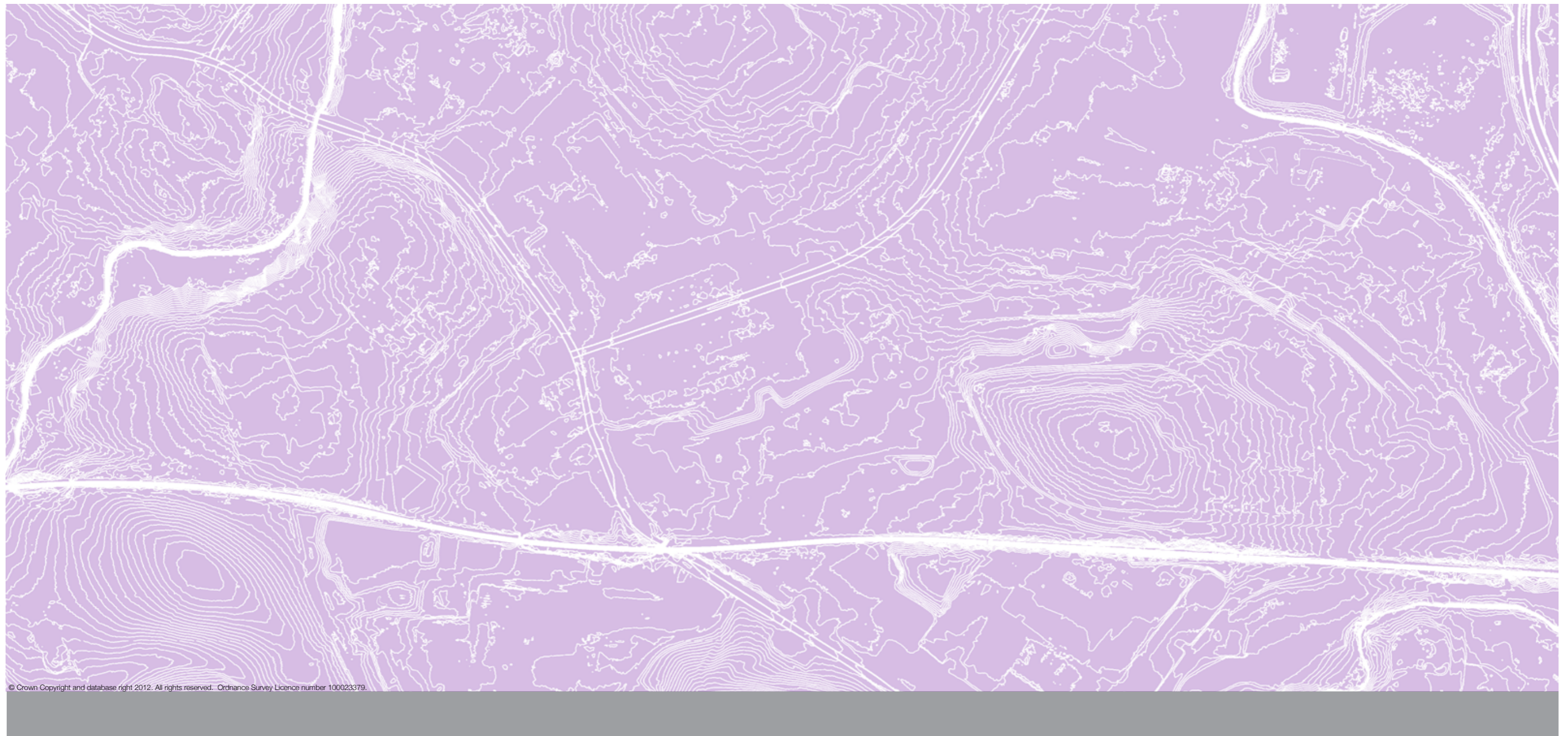
1. VAT
2. Professional fees
3. Fluctuations in labour and material beyond today's date
4. Abnormal ground conditions
5. Contaminated material
6. Back courts, service areas, built development and gardens
7. Demolition of existing buildings except where specifically noted





next steps

action plan





# action plan

Action is required in a number of different contexts to progress the Integrated Green Infrastructure agenda, to ultimately deliver better places.

This includes action in terms of Scottish Government policy (to embed the process on a national level), at the Glasgow City local authority planning level (to embed the strategy and influence decision making) and at the site level (to implement demonstration projects).

key next steps:

Scottish Government Level:

The Integrated Green Infrastructure approach needs to be embedded in policy terms, on a national level. It needs to be recognised and established as a process to deliver better place making.

The approach in many respects seeks to better co-ordinate what are presently independently considered and delivered institutional roles. This goal is much more readily achieved if directed at a Scottish Government level.

Glasgow City Council level:

The findings of the Nitshill area study and the resultant strategy need to be adopted by Glasgow City council, to inform and steer decision making. The study should be adopted as supplementary guidance and used to influence development control and other decision making in the area.

The findings and recommendations of the study relate to the areas of activity of a broad range of council departments. Co-ordinated working across departments is required to implement the recommendations of the study and to deliver the maximum benefits from existing budgets and any further investment in the area.

Site level:

The design studies describe a range of specific projects and interventions in the Nitshill area. Specific portions or components of the proposals could be implemented as demonstration projects, to realise change in the local area and to demonstrate best practice in Scotland. Delivery of demonstration projects depends on establishing partnerships with key funders and delivery agencies and developing proposals in detail with the local community.

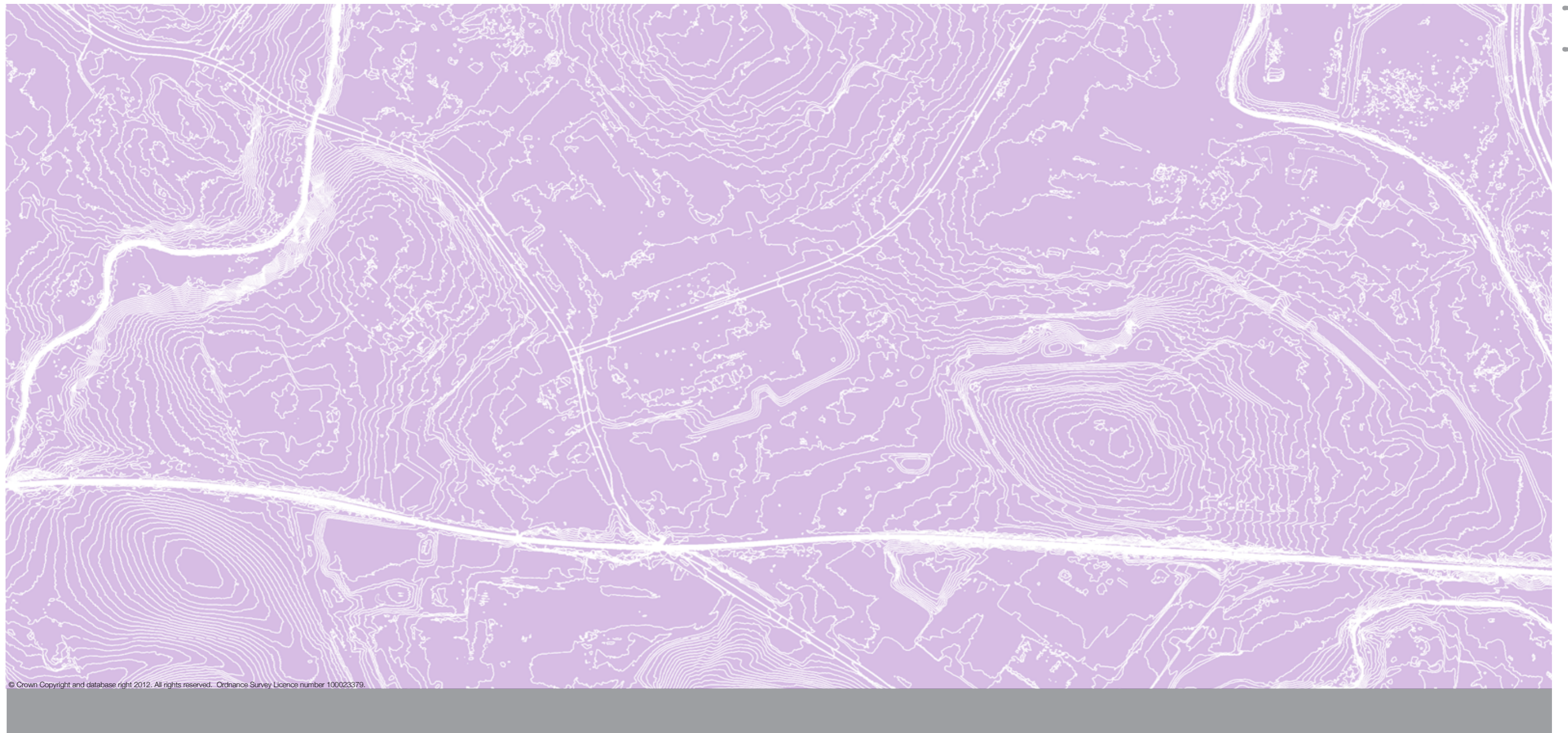






appendices

design proposal review & testing



F

# design proposal review & testing

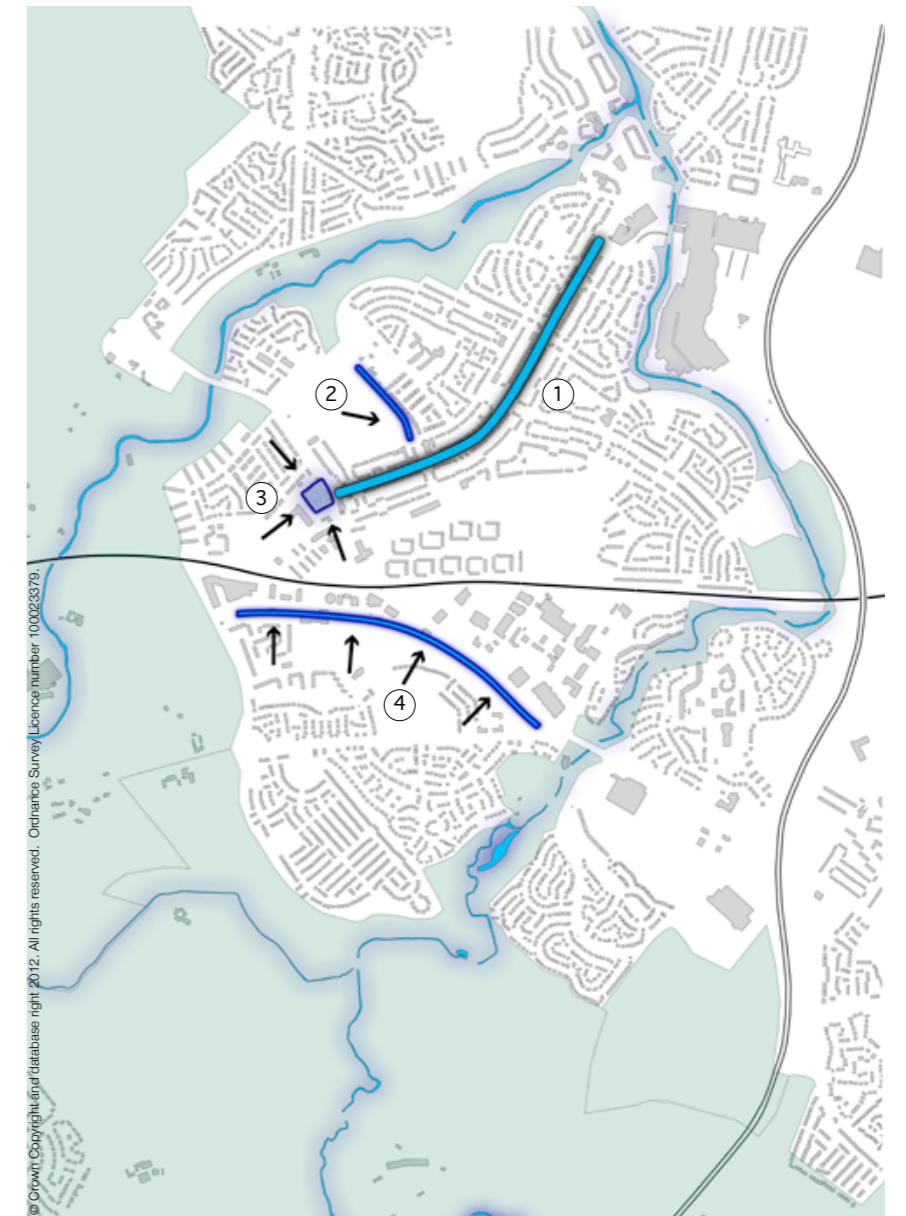
## design proposal review / testing:

The development of integrated green infrastructure proposals for the Nitshill area has been informed by comprehensive and detailed analysis across a broad range of topics. The findings of this process have in turn informed the development of an overall strategy for the area, key elements of which have then been considered in greater detail through the design studies.

To test the process and the outcomes, this section of the report aims to review the strategy and design proposals in terms of the core ambitions of integrated green infrastructure, which are:

- water management
- access networks
- habitat networks
- green & open space
- stewardship over time

The strategy and design proposals will be reviewed in terms of each topic in turn to attempt to assess the outcomes.



## integrated water management

1. Peat Road corridor redesigned to manage surface water thro' SUDs features such as: swales, linear wetland, tree planting etc.
2. SUDs features associated with adjacent residential development site incorporated into linear park
3. SUDs feature created as terminus to boulevard on cleared site: addressing water management requirements of surrounding development sites
4. linear swale/wetland SUDs features incorporated into design of green link: management of surface water in upper portion of catchment (south of rail line)

# design proposal review & testing

## design proposal review / testing: water management

The surface water management design principles adopted across the masterplan area follow the sustainable drainage system (SuDS) approach. Core to this is the management train of measures to ensure techniques at the appropriate scale are used and that the techniques integrate the main water management function with the wider benefits of IGI.

The surface water management design has incorporated the key principles of:

- Provision for disconnection of existing combined drainage network to new surface water system
- Managing surface water on the surface, avoiding piped systems where possible
- Integrate management features with wider aims of IGI
- encourage infiltration where possible and appropriate
- All runoff managed within natural catchment
- Treatment train where runoff is initially managed close to source, with measures linked to form regional control
- Testing for capacity up to the 0.5% annual exceedance probability / 1 in 200 year return period event including an allowance for climate change

The masterplan design recognises that the existing drainage network is presently a combined piped sewer system. The primary aim would be to reach the situation where a separate surface water drainage network was present across the area with the existing sewer being used for foul drainage alone. The measures promoted will allow areas of surface water to be disconnected from the existing system, treated and attenuated before in time being routed via a new surface water drainage system which is in line with MGSDP objectives. This will facilitate the staged development of individual areas which can eventually be linked up over time to achieve the overall aim of a separate surface water drainage system, which complies with MGSDP aspirations recognised in NPF2.

A range of techniques have been adopted which serve both to provide a practical solution to managing the existing surface water and also to demonstrate the range of solutions that can be developed. These cover the range of landscape settings throughout the masterplan area from urban centre through residential areas to greenspace and woodland areas.

The design approach has been to initially examine the local topography to establish the natural drainage patterns then along with reviewing the existing infrastructure constraints, identify sub-catchments which would be appropriate for local scale water management. The zones

identified were then compared with similar assessments for the other aspects of IGI and those with the greater scope for maximising IGI benefit were taken forward as preferred areas for developing local water management features.

The local surface water management measures can be used to help stimulate and promote development by providing a strategic water management system into which new development can effectively connect into without the need for development-scale SuDS.

The areas of water management within the masterplan are:

### 1. Darnley to Nitshill open space

This area is presently intensively maintained grassland across a relatively steep slope. A series of two grass swales which will closely follow the land contours will be developed. The upper swale will be alongside a new footpath, with the lower swale along the roadside at the foot of the hill.

The upper swale draining to the west will be connected to a small wetland already beginning to establish in the boggy perched area to the west end of the grassy bank. An over flow, during large rainfall events will operate and lead to a small rock lined channel which will lead down to the museum resource centre access road. This will form a cascade during high flows down the relatively steep slope. The lower swale may receive road runoff from Nitshill Road only and as an option be isolated from overland flow using HDPE liners or similar with the drainage from this swales discharging back into the existing piped drainage in the short term and ultimately to a separate surface water system.

### 2. Museum Resource Centre approach

A new open drainage feature will be formed along the access road to the Museum Resource Centre. This feature would initially be formed as a linear wetland or swale as there is presently little surface water drainage that will be able to connect directly into this. The feature would be designed to eventually contain open water as the volume of surface water able to discharge into it increases from sources such as the planned residential housing a phased retrofitting of existing surface water drainage connections in the area. The outflow from this would in the short term then have to discharge back into the piped drainage network under the railway, and in the longer term piped in a dedicated connection under the railway to the surface water system

### 3. Nitshill Centre

The surface water drainage from the redevelopment, including all roof runoff from the adjacent buildings would be channelled on the surface to a landscaped water feature with the main street. The outflow would then be conveyed via open channels as part of the new surface water system in the long term or to the existing network in the short term.

### 4. Peat Road

A linear wetland feature will provide water treatment, attenuation and flow routing along the existing central reservation along Peat Road. The existing road drainage can be connected into this swale, which will also collect overland flow and ultimately to the Brock Burn through a new surface water drainage system.. There will be available capacity to allow the surrounding drainage area to eventually be treated in the swale. Attenuation basins will also be provided in the longer term along with a dedicated surface water flowpath via a swale or similar that will convey flows along Priesthill Road and Muirshiel Crescent to the Brock Burn.

### 5. Newfield Square / Craigbank development site

A landscaped wetland and swale arrangement will be used to manage surface water from this new residential area. This will be used to form a shared greenspace area with the areas further downhill being progressively wetter. This system would drain into the Peat Road system and again ultimately to the Brock Burn via this new surface water drainage system.

# design proposal review & testing

## design proposal review / testing: stewardship over time

Dialogue with representatives of Glasgow City Council's Land and Environmental Services department highlighted from an early stage that ongoing maintenance costs for public open space in Nitshill are a significant concern.

As discussed in the analysis stage, there are extensive areas of amenity grassland within the study area of no clear function and of little benefit in terms of leisure, recreation, habitat or landscape character. These expanses of amenity grassland are expensive to maintain and the city council's expressed view is that the current position is not sustainable.

In response to this issue, as well as meeting other goals, a broad strategy has been developed that shifts the landscape typology in the large areas of public open space from amenity grassland to a more balanced mix of landscape types, including woodland and meadow.

As noted earlier in the study, a total of 40.5 hectares of new woodland are proposed and 16 hectares of new meadow. In total 25 hectares of existing amenity grassland are to be transformed to either woodland or meadow (14 hectares and 11 hectares respectively).

To assess the actual cost implications of the current maintenance of amenity grassland and the impact of the proposed changes of landscape type, we have researched typical maintenance costs for different landscape types. This information has been triangulated between several sources, including: Armours quantity surveyors' review of rates, dialogue with landscape contractors and a review of the Woodland Trust document 'Trees or Turf?'. This suggests the following typical rates:

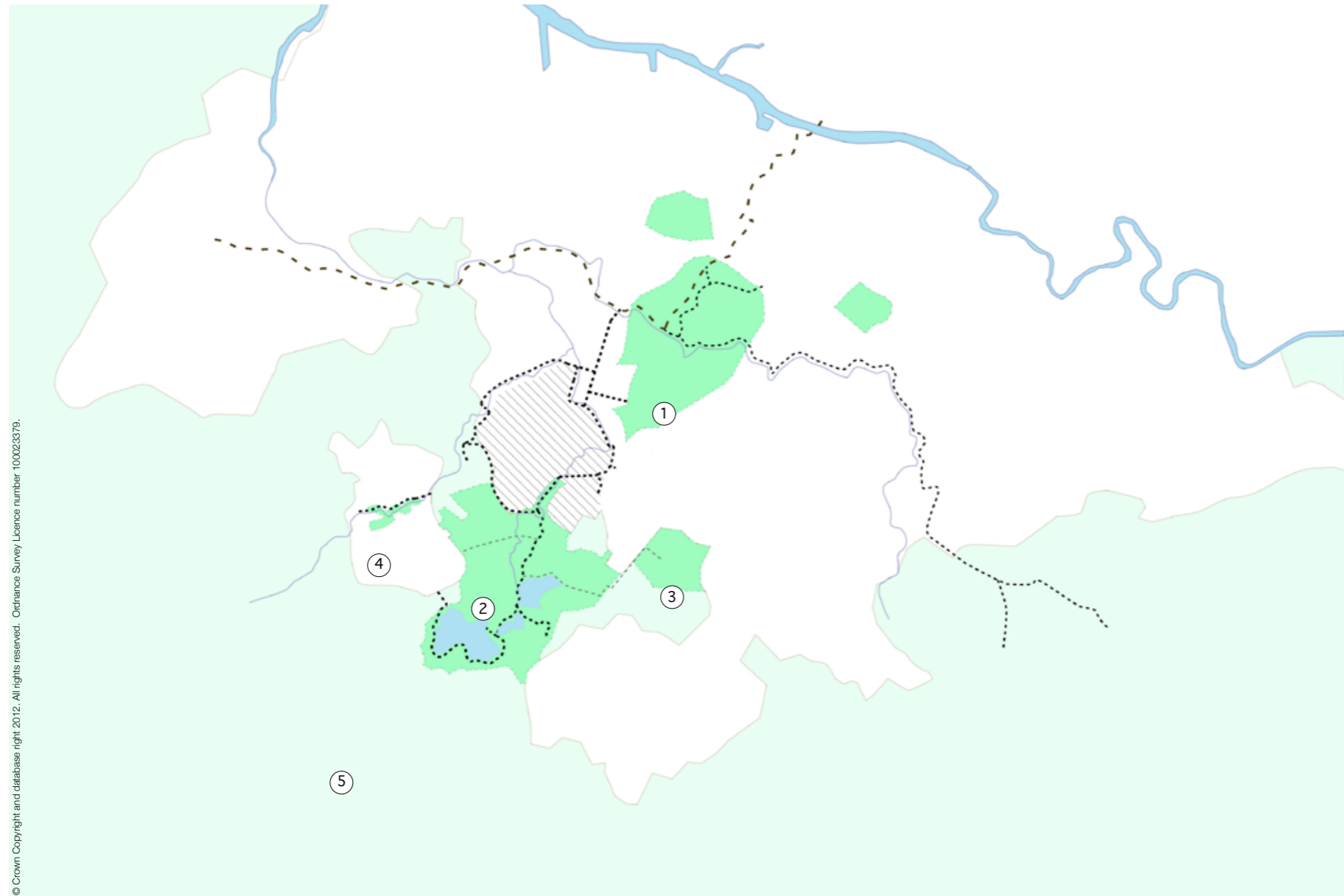
- amenity grass maintenance: £2,000 - £2,300 / hectare / year
- woodland maintenance: £700 - £1,000 / hectare / year
- meadow maintenance: £500 - £700 / hectare / year
  
- 25 hectares of amenity grassland: costs circa £54,000 / year
- 14 hectares of woodland: saves circa £18,200 / year
- 11 hectares of meadow: saves circa £17,100 / year

The proposed changes of landscape type, therefore save in the order of £35,300 / year.

- existing woodland
- proposed woodland creation
- proposed meadow creation / management
- developed public open space / amenity grass etc.



# design proposal review & testing

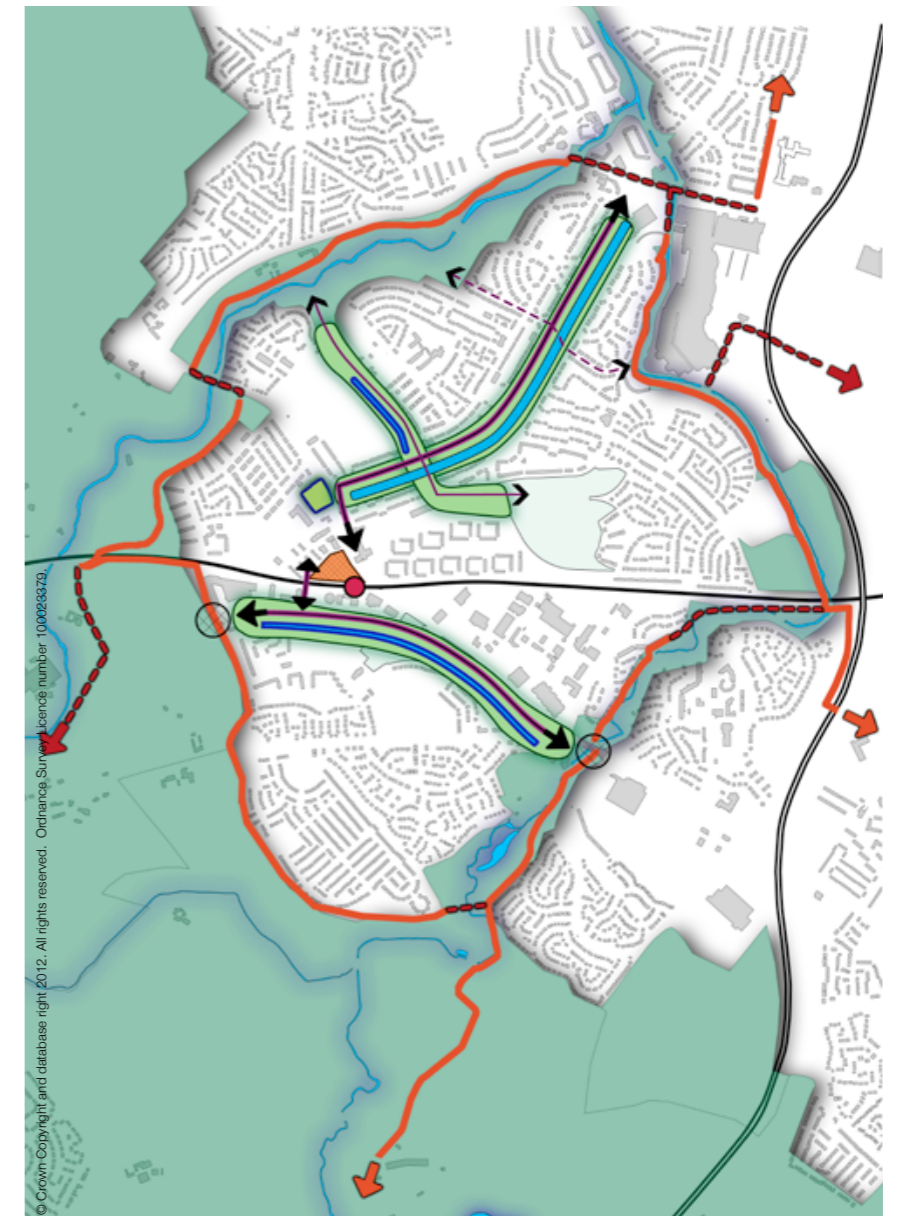


proposed green network: south-west Glasgow

- national cycle route NC7
- - - core paths (off street)
- ..... aspirational / planned links
- 1. pollock country park
- 2. dams to darnley country park
- 3. rouken glen park
- 4. carlibar / centenary park
- 5. green belt

design proposal review / testing: access networks

As described in the strategy plans (repeated here), the proposals include a number of moves to create a well integrated, legible and connected green network that operates at both a local and citywide level.



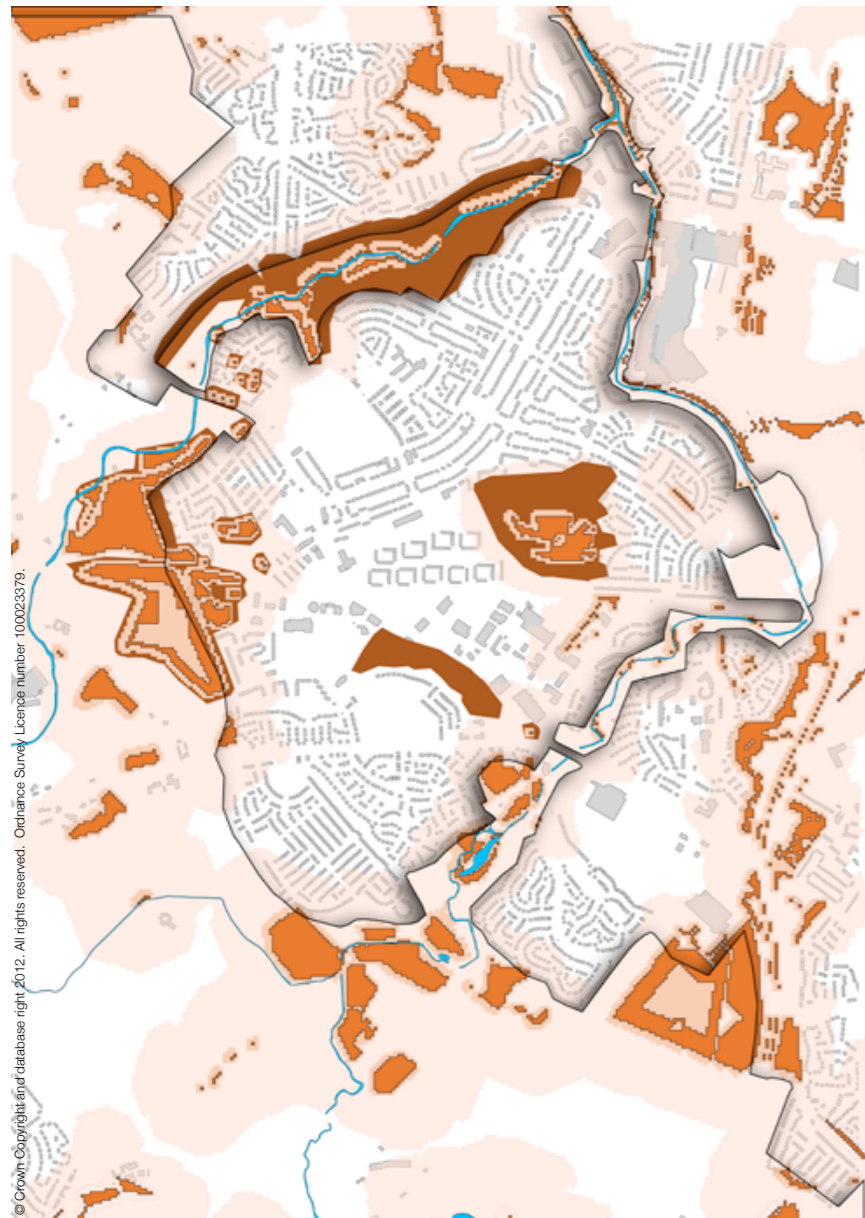
design proposal review / testing: green / open space

The proposals do not include extensive creation of new public open space or greenspace. Arguably there is presently an over provision of public open space in Nitshill.

The core issue is one of quality: is the open space in the right location, is it accessible, is it linked to a wider network, does it contain appropriate facilities etc.? Much of the public open space in Nitshill is poorly located amenity grassland with limited value in terms of leisure / recreation, habitat or landscape character.

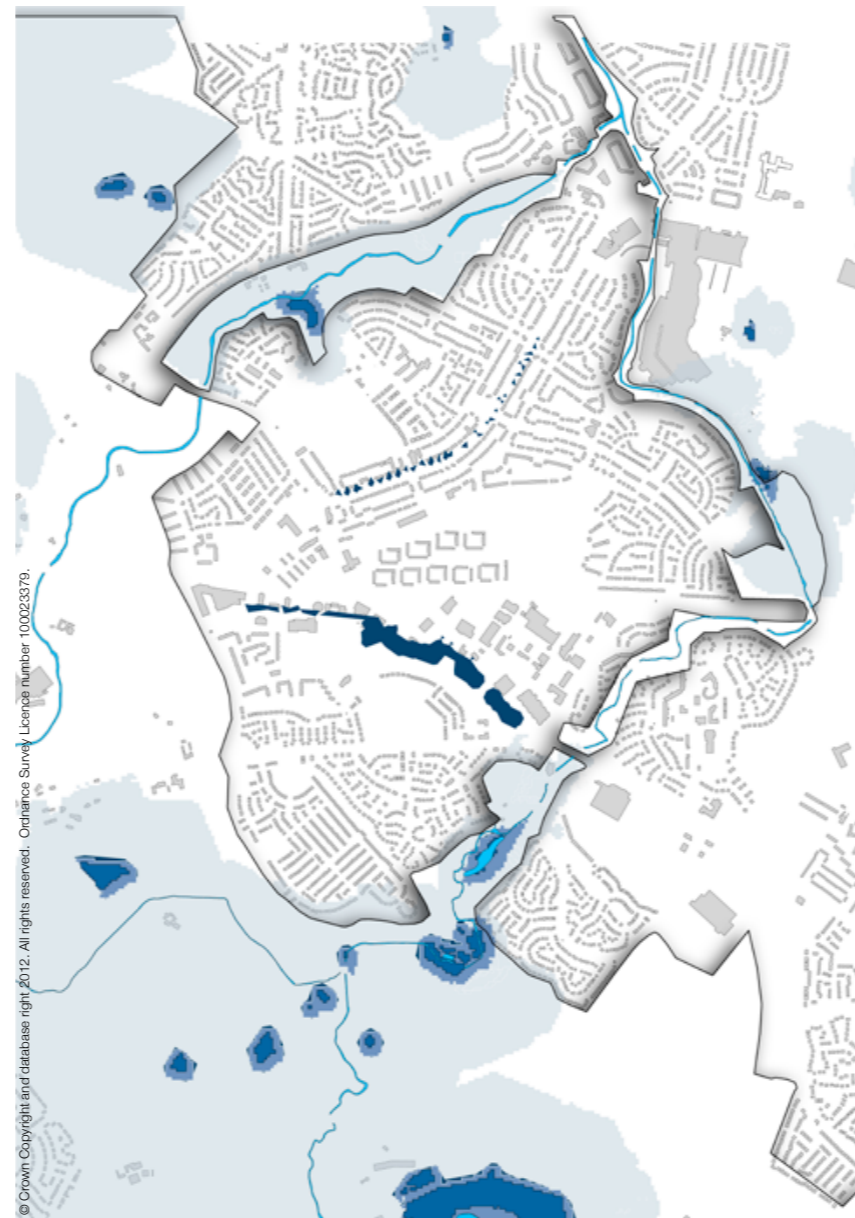
The proposed strategy aims to connect the network of public open spaces, to enhance the character of the spaces and to focus facilities in key locations. The strategy is focused on 'better' rather than 'more'.

# design proposal review & testing



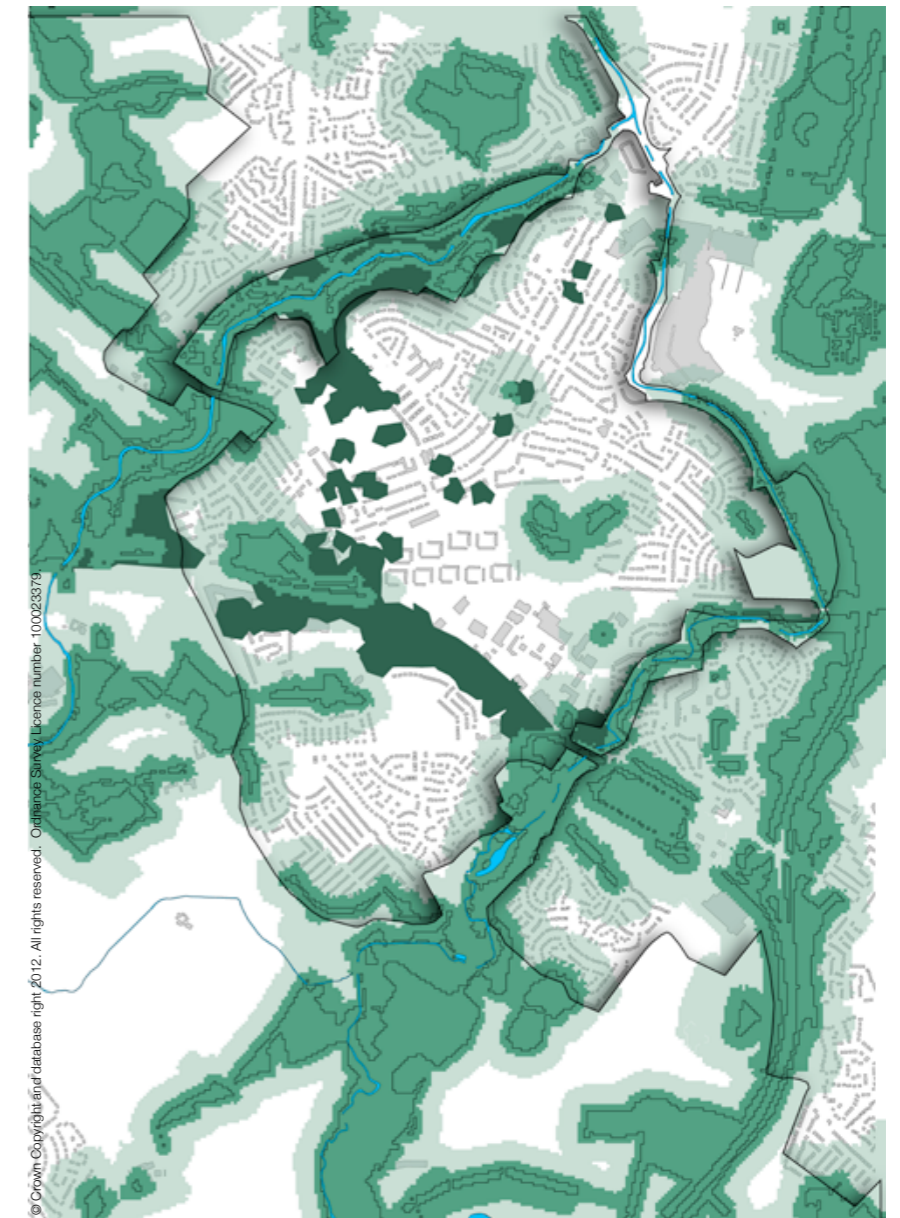
neutral grassland

- neutral grassland habitat
- neutral grassland 300m network
- neutral grassland 2km network
- proposed improvement to 300m network



fen marsh swamp

- fen marsh swamp habitat
- fen marsh swamp 150m network
- fen marsh swamp 2km network
- proposed improvement to 150m network



broadleaved & yew woodland

- broadleaved & yew woodland habitat
- broadleaved & yew woodland 500m network
- broadleaved & yew woodland 2km network
- proposed improvement to 500m network

# design proposal review & testing

## design proposal review / testing: habitat networks

The impacts of the proposals were analysed by Scottish Natural Heritage utilising the Integrated Habitat Network Model. The habitat networks have been tested at the medium dispersal for each habitat type only. The findings are outlined below:

### Neutral grassland:

The site as existing has 12 grassland networks intersecting its boundary. The indicative total area is 47.8 Ha.

The proposed scheme consolidates 2 networks, along the Lavern Water however also creates two isolated patches. The proposal also creates one large network

Grassland network area is lost to the west of the site 2.6 Ha.

Within the site networks created is 29.5 Ha, resulting in an overall gain of 26.9Ha

| Neutral Grassland             | Networks Ha |
|-------------------------------|-------------|
| Network area                  | 47.8        |
| Loss of existing network area | 2.6         |
| Increased networks size*      | 24.6        |
| New networks                  | 4.9         |
| Proposed network area         | 74.7        |
| Overall change                | 26.9        |

\*network to the north – Lavern Water +16.6 Ha, network to north of railway and east of flats +8.0 Ha

### Wetland (Fen Marsh Swamp):

The site as existing has no networks intersecting its boundary. The project does impact on a wetland network to the north of the site, Lavern Water. The single network indicative total area is 1.45 Ha.

The proposed scheme will create 2 significant networks, and create a further 19 smaller networks across the swale; however these 19 are too minor to be considered within the results.

Within the site networks created is 3.83 Ha, resulting in an overall gain of 3.26 Ha

| Wetland                       | Networks Ha |
|-------------------------------|-------------|
| Network area                  | 1.45        |
| Loss of existing network area | 0           |
| Increased networks size       | 0           |

|                       |      |
|-----------------------|------|
| New networks          | 3.83 |
| Proposed network area | 4.71 |
| Overall change        | 3.26 |

### Broadleaved Woodland:

The site as existing has 6 woodland networks intersecting its boundary. The indicative total area is 494.4 Ha.

The proposed scheme consolidates 2 networks, linking an isolated network in the centre of the site to a much larger network to the south, and also increasing the size of the network to the north. The proposal will create a further 8 networks. No woodland network area is lost. The proposed scheme indicative total broadleaved woodland area is 531.4 Ha.

| Broadleaved Woodland          | Networks Ha |
|-------------------------------|-------------|
| Network area                  | 494.4       |
| Loss of existing network area | 0           |
| Increased networks size*      | 32.7        |
| New networks                  | 4.3         |
| Proposed network area         | 531.4       |
| Overall change                | 37.0        |

\*network to the north – Lavern Water +13.8 Ha, network to centre consolidated with Darnley Mill +18.9 Ha

## design proposal review / testing: findings

Alongside other benefits, when assessed in terms of the core ambitions of integrated green infrastructure, the proposals are found to deliver positive outcomes across the full range of issues:

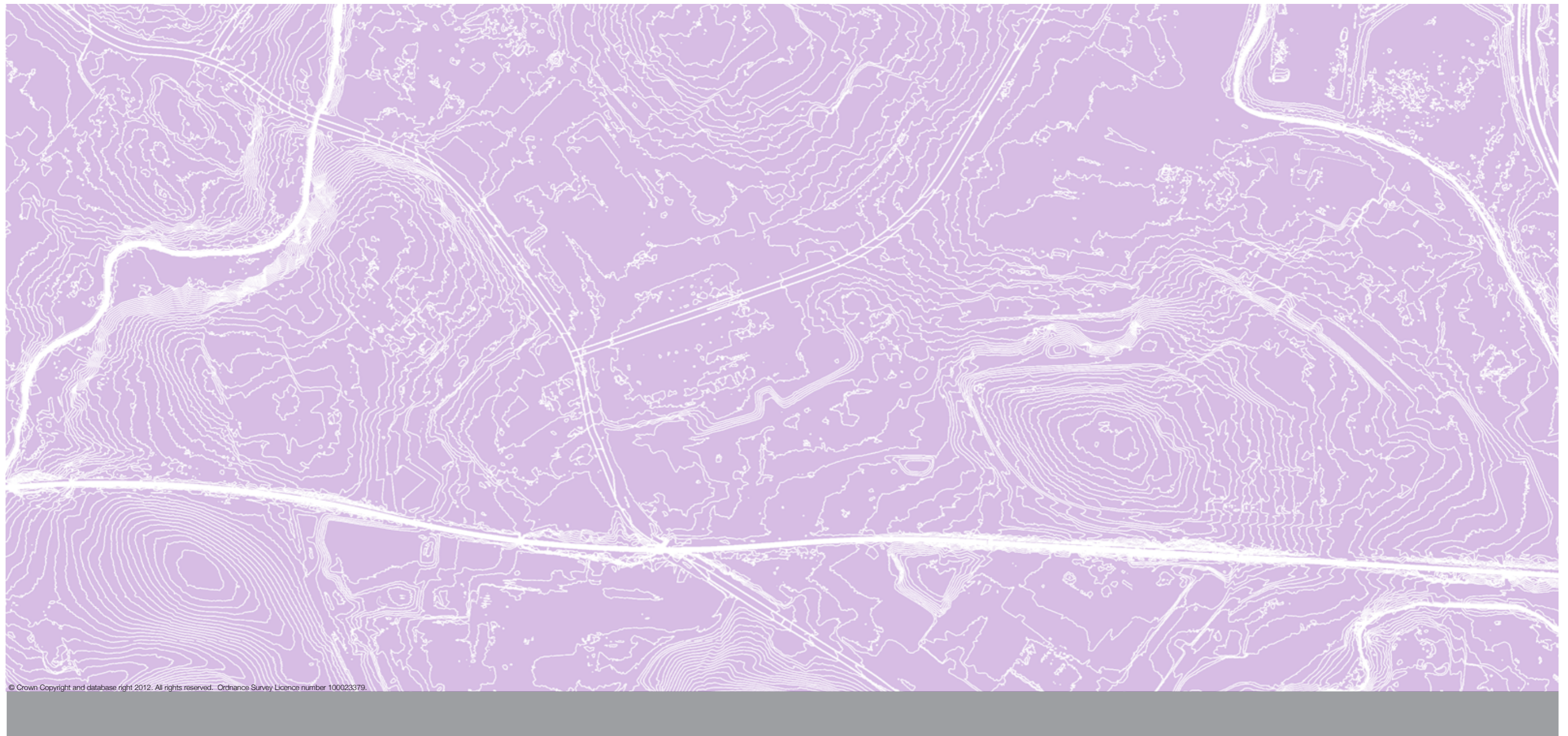
- water management:
- access networks
- habitat networks
- green & open space
- stewardship over time





appendices

outline costings



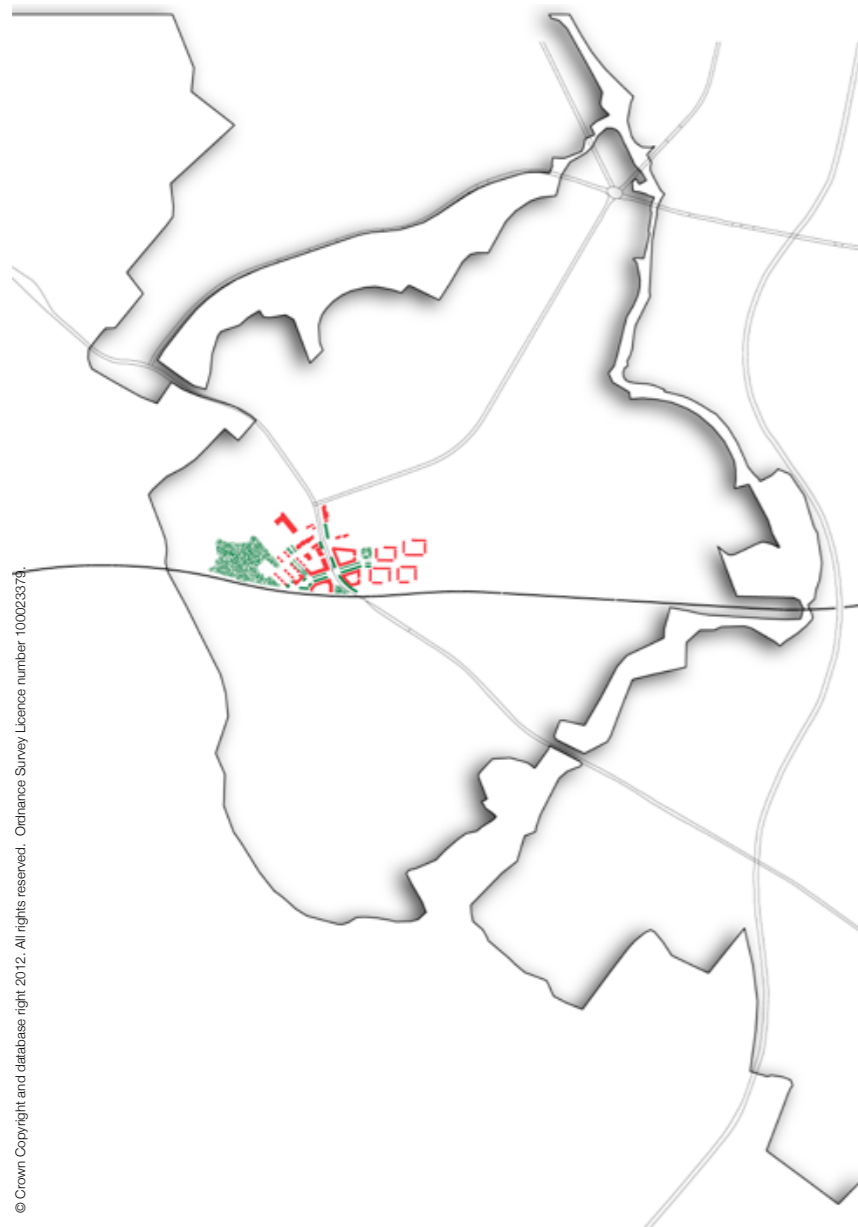
F

Notes

The following exclusions apply: -

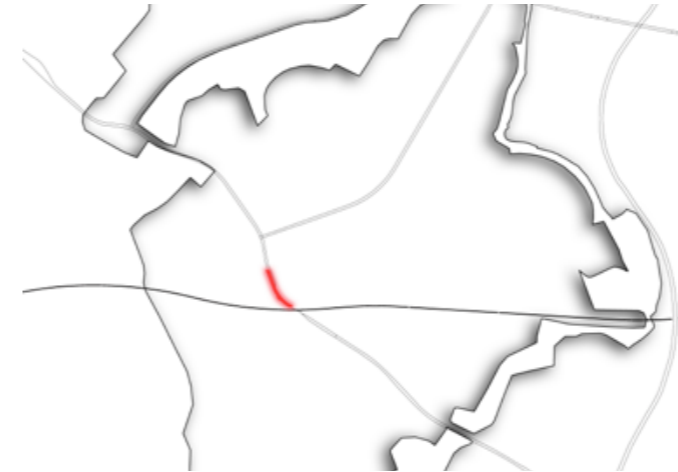
1. VAT
2. Professional fees
3. Fluctuations in labour and material beyond today's date
4. Abnormal ground conditions
5. Contaminated material
6. Back courts, service areas, built development and gardens
7. Demolition of existing buildings except where specifically noted

# outline costs



## Nitshill Neighbourhood Centre

- Nitshill Road Improvements
- Civic Core to West of Nitshill Road
- Housing development to East of Nitshill Road



### Nitshill Road Improvements

#### Work to existing roads

Breaking out existing road wearing course and relaying with new; approx 40mm thick

|  |                         |   |       |           |
|--|-------------------------|---|-------|-----------|
| generally                                  | 1,603.00 m <sup>2</sup> | @ | 25.00 | 40,075.00 |
| extra; breaking out and removing road kerb | 75.00 m                 | @ | 3.00  | 225.00    |

#### Work to existing paths

Breaking out existing path; approx 80 thick and relaying with new

|           |                         |   |       |           |
|-----------|-------------------------|---|-------|-----------|
| generally | 1,039.00 m <sup>2</sup> | @ | 26.00 | 27,014.00 |
|-----------|-------------------------|---|-------|-----------|

#### Road kerbs

New road kerbs including all associated excavations, foundations, haunching etc

|  |          |   |       |           |
|--|----------|---|-------|-----------|
| generally                                    | 578.00 m | @ | 25.00 | 14,450.00 |
| extra; forming neat joint with existing road | 578.00 m | @ | 5.00  | 2,890.00  |

#### Round top kerbs

New round top kerbs including all associated excavations, foundations, haunching etc

|           |          |   |       |          |
|-----------|----------|---|-------|----------|
| generally | 373.00 m | @ | 20.00 | 7,460.00 |
|-----------|----------|---|-------|----------|

### Grass verge

Formation of new grass verge including removing existing turf and topsoil; new topsoil, 150 thick; complete with seeding etc as required

|           |        |    |   |       |          |
|-----------|--------|----|---|-------|----------|
| generally | 359.00 | m2 | @ | 13.00 | 4,667.00 |
|-----------|--------|----|---|-------|----------|

extra; breaking out existing path and build below; approx 450 deep; and importing sub soil; 450 deep

|  |        |    |   |       |           |
|--|--------|----|---|-------|-----------|
|  | 359.00 | m2 | @ | 38.00 | 13,642.00 |
|--|--------|----|---|-------|-----------|

### Trees

Trees; forming pit; removal of excavated material off site; imported topsoil and granular soil improver; clean stone drainage layer, stakes etc

|                   |        |    |   |        |           |
|-------------------|--------|----|---|--------|-----------|
| in soft landscape | 114.00 | nr | @ | 250.00 | 28,500.00 |
|-------------------|--------|----|---|--------|-----------|

### Signage etc

Street signage, bus stop signage etc as required

|           |      |      |   |           |           |
|-----------|------|------|---|-----------|-----------|
| generally | 1.00 | item | @ | 10,000.00 | 10,000.00 |
|-----------|------|------|---|-----------|-----------|

### Street lighting

Street lighting improvement; removal of existing lighting and replacing with new to revised locations; ductwork, cabling, etc

|                         |      |      |   |           |           |
|-------------------------|------|------|---|-----------|-----------|
| general street lighting | 1.00 | item | @ | 50,000.00 | 50,000.00 |
|-------------------------|------|------|---|-----------|-----------|

### Linings and markings

Linings and road markings as required including alternative colours and surfaces at junctions, crossings etc

|           |      |      |   |          |          |
|-----------|------|------|---|----------|----------|
| generally | 1.00 | item | @ | 5,000.00 | 5,000.00 |
|-----------|------|------|---|----------|----------|

### Services

Allowance meantime for alterations to existing drainage and services etc

|           |      |      |   |           |           |
|-----------|------|------|---|-----------|-----------|
| generally | 1.00 | item | @ | 25,000.00 | 25,000.00 |
|-----------|------|------|---|-----------|-----------|

### Public realm paving

Public realm paving; removing existing surface and excavate 100 deep; new type 1 upfill, good quality paving on mortar bed

|           |        |    |   |        |                  |
|-----------|--------|----|---|--------|------------------|
| generally | 169.00 | m2 | @ | 110.00 | <u>18,590.00</u> |
|-----------|--------|----|---|--------|------------------|

247,513.00

# outline costs



## Civic Core to West of Nitshill Road

### Trees

Trees; forming pit; removal of excavated material off site; imported topsoil and granular soil improver; clean stone drainage layer, stakes etc

|                   |       |    |   |        |           |
|-------------------|-------|----|---|--------|-----------|
| in soft landscape | 31.00 | nr | @ | 250.00 | 7,750.00  |
| in hard landscape | 31.00 | nr | @ | 750.00 | 23,250.00 |

### Street lighting

Street lighting improvement; removal of existing lighting and replacing with new to revised locations; ductwork, cabling, etc

|                                   |      |      |   |           |           |
|-----------------------------------|------|------|---|-----------|-----------|
| public realm lighting enhancement | 1.00 | item | @ | 50,000.00 | 50,000.00 |
|-----------------------------------|------|------|---|-----------|-----------|

### Drainage

Allowance meantime for SUDS feature

|           |        |    |   |        |            |
|-----------|--------|----|---|--------|------------|
| generally | 295.00 | m2 | @ | 350.00 | 103,250.00 |
|-----------|--------|----|---|--------|------------|

Allowance meantime for integrated water management feature and infrastructure

|           |      |      |   |           |           |
|-----------|------|------|---|-----------|-----------|
| generally | 1.00 | item | @ | 25,000.00 | 25,000.00 |
|-----------|------|------|---|-----------|-----------|

### Greenspace

Public greenspace; removal of existing turf to a depth of 100mm; importing topsoil 100 thick; seeding, shrub planting etc

|   |        |      |   |           |           |
|---|--------|------|---|-----------|-----------|
| generally                                   | 479.00 | m2   | @ | 12.00     | 5,748.00  |
| extra; providing play equipment and seating | 1.00   | item | @ | 25,000.00 | 25,000.00 |

### Public realm paving

Public realm paving; removing existing surface and excavate 100 deep; new type 1 upfill, good quality paving on mortar bed

|           |          |    |   |        |            |
|-----------|----------|----|---|--------|------------|
| generally | 5,315.00 | m2 | @ | 110.00 | 584,650.00 |
|-----------|----------|----|---|--------|------------|

### Shared surface paving

Shared surface paving; removing existing surface and excavate 600 deep; new type 1 upfill, good quality paving on mortar bed

|           |        |    |   |        |            |
|-----------|--------|----|---|--------|------------|
| generally | 760.00 | m2 | @ | 140.00 | 106,400.00 |
|-----------|--------|----|---|--------|------------|

### Ramp surface paving

Ramp surface paving; removing existing surface and excavate 100 deep; new type 1 upfill, good quality paving on mortar bed

|           |        |    |   |        |           |
|-----------|--------|----|---|--------|-----------|
| generally | 324.00 | m2 | @ | 110.00 | 35,640.00 |
|-----------|--------|----|---|--------|-----------|

### Woodland

Dense mix of trees, shrubs, bushes, etc; including removal of material off site; imported topsoil and granular soil improver etc

|                                      |        |    |   |       |           |
|--------------------------------------|--------|----|---|-------|-----------|
| generally                            | 991.00 | m2 | @ | 10.50 | 10,405.50 |
| extra; perimeter post and wire fence | 172.00 | m  | @ | 15.00 | 2,580.00  |

### Gateway feature

Allowance meantime for Gateway feature

|           |      |      |   |           |           |
|-----------|------|------|---|-----------|-----------|
| generally | 1.00 | item | @ | 20,000.00 | 20,000.00 |
|-----------|------|------|---|-----------|-----------|

### Memorials

#### Relocate memorials

|           |      |    |   |          |          |
|-----------|------|----|---|----------|----------|
| generally | 2.00 | nr | @ | 2,500.00 | 5,000.00 |
|-----------|------|----|---|----------|----------|

### Street furniture

#### Allowance meantime for additional street furniture etc

|           |      |      |   |           |                  |
|-----------|------|------|---|-----------|------------------|
| generally | 1.00 | item | @ | 10,000.00 | <u>10,000.00</u> |
|           |      |      |   |           | 1,014,673.50     |



### Housing to East of Nitshill Road

#### Trees

Trees; forming pit; removal of excavated material off site; imported topsoil and granular soil improver; clean stone drainage layer, stakes etc

|                   |       |    |   |        |           |
|-------------------|-------|----|---|--------|-----------|
| in soft landscape | 37.00 | nr | @ | 250.00 | 9,250.00  |
| in hard landscape | 38.00 | nr | @ | 750.00 | 28,500.00 |

#### Drainage

SUDS pond; excavating approx 1500 deep; removing approx 50% material off site; retaining remainder on site

|           |        |    |   |       |           |
|-----------|--------|----|---|-------|-----------|
| generally | 287.00 | m2 | @ | 41.00 | 11,767.00 |
|-----------|--------|----|---|-------|-----------|

#### Greenspace

Public greenspace; removal of existing turf to a depth of 100mm; importing topsoil 100 thick; seeding, shrub planting etc

|           |        |    |   |       |          |
|-----------|--------|----|---|-------|----------|
| generally | 356.00 | m2 | @ | 12.00 | 4,272.00 |
|-----------|--------|----|---|-------|----------|

|   |      |      |   |           |           |
|---|------|------|---|-----------|-----------|
| extra; providing play equipment and seating | 1.00 | item | @ | 25,000.00 | 25,000.00 |
|---|------|------|---|-----------|-----------|

# outline costs

## Public realm paving

Public realm paving; removing existing surface and excavate 100 deep; new type 1 upfill, good quality paving on mortar bed

|           |        |    |   |        |           |
|-----------|--------|----|---|--------|-----------|
| generally | 500.00 | m2 | @ | 110.00 | 55,000.00 |
|-----------|--------|----|---|--------|-----------|

## Shared surface paving

Shared surface paving; removing existing surface and excavate 600 deep; new type 1 upfill, good quality paving on mortar bed

|           |          |    |   |        |            |
|-----------|----------|----|---|--------|------------|
| generally | 1,296.00 | m2 | @ | 140.00 | 181,440.00 |
|-----------|----------|----|---|--------|------------|

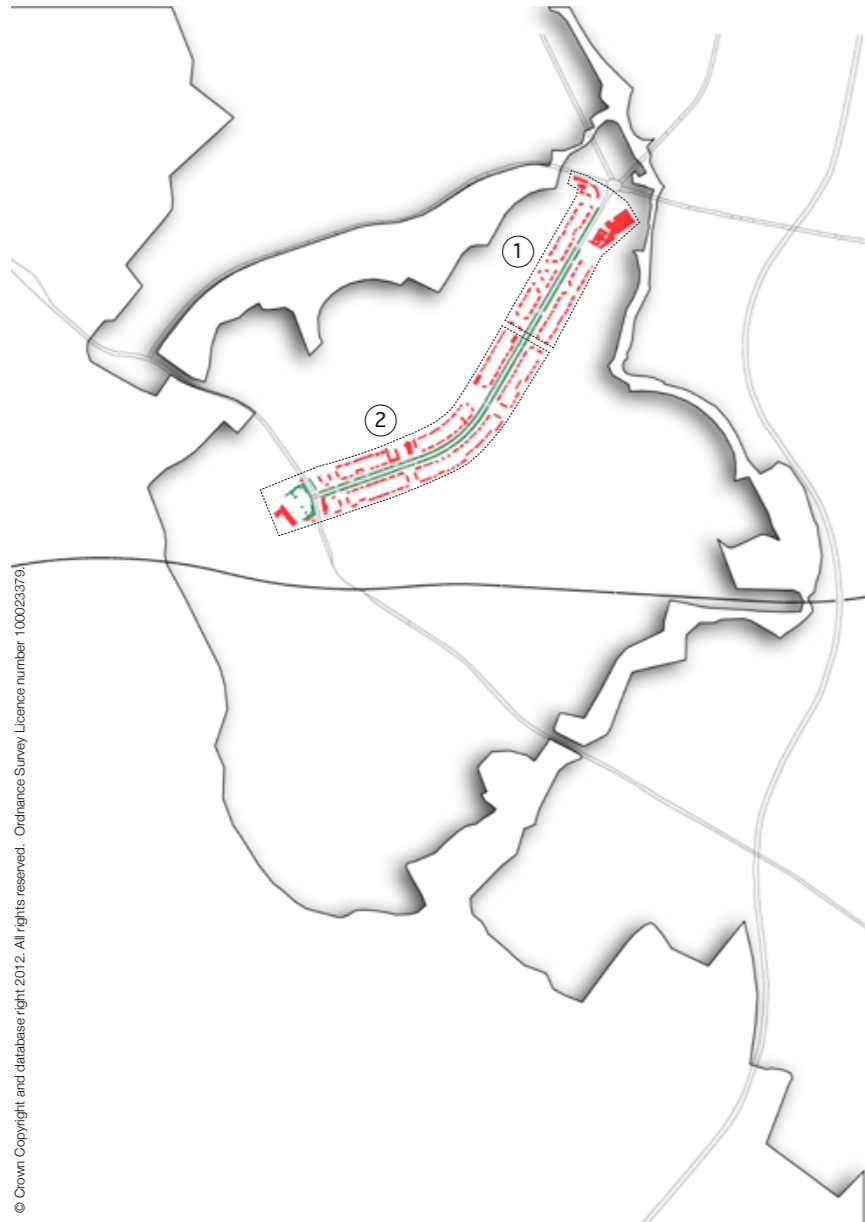
## Woodland

Dense mix of trees, shrubs, bushes, etc; including removal of material off site; imported topsoil and granular soil improver etc

|           |        |    |   |       |          |
|-----------|--------|----|---|-------|----------|
| generally | 873.00 | m2 | @ | 10.50 | 9,166.50 |
|-----------|--------|----|---|-------|----------|

|                                      |        |   |   |       |                 |
|--------------------------------------|--------|---|---|-------|-----------------|
| extra; perimeter post and wire fence | 186.00 | m | @ | 15.00 | <u>2,790.00</u> |
|--------------------------------------|--------|---|---|-------|-----------------|

327,185.50



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1. Peat Road Northern Section
2. Peat Road Southern Section

### Peat Road Corridor

- Peat Road North
  - Road Improvements
  - Green Infrastructure
- Peat Road South
  - Road Improvements
  - Green Infrastructure
  - Community Garden



### North - Road Improvement Works

#### Alternative Surface

Overlaying existing tarmac surface with new coloured top coat

|           |        |    |   |       |           |
|-----------|--------|----|---|-------|-----------|
| generally | 502.00 | m2 | @ | 25.00 | 12,550.00 |
|-----------|--------|----|---|-------|-----------|

#### Signage etc

Street signage, bus stop signage etc as required

|           |      |      |   |          |          |
|-----------|------|------|---|----------|----------|
| generally | 1.00 | item | @ | 7,500.00 | 7,500.00 |
|-----------|------|------|---|----------|----------|

#### Street lighting

Street lighting improvement; removal of existing lighting and replacing with new to revised locations; ductwork, cabling, etc

|           |      |      |   |           |           |
|-----------|------|------|---|-----------|-----------|
| generally | 1.00 | item | @ | 35,000.00 | 35,000.00 |
|-----------|------|------|---|-----------|-----------|

#### Pedestrian crossing

Improved pedestrian crossing; new beacon installation; ductwork, cabling etc

|           |      |    |   |          |           |
|-----------|------|----|---|----------|-----------|
| generally | 7.00 | nr | @ | 3,500.00 | 24,500.00 |
|-----------|------|----|---|----------|-----------|

#### Linings etc

Linings and road markings as required including alternative colours and surfaces at junctions, crossings etc

|           |      |      |   |          |                 |
|-----------|------|------|---|----------|-----------------|
| generally | 1.00 | item | @ | 7,500.00 | <u>7,500.00</u> |
|-----------|------|------|---|----------|-----------------|

87,050.00



# outline costs

## North - Green Infrastructure

### Road kerbs

New road kerbs including all associated excavations, foundations, haunching etc

|  |            |   |       |           |  |
|--|------------|---|-------|-----------|--|
| generally                                    | 1,163.00 m | @ | 25.00 | 29,075.00 |  |
| extra; breaking out and removing road kerb   | 1,030.00 m | @ | 2.00  | 2,060.00  |  |
| extra; forming neat joint with existing road | 1,163.00 m | @ | 5.00  | 5,815.00  |  |

### Grass verge

Formation of new grass verge including removing existing turf and topsoil; new topsoil, 150 thick; complete with seeding etc as required

|  |             |   |       |            |  |
|--|-------------|---|-------|------------|--|
| generally  | 4,524.00 m2 | @ | 13.00 | 58,812.00  |  |
| extra; breaking out existing road and build below; approx 600 deep; and importing sub soil; 600 deep | 2,822.00 m2 | @ | 49.00 | 138,278.00 |  |

### Linear wetland

Formation of new linear wetland; excavating approx 900 deep; infilling with 300 deep free draining gravel and average 100 deep topsoil; shrub/reed planting as required; removal of material off site; earthwork support etc

|  |          |   |        |           |  |
|--|----------|---|--------|-----------|--|
| generally                                  | 292.00 m | @ | 147.00 | 42,924.00 |  |
| extra; stripping out and removing barriers | 200.00 m | @ | 5.00   | 1,000.00  |  |
| extra; culvert at crossings                | 20.00 m  | @ | 200.00 | 4,000.00  |  |

### Trees

Trees; forming pit; removal of excavated material off site; imported topsoil and granular soil improver; clean stone drainage layer, stakes etc

|           |           |   |        |           |  |
|-----------|-----------|---|--------|-----------|--|
| generally | 130.00 nr | @ | 250.00 | 32,500.00 |  |
|-----------|-----------|---|--------|-----------|--|

## Drainage

SUDS pond; excavating approx 1500 deep; removal of material off site

|                               |           |   |          |                 |            |
|-------------------------------|-----------|---|----------|-----------------|------------|
| generally                     | 408.00 m2 | @ | 57.00    | 23,256.00       |            |
| extra; allowance for planting | 1.00 item | @ | 2,500.00 | <u>2,500.00</u> |            |
|                               |           |   |          |                 | 340,220.00 |



### South - Road Improvement Works

#### Alternative Surface

Overlaying existing tarmac surface with new coloured top coat

|           |        |    |   |       |           |
|-----------|--------|----|---|-------|-----------|
| generally | 582.00 | m2 | @ | 25.00 | 14,550.00 |
|-----------|--------|----|---|-------|-----------|

#### Signage etc

Street signage, bus stop signage etc as required

|           |      |      |   |           |           |
|-----------|------|------|---|-----------|-----------|
| generally | 1.00 | item | @ | 10,000.00 | 10,000.00 |
|-----------|------|------|---|-----------|-----------|

#### Street lighting

Street lighting improvement; removal of existing lighting and replacing with new to revised locations; ductwork, cabling, etc

|           |      |      |   |           |           |
|-----------|------|------|---|-----------|-----------|
| generally | 1.00 | item | @ | 50,000.00 | 50,000.00 |
|-----------|------|------|---|-----------|-----------|

#### Pedestrian crossing

Improved pedestrian crossing; new beacon installation; ductwork, cabling etc

|           |       |    |   |          |           |
|-----------|-------|----|---|----------|-----------|
| generally | 10.00 | nr | @ | 3,500.00 | 35,000.00 |
|-----------|-------|----|---|----------|-----------|

#### Linings etc

Linings and road markings as required including alternative colours and surfaces at junctions, crossings etc

|           |      |      |   |           |                  |
|-----------|------|------|---|-----------|------------------|
| generally | 1.00 | item | @ | 10,000.00 | <u>10,000.00</u> |
|-----------|------|------|---|-----------|------------------|

119,550.00

### South - Green Infrastructure

#### Public realm paving

Public realm paving; removing existing surface and excavate 150 deep; new type 1 upfill, good quality paving on mortar bed

|           |        |    |   |        |           |
|-----------|--------|----|---|--------|-----------|
| generally | 750.00 | m2 | @ | 110.00 | 82,500.00 |
|-----------|--------|----|---|--------|-----------|

#### Road kerbs

New road kerbs including all associated excavations, foundations, haunching etc

|           |        |   |   |       |           |
|-----------|--------|---|---|-------|-----------|
| generally | 900.00 | m | @ | 25.00 | 22,500.00 |
|-----------|--------|---|---|-------|-----------|

|  |        |   |   |      |          |
|--|--------|---|---|------|----------|
| extra; breaking out and removing road kerb | 709.00 | m | @ | 2.00 | 1,418.00 |
|--|--------|---|---|------|----------|

|  |        |   |   |      |          |
|--|--------|---|---|------|----------|
| extra; forming neat joint with existing road | 900.00 | m | @ | 5.00 | 4,500.00 |
|--|--------|---|---|------|----------|

#### Grass verge

Formation of new grass verge including removing existing turf and topsoil; new topsoil, 150 thick; complete with seeding etc as required

|           |          |    |   |       |           |
|-----------|----------|----|---|-------|-----------|
| generally | 2,208.00 | m2 | @ | 13.00 | 28,704.00 |
|-----------|----------|----|---|-------|-----------|

|  |        |    |   |       |           |
|--|--------|----|---|-------|-----------|
| extra; breaking out existing road and build below; approx 600 deep; and importing sub soil; 600 deep | 999.00 | m2 | @ | 49.00 | 48,951.00 |
|--|--------|----|---|-------|-----------|

#### Round top kerb

New round top kerbs including all associated excavations, foundations, haunching etc

|           |        |   |   |       |          |
|-----------|--------|---|---|-------|----------|
| generally | 403.00 | m | @ | 20.00 | 8,060.00 |
|-----------|--------|---|---|-------|----------|

# outline costs

## Linear Wetland

Formation of new linear wetland; excavating approx 900 deep; infilling with 300 deep free draining gravel and average 100 deep topsoil; shrub/reed planting as required; removal of material off site; earthwork support etc

|  |            |   |        |            |
|--|------------|---|--------|------------|
| generally                                  | 1,020.00 m | @ | 147.00 | 149,940.00 |
| extra; stripping out and removing barriers | 1,072.00 m | @ | 5.00   | 5,360.00   |
| extra; culvert at crossings                | 110.00 m   | @ | 200.00 | 22,000.00  |

## Drainage

SUDS pond; excavating approx 1500 deep; retaining material; forming embankment

|           |             |   |       |           |
|-----------|-------------|---|-------|-----------|
| generally | 2,038.00 m2 | @ | 27.00 | 55,026.00 |
|-----------|-------------|---|-------|-----------|

SUDS reeds etc

|           |             |   |       |           |
|-----------|-------------|---|-------|-----------|
| generally | 1,152.00 m2 | @ | 15.00 | 17,280.00 |
|-----------|-------------|---|-------|-----------|

## Trees

Trees; forming pit; removal of excavated material off site; imported topsoil and granular soil improver; clean stone drainage layer, stakes etc

|           |           |   |        |           |
|-----------|-----------|---|--------|-----------|
| generally | 289.00 nr | @ | 250.00 | 72,250.00 |
|-----------|-----------|---|--------|-----------|

## Public greenspace

Public greenspace; removal of existing turf to a depth of 100mm; importing topsoil 100 thick; seeding etc

|           |             |   |      |           |
|-----------|-------------|---|------|-----------|
| generally | 1,608.00 m2 | @ | 8.00 | 12,864.00 |
|-----------|-------------|---|------|-----------|

|                                   |           |   |           |           |
|-----------------------------------|-----------|---|-----------|-----------|
| extra; providing street furniture | 1.00 item | @ | 10,000.00 | 10,000.00 |
|-----------------------------------|-----------|---|-----------|-----------|

## Demolition work

Demolition of existing building including removal of all services, grubbing up floor slabs and foundations etc; removal off site

|           |           |   |       |           |
|-----------|-----------|---|-------|-----------|
| generally | 200.00 m2 | @ | 50.00 | 10,000.00 |
|-----------|-----------|---|-------|-----------|

551,353.00

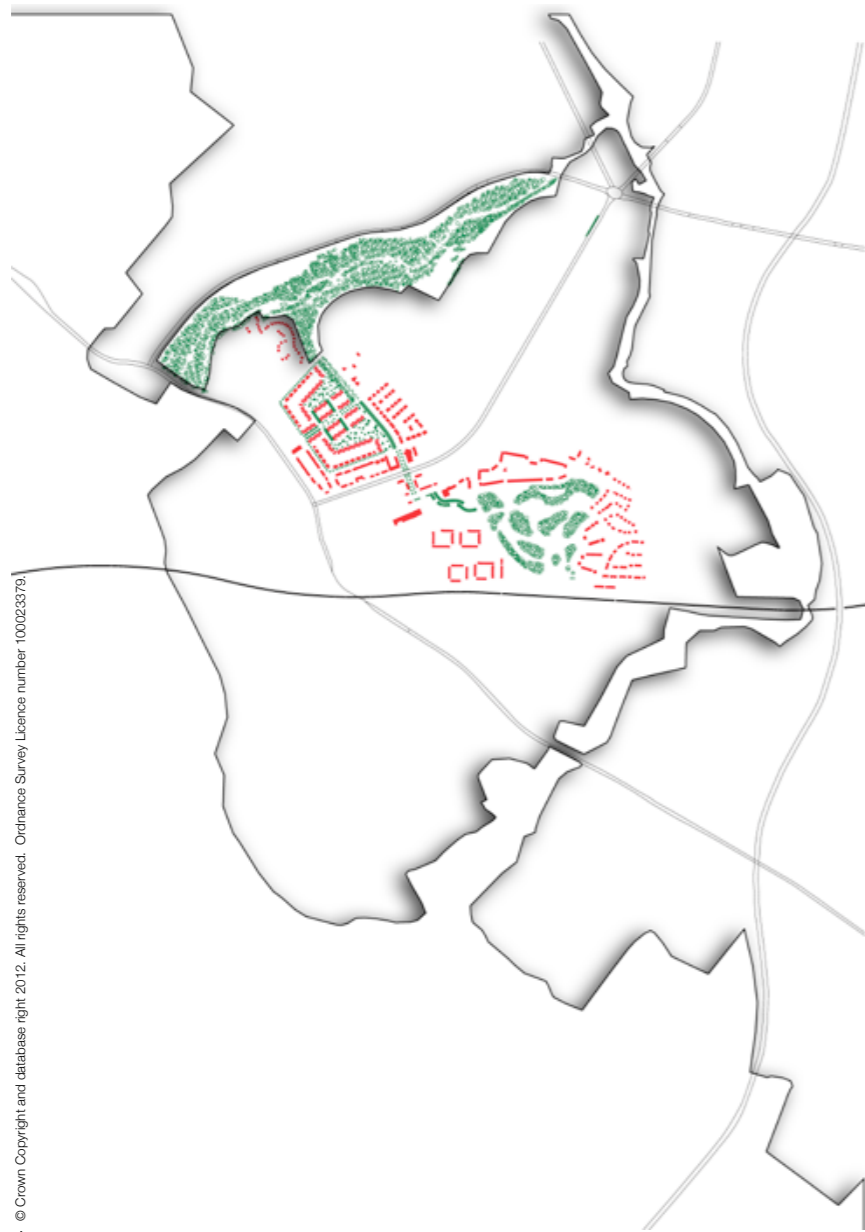


## Community Garden

### Community garden

Community garden; comprising fencing, paths and infrastructure works

|           |             |   |       |            |
|-----------|-------------|---|-------|------------|
| generally | 2,090.00 m2 | @ | 60.00 | 125,400.00 |
|           |             |   |       | 125,400.00 |



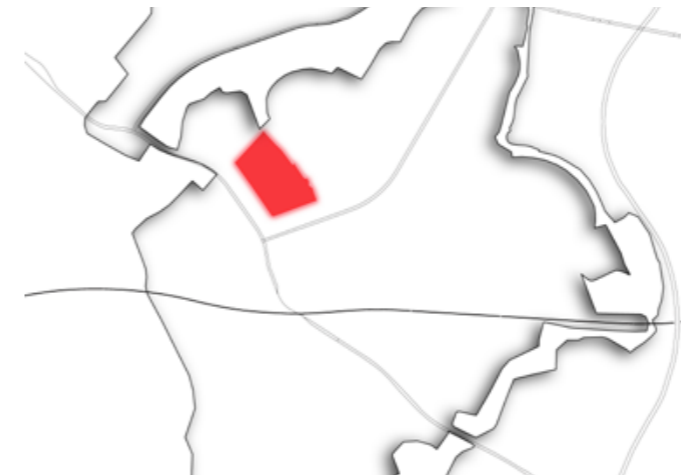
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1. Peat Road Northern Section
2. Peat Road Southern Section

**Levern Water to Hartstone Wood Hill**

West of Peat Road  
 Housing Development  
 Public Realm Works

East of Peat Road  
 Public Realm Works  
 Landmark Project



**West of Peat Road: Housing Development**

Drainage

SUDS pond; excavating approx 1500 deep; removing approx 25% material off site; retaining remainder on site

|           |           |   |       |           |
|-----------|-----------|---|-------|-----------|
| generally | 591.00 m2 | @ | 34.00 | 20,094.00 |
|-----------|-----------|---|-------|-----------|

Public greenspace

Public greenspace; removal of existing turf to a depth of 100mm; importing topsoil 100 thick; seeding, shrub planting and fencing etc

|           |             |   |       |           |
|-----------|-------------|---|-------|-----------|
| generally | 2,465.00 m2 | @ | 40.00 | 98,600.00 |
|-----------|-------------|---|-------|-----------|

|   |           |   |           |           |
|---|-----------|---|-----------|-----------|
| extra; providing play equipment and seating | 1.00 item | @ | 50,000.00 | 50,000.00 |
|---|-----------|---|-----------|-----------|

Work to existing road

Breaking out existing road wearing course and relaying with new; approx 40mm thick

|           |           |   |       |           |
|-----------|-----------|---|-------|-----------|
| generally | 578.00 m2 | @ | 25.00 | 14,450.00 |
|-----------|-----------|---|-------|-----------|

Trees

Trees; forming pit; removal of excavated material off site; imported topsoil and granular soil improver; clean stone drainage layer, stakes etc

|           |           |   |        |           |
|-----------|-----------|---|--------|-----------|
| generally | 280.00 nr | @ | 250.00 | 70,000.00 |
|-----------|-----------|---|--------|-----------|

# outline costs

## Shared surfaces

Shared surface paving; removing existing surface and excavate 100 deep; new type 1 upfill, good quality paving on mortar bed

|      |           |    |   |        |                   |
|------|-----------|----|---|--------|-------------------|
| hard | 11,042.00 | m2 | @ | 110.00 | 1,214,620.00      |
| soft | 4,732.00  | m2 | @ | 50.00  | <u>236,600.00</u> |
|      |           |    |   |        | 1,704,364.00      |



## West of Peat Road: Public Realm Works

### Drainage

SUDS pond; excavating approx 1500 deep; removing approx 25% material off site; retaining remainder on site

|           |        |    |   |       |           |
|-----------|--------|----|---|-------|-----------|
| generally | 591.00 | m2 | @ | 34.00 | 20,094.00 |
|-----------|--------|----|---|-------|-----------|

Drainage swale; excavations including removing material off site; shrub/reed planting as required; not exceeding 500 deep

|           |        |    |   |       |          |
|-----------|--------|----|---|-------|----------|
| generally | 420.00 | m2 | @ | 19.00 | 7,980.00 |
|-----------|--------|----|---|-------|----------|

### Public greenspace

Public greenspace; removal of existing turf to a depth of 100mm; importing topsoil 100 thick; seeding, shrub planting and fencing etc

|           |          |    |   |       |           |
|-----------|----------|----|---|-------|-----------|
| generally | 4,446.00 | m2 | @ | 20.00 | 88,920.00 |
|-----------|----------|----|---|-------|-----------|

### Woodland area

Woodland management; clearing and pruning etc as required

|           |          |    |   |      |          |
|-----------|----------|----|---|------|----------|
| generally | 2,278.00 | m2 | @ | 2.00 | 4,556.00 |
|-----------|----------|----|---|------|----------|

Dense mix of trees, shrubs, bushes, etc; including removal of material off site; imported topsoil and granular soil improver etc

|           |          |    |   |       |           |
|-----------|----------|----|---|-------|-----------|
| generally | 2,260.00 | m2 | @ | 10.50 | 23,730.00 |
|-----------|----------|----|---|-------|-----------|

### New footpath

50 base course and 30 wearing course tarmac path on 150 thick blinded type 1 base; including all excavations, disposal, preparation etc

|                        |          |    |   |          |           |
|------------------------|----------|----|---|----------|-----------|
| 4.00m wide             | 1,532.00 | m2 | @ | 40.00    | 61,280.00 |
| extra; crossing points | 3.00     | nr | @ | 3,500.00 | 10,500.00 |

### Trees

Trees; forming pit; removal of excavated material off site; imported topsoil and granular soil improver; clean stone drainage layer, stakes etc

|                           |       |    |   |        |                  |
|---------------------------|-------|----|---|--------|------------------|
| generally                 | 38.00 | nr | @ | 250.00 | 9,500.00         |
| semi mature tree planting | 68.00 | nr | @ | 200.00 | <u>13,600.00</u> |
|                           |       |    |   |        | 240,160.00       |



### East of Peat Road: Public Realm Works

#### New footpath

50 base course and 30 wearing course tarmac path on 150 thick blinded type 1 base; including all excavations, disposal, preparation etc

|           |        |    |   |       |           |
|-----------|--------|----|---|-------|-----------|
| generally | 582.00 | m2 | @ | 40.00 | 23,280.00 |
|-----------|--------|----|---|-------|-----------|

#### Trees

Trees; forming pit; removal of excavated material off site; imported topsoil and granular soil improver; clean stone drainage layer, stakes etc

|           |        |    |   |        |           |
|-----------|--------|----|---|--------|-----------|
| generally | 104.00 | nr | @ | 250.00 | 26,000.00 |
|-----------|--------|----|---|--------|-----------|

#### Grassland

Meadow; wildflower/british seed mix; grading and preparing existing soil

|           |           |    |   |      |           |
|-----------|-----------|----|---|------|-----------|
| generally | 21,001.00 | m2 | @ | 1.00 | 21,001.00 |
|-----------|-----------|----|---|------|-----------|

#### Public realm paving

Public realm paving; removing existing surface and excavate 100 deep; new type 1 upfill, good quality paving on mortar bed

|           |        |    |   |        |                  |
|-----------|--------|----|---|--------|------------------|
| generally | 665.00 | m2 | @ | 110.00 | <u>73,150.00</u> |
|           |        |    |   |        | 120,151.00       |

# outline costs

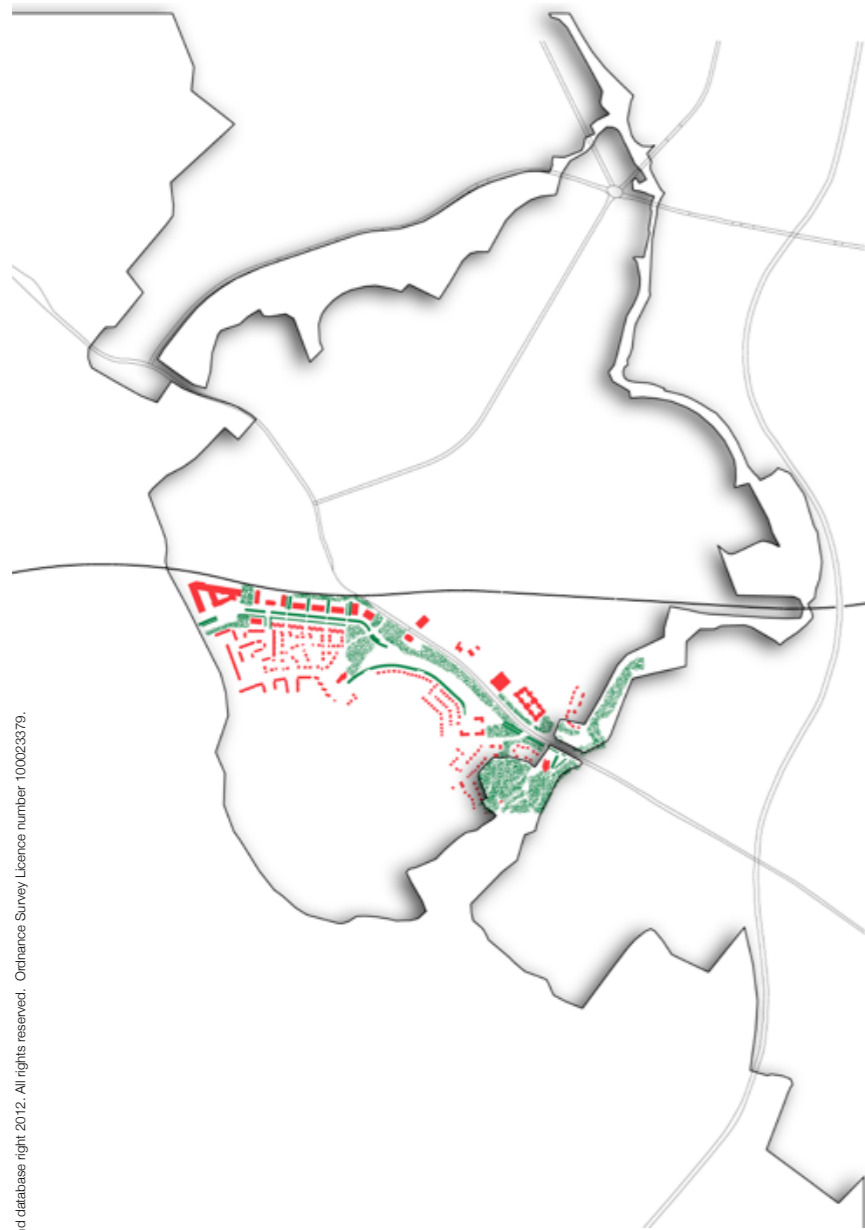


## **East of Peat Road: Landmark Project**

### Landmark

Allowance only for Landmark Project

|           |      |      |   |            |                   |
|-----------|------|------|---|------------|-------------------|
| generally | 1.00 | item | @ | 100,000.00 | <u>100,000.00</u> |
|           |      |      |   |            | 100,000.00        |

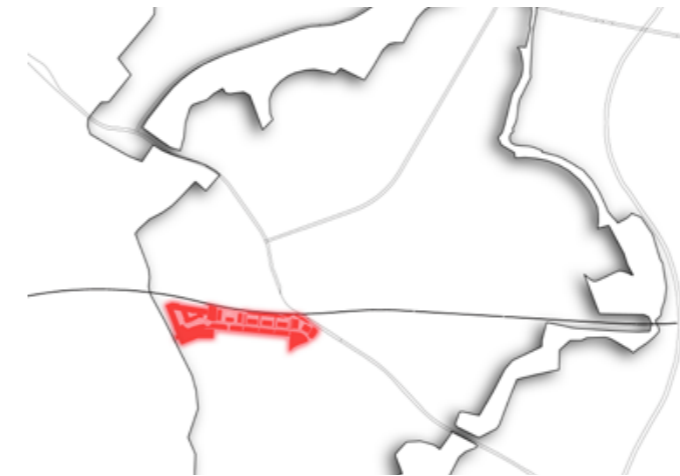


**Darnley Mill to Glasgow Museums Resource Centre**

Glasgow Museum Resource Centre to Wiltonburn Road  
 Business Park Development  
 Public Realm Works

Wiltonburn Road to Parkhouse Road

Darnley Mill / Dams to Darnley Country Park Entrance



**Area 1:- Museum Resource Centre to Wiltonburn Road: Business Park Development**

New parking

100 base course and 40 wearing course tarmac parking on 600 thick blinded type 1 base; including all excavations, disposal, preparation etc

|  |           |   |       |           |
|--|-----------|---|-------|-----------|
| generally                                  | 664.00 m2 | @ | 90.00 | 59,760.00 |
| extra; breaking out and removing road kerb | 290.00 m  | @ | 3.00  | 870.00    |

New road kerbs including all associated excavations, foundations, haunching etc

|           |          |   |       |          |
|-----------|----------|---|-------|----------|
| generally | 290.00 m | @ | 25.00 | 7,250.00 |
|-----------|----------|---|-------|----------|

New footpath

50 base course and 30 wearing course tarmac path on 150 thick blinded type 1 base; including all excavations, disposal, preparation etc

|                                 |           |   |       |           |
|---------------------------------|-----------|---|-------|-----------|
| southern access to rail station | 488.00 m2 | @ | 40.00 | 19,520.00 |
|---------------------------------|-----------|---|-------|-----------|

Trees

Trees; forming pit; removal of excavated material off site; imported topsoil and granular soil improver; clean stone drainage layer, stakes etc

|                        |           |   |        |           |
|------------------------|-----------|---|--------|-----------|
| within Business Estate | 121.00 nr | @ | 250.00 | 30,250.00 |
|------------------------|-----------|---|--------|-----------|

117,650.00



# outline costs



## Area 1:- Museum Resource Centre to Wiltonburn Road: Public Realm Works

### Woodland area

Dense mix of trees, shrubs, bushes, etc; including removal of material off site; imported topsoil and granular soil improver etc

|           |             |   |       |           |
|-----------|-------------|---|-------|-----------|
| generally | 8,853.00 m2 | @ | 10.50 | 92,956.50 |
|-----------|-------------|---|-------|-----------|

### Drainage

Drainage swale; excavations approx 2200 deep; infilling with 300 deep topsoil; shrub/reed planting as required; removal of material off site; earthwork support etc

|           |          |   |        |            |
|-----------|----------|---|--------|------------|
| generally | 564.00 m | @ | 468.00 | 263,952.00 |
|-----------|----------|---|--------|------------|

|                                     |          |   |        |            |
|-------------------------------------|----------|---|--------|------------|
| extra; hard edge on imported upfill | 449.00 m | @ | 300.00 | 134,700.00 |
|-------------------------------------|----------|---|--------|------------|

### New footpath

50 base course and 30 wearing course tarmac path on 150 thick blinded type 1 base; including all excavations, disposal, preparation etc

|                             |             |   |       |           |
|-----------------------------|-------------|---|-------|-----------|
| main path route; 4.00m wide | 2,234.00 m2 | @ | 40.00 | 89,360.00 |
|-----------------------------|-------------|---|-------|-----------|

### Grassland

Meadow; wildflower/british seed mix; grading and preparing existing soil

|           |             |   |      |          |
|-----------|-------------|---|------|----------|
| generally | 3,174.00 m2 | @ | 1.00 | 3,174.00 |
|-----------|-------------|---|------|----------|

### Enhancement of open space

Open space enhancement; comprising fencing, paths and infrastructure works

|           |             |   |       |           |
|-----------|-------------|---|-------|-----------|
| generally | 2,550.00 m2 | @ | 20.00 | 51,000.00 |
|-----------|-------------|---|-------|-----------|

### Developed node space

Developed node space; hard and soft; removing existing and excavate as required; type 1 upfill and surface finishes as required

|           |           |   |       |          |
|-----------|-----------|---|-------|----------|
| generally | 151.00 m2 | @ | 50.00 | 7,550.00 |
|-----------|-----------|---|-------|----------|

### Trees

Trees; forming pit; removal of excavated material off site; imported topsoil and granular soil improver; clean stone drainage layer, stakes etc

|                   |           |   |        |           |
|-------------------|-----------|---|--------|-----------|
| linear greenspace | 335.00 nr | @ | 250.00 | 83,750.00 |
|-------------------|-----------|---|--------|-----------|

### Bridges

Allowance meantime for bridges over drainage swales

|           |           |   |          |           |
|-----------|-----------|---|----------|-----------|
| generally | 4.00 item | @ | 7,500.00 | 30,000.00 |
|-----------|-----------|---|----------|-----------|

### Public greenspace

Public greenspace; removal of existing turf to a depth of 100mm; importing topsoil 100 thick; seeding etc

|           |             |   |      |                  |
|-----------|-------------|---|------|------------------|
| generally | 3,360.00 m2 | @ | 8.00 | <u>26,880.00</u> |
|-----------|-------------|---|------|------------------|

783,322.50



**Area 2:- Wiltonburn Road to Parkhouse Road**

New footpath

50 base course and 30 wearing course tarmac path on 150 thick blinded type 1 base; including all excavations, disposal, preparation etc

4.00m wide 2,121.00 m2 @ 40.00 84,840.00

50 x 200 roundtop kerb to paths; excavations and removal of material off site; foundations and haunchings etc

generally 1,207.00 m @ 15.00 18,105.00

extra; neat edge to existing surface

generally 1,207.00 m @ 5.00 6,035.00

Woodland area

Dense mix of trees, shrubs, bushes, etc; including removal of material off site; imported topsoil and granular soil improver etc

generally 28,034.00 m2 @ 10.50 294,357.00

Grassland

Good quality British seed mix; grading and preparing existing soil, weeding, fertilizing

generally 4,546.00 m2 @ 2.50 11,365.00

Signage and furniture etc

Allowance meantime for markers

generally 2.00 item @ 10,000.00 20,000.00

Seating/benches/signage as required

generally 1.00 item @ 5,000.00 5,000.00

Trees

Trees; forming pit; removal of excavated material off site; imported topsoil and granular soil improver; clean stone drainage layer, stakes etc

generally 291.00 nr @ 250.00 72,750.00

Retaining wall

215 engineering brick retaining wall complete with associated excavations, removal of material off site; foundations etc; approx 1.50m high

generally 70.00 m @ 225.00 15,750.00

Grassland

Wildflower/british seed mix; grading and preparing existing soil

generally 17,568.00 m2 @ 1.00 17,568.00

Drainage

Drainage swale; excavations approx 750 deep; infilling with 300 deep topsoil; seed planting as required; retaining of material on site; earthwork support etc

generally 2,214.00 m2 @ 18.00 39,852.00

585,622.00

# outline costs



## Area 3:- Darnley Mill/Dams to Darnley Coutry Park Entrance

### New footpath

50 base course and 30 wearing course tarmac path on 150 thick blinded type 1 base; including all excavations, disposal, preparation etc

|            |        |    |   |       |           |
|------------|--------|----|---|-------|-----------|
| 4.00m wide | 735.00 | m2 | @ | 40.00 | 29,400.00 |
|------------|--------|----|---|-------|-----------|

50 x 200 roundtop kerb to paths; excavations and removal of material off site; foundations and haunchings etc

|           |        |   |   |       |          |
|-----------|--------|---|---|-------|----------|
| generally | 410.00 | m | @ | 15.00 | 6,150.00 |
|-----------|--------|---|---|-------|----------|

|                                      |        |   |   |      |          |
|--------------------------------------|--------|---|---|------|----------|
| extra; neat edge to existing surface | 410.00 | m | @ | 5.00 | 2,050.00 |
|--------------------------------------|--------|---|---|------|----------|

### Woodland area

Dense mix of trees, shrubs, bushes, etc; including removal of material off site; imported topsoil and granular soil improver etc

|           |          |    |   |       |           |
|-----------|----------|----|---|-------|-----------|
| generally | 1,674.00 | m2 | @ | 10.50 | 17,577.00 |
|-----------|----------|----|---|-------|-----------|

### Grassland

Good quality British seed mix; grading and preparing existing soil, weeding, fertilizing

|           |        |    |   |      |          |
|-----------|--------|----|---|------|----------|
| generally | 500.00 | m2 | @ | 2.50 | 1,250.00 |
|-----------|--------|----|---|------|----------|

### Signage etc

Allowance meantime for signage/markers

|           |      |      |   |          |          |
|-----------|------|------|---|----------|----------|
| generally | 1.00 | item | @ | 5,000.00 | 5,000.00 |
|-----------|------|------|---|----------|----------|

### Trees

Trees; forming pit; removal of excavated material off site; imported topsoil and granular soil improver; clean stone drainage layer, stakes etc

|           |       |    |   |        |           |
|-----------|-------|----|---|--------|-----------|
| generally | 61.00 | nr | @ | 250.00 | 15,250.00 |
|-----------|-------|----|---|--------|-----------|

### Gateway structure

Allowance meantime for gateway structure

|           |      |      |   |           |           |
|-----------|------|------|---|-----------|-----------|
| generally | 1.00 | item | @ | 10,000.00 | 10,000.00 |
|-----------|------|------|---|-----------|-----------|

### Natural stone paving

Natural stone paving on and including 50 thick dry mortar bed on 150 thick blinded type 1 base; including all necessary excavations, preparation etc

|           |        |    |   |        |                  |
|-----------|--------|----|---|--------|------------------|
| generally | 130.00 | m2 | @ | 250.00 | <u>32,500.00</u> |
|-----------|--------|----|---|--------|------------------|

119,177.00



**Levern Water Corridor**

Woodland area

Dense mix of trees, shrubs, bushes, etc;  
including removal of material off site;  
imported topsoil and granular soil improver  
etc

|           |            |    |   |       |              |
|-----------|------------|----|---|-------|--------------|
| generally | 127,638.00 | m2 | @ | 10.50 | 1,340,199.00 |
|-----------|------------|----|---|-------|--------------|

Woodland management; clearing and  
pruning etc as required

|           |           |    |   |      |            |
|-----------|-----------|----|---|------|------------|
| generally | 72,809.00 | m2 | @ | 2.00 | 145,618.00 |
|-----------|-----------|----|---|------|------------|

Grassland

Wildflower/british seed mix; grading and  
preparing existing soil

|           |           |    |   |      |                  |
|-----------|-----------|----|---|------|------------------|
| generally | 50,485.00 | m2 | @ | 1.00 | <u>50,485.00</u> |
|-----------|-----------|----|---|------|------------------|

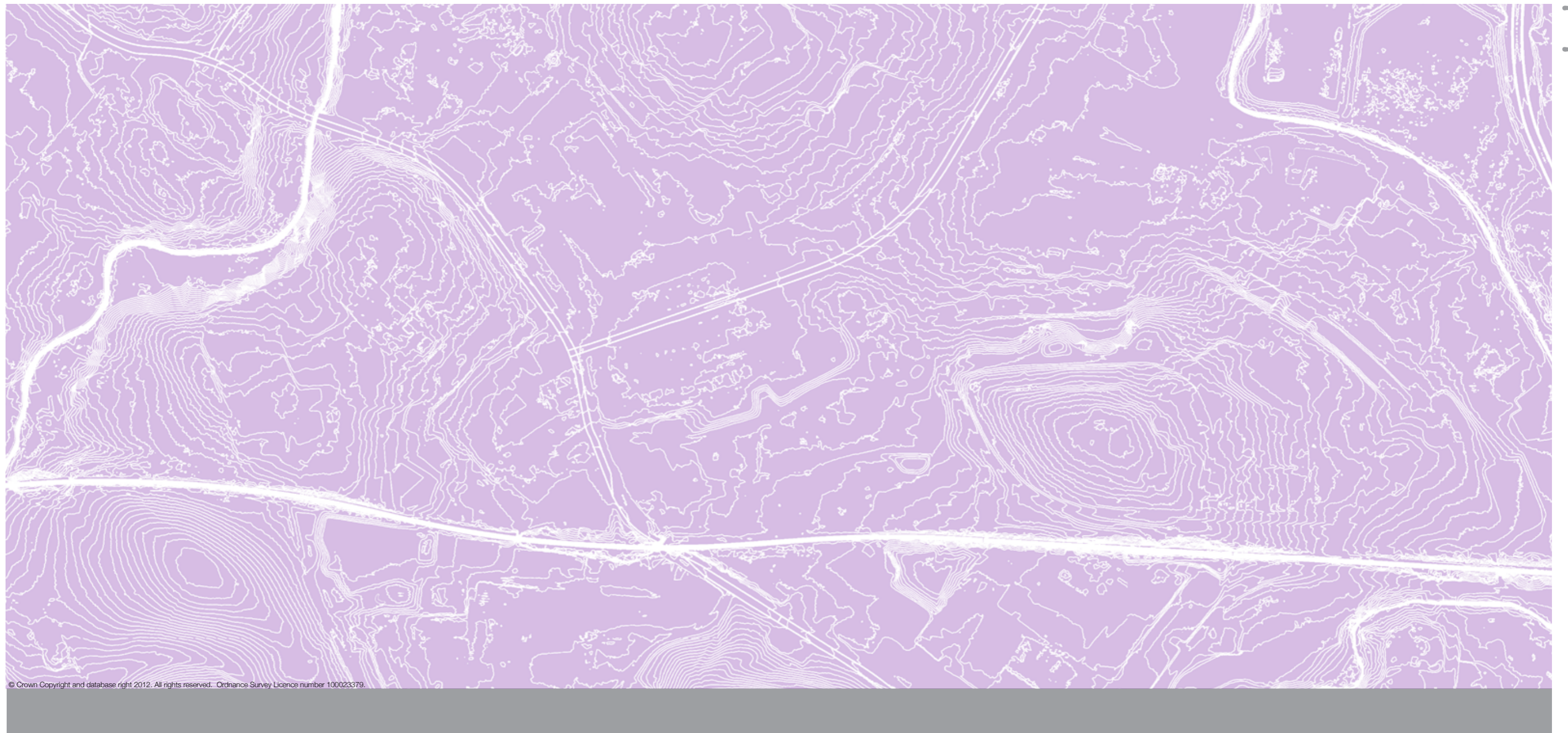
1,536,302.00

# outline costs

|   |                   |              |                       |              |
|---|-------------------|--------------|-----------------------|--------------|
| <b>Summary</b>  |                   |              | Levern Water Corridor | 1,536,302.00 |
| Neighbourhood Centre  |                   |              |                       |              |
| Nitshill Road Improvements  | 247,513.00        |              |                       |              |
| Civic Core to West of Nitshill Road   | 1,014,673.50      |              |                       |              |
| Housing to East of Nitshill Road  | <u>327,185.50</u> |              |                       |              |
|   | 1,589,372.00      | 1,589,372.00 |                       |              |
| Peat Road Corridor  |                   |              |                       |              |
| North - Road Improvement Works  | 87,050.00         |              |                       |              |
| North - Green Infrastructure  | 340,220.00        |              |                       |              |
| South - Road Improvement Works  | 119,550.00        |              |                       |              |
| South - Green Infrastructure  | 551,353.00        |              |                       |              |
| Community Garden  | <u>125,400.00</u> |              |                       |              |
|   | 1,223,573.00      | 1,223,573.00 |                       |              |
| Levern Water to Hartstone Wood Hill   |                   |              |                       |              |
| West of Peat Road: Housing Development  | 1,704,364.00      |              |                       |              |
| West of Peat Road: Public Realm Works   | 240,160.00        |              |                       |              |
| East of Peat Road: Public Realm Works   | 120,151.00        |              |                       |              |
| East of Peat Road: Landmark Project   | <u>100,000.00</u> |              |                       |              |
|   | 2,164,675.00      | 2,164,675.00 |                       |              |
| Darnley Mill to Museum Resource Centre  |                   |              |                       |              |
| Area 1:- Museum Resource Centre to Wiltonburn Road: Business Park Development | 117,650.00        |              |                       |              |
| Area 1:- Museum Resource Centre to Wiltonburn Road: Public Realm Works        | 783,322.50        |              |                       |              |
| Area 2:- Wiltonburn Road to Parkhouse Road                                    | 585,622.00        |              |                       |              |
| Area 3:- Darnley Mill/Dams to Darnley Country Park Entrance                   | <u>119,177.00</u> |              |                       |              |
|   | 1,605,771.50      | 1,605,771.50 |                       |              |







F

# hydrological calculations

## Appendix A – Nitshill Hydrological Calculations

Preliminary hydrological and geomorphological calculations have been undertaken to inform the development of the master plan. These are outlined below, along with the assumptions used in the calculations.

### Flow estimates summary

Peak flow estimates were calculated from 1 in 2 year to 1 in 200 year plus climate change using the Flood Estimation Handbook (FEH) rainfall-runoff method, as outlined in Table A 1 and Table A 2. It is emphasised that although the extreme event of 1 in 200 years plus climate change has been tested it is better practice and in keeping with Scottish Government directions to design to smaller events and cater for flood routing beyond these lesser events. Typically this could be the 1 in 30 year event. The calculations show however that the larger events can be handled by the proposals. Land take for flood attenuation and conveyance has not been detailed in the study but would be sized accordingly depending on required flood storage and routing requirements. There are no flow gauges within the catchments of Levern or Brock Burns. The QMED and low flow estimates were not required for the calculations carried out at this site. FEH calculation sheets are provided in Table A 3 to Table A 5.

Johns Burn formerly flowed through the site but is no longer an open watercourse. The flows presented in Table A 2 are based on the catchment area and catchment descriptors extracted from the FEH CD-ROM for this catchment and are influenced by the highly urbanised nature of the catchment (URBEXT 0.45).

Table A 1: Nitshill Flow Estimation Methods

| Parameter  | Method              | Location  |
|------------|---------------------|---|
| Peak flows | FEH rainfall-runoff | <ul style="list-style-type: none"> <li>Levern Water, to confluence with Brock Burn;</li> <li>Brock Burn, to confluence with Levern Water; and</li> <li>Johns Burn to confluence with Brock Burn.</li> </ul> |

Table A 2: Nitshill Flow Estimates

| Catchment    | Catchment Area (km <sup>2</sup> ) | Flows (m <sup>3</sup> /s) |       |
|--------------|-----------------------------------|---------------------------|-------|
|              |                                   | T2                        | T200* |
| Levern Water | 29.99                             | 19.3                      | 61.6  |
| Brock Burn   | 27.48                             | 17.1                      | 54.1  |
| Johns Burn   | 1.16                              | 3.6                       | 13.3  |

\* Climate change allowances are typically a 20% increase on the peak flow estimate

### FEH calculation sheets

Table A 3: Levern Water FEH calculation sheet

| Catchment Characteristics  |                   |             |             |             |             |             |             |             |
|--|-------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| AREA   | 29.99             | DPSBAR      | 81.90       | CWI         | 124         | D/Tp        | 2.418       |             |
| SAAR   | 1418.00           | DPLBAR      | 9.640       | URBEXT      | 0.085       | RLAG        | 0           |             |
| BFI  | 0.453             | PROPWET     | 0.610       | RC          | 0.37        | ARF         | 0.941       |             |
| Estimate Tp(0) and Unit Hydrograph                                       |                   |             |             |             |             |             |             |             |
| Tp(0)  | 2.88              |             |             |             |             |             |             |             |
| 20% Tp(0)  | 0.58              |             |             |             |             |             |             |             |
| ΔT   | 0.50              |             |             |             |             |             |             |             |
| Tp(ΔT)   | 3.13              |             |             |             |             |             |             |             |
| Up   | 21.11             |             |             |             |             |             |             |             |
| TB   | 7.88              |             |             |             |             |             |             |             |
| Calculation of Design Storm Duration D                                   |                   |             |             |             |             |             |             |             |
| D  | 7.56              |             |             |             |             |             |             |             |
| <b>D</b>   | <b>7.50 hours</b> |             |             |             |             |             |             |             |
| Rounded to nearest odd integer multiple of ΔT                            |                   |             |             |             |             |             |             |             |
| Unit Hydrograph Response (m <sup>3</sup> /s)                             |                   |             |             |             |             |             |             |             |
|  |                   |             |             |             |             |             |             |             |
| Summary of Design Storm Depths (P) and Peak Flows (Qt) for Design Storms |                   |             |             |             |             |             |             |             |
| Tf (return period flow) [years]  | 2.33              | 5           | 10          | 25          | 50          | 100         | 200         | 200+CC      |
| Tr (return period storm) [years]   | 2                 | 8           | 17          | 44          | 81          | 140         | 240         | -           |
| M(Tr)-(D)h(point) [mm]   | 30.1              | 42.6        | 50.3        | 61.6        | 70.2        | 78.8        | 88.3        | 106.0       |
| P (catchment) [mm]   | 28.3              | 40.1        | 47.3        | 58.0        | 66.1        | 74.2        | 83.1        | 99.7        |
| <b>Peak Flow Qt [m<sup>3</sup>/s]</b>                                    | <b>19.3</b>       | <b>26.9</b> | <b>32.7</b> | <b>41.0</b> | <b>47.5</b> | <b>54.1</b> | <b>61.6</b> | <b>73.9</b> |

Table A 4: Brock Burn FEH calculation sheet

| Catchment Characteristics  |                   |             |             |             |             |             |             |             |
|--|-------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| AREA   | 27.48             | DPSBAR      | 62.50       | CWI         | 124         | D/Tp        | 2.339       |             |
| SAAR   | 1339.00           | DPLBAR      | 8.650       | URBEXT      | 0.092       | RLAG        | 0           |             |
| BFI  | 0.445             | PROPWET     | 0.610       | RC          | 0.36        | ARF         | 0.942       |             |
| Estimate Tp(0) and Unit Hydrograph                                       |                   |             |             |             |             |             |             |             |
| Tp(0)  | 2.87              |             |             |             |             |             |             |             |
| 20% Tp(0)  | 0.57              |             |             |             |             |             |             |             |
| ΔT   | 0.50              |             |             |             |             |             |             |             |
| Tp(ΔT)   | 3.12              |             |             |             |             |             |             |             |
| Up   | 19.37             |             |             |             |             |             |             |             |
| TB   | 7.87              |             |             |             |             |             |             |             |
| Calculation of Design Storm Duration D                                   |                   |             |             |             |             |             |             |             |
| D  | 7.30              |             |             |             |             |             |             |             |
| <b>D</b>   | <b>7.50 hours</b> |             |             |             |             |             |             |             |
| Rounded to nearest odd integer multiple of ΔT                            |                   |             |             |             |             |             |             |             |
| Unit Hydrograph Response (m <sup>3</sup> /s)                             |                   |             |             |             |             |             |             |             |
|  |                   |             |             |             |             |             |             |             |
| Summary of Design Storm Depths (P) and Peak Flows (Qt) for Design Storms |                   |             |             |             |             |             |             |             |
| Tf (return period flow) [years]  | 2.33              | 5           | 10          | 25          | 50          | 100         | 200         | 200+CC      |
| Tr (return period storm) [years]   | 2                 | 8           | 17          | 44          | 81          | 140         | 240         | -           |
| M(Tr)-(D)h(point) [mm]   | 29.5              | 41.6        | 49.2        | 60.3        | 68.6        | 77          | 86.2        | 103.4       |
| P (catchment) [mm]   | 27.8              | 39.2        | 46.3        | 56.8        | 64.6        | 72.5        | 81.2        | 97.4        |
| <b>Peak Flow Qt [m<sup>3</sup>/s]</b>                                    | <b>17.1</b>       | <b>23.7</b> | <b>28.8</b> | <b>36.2</b> | <b>41.8</b> | <b>47.6</b> | <b>54.1</b> | <b>64.9</b> |

Table A 5: Johns Burn FEH calculation sheet

| Catchment Characteristics  |                   |            |            |            |             |             |             |             |
|--|-------------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| AREA   | 1.16              | DPSBAR     | 47.70      | CWI        | 124         | D/Tp        | 2.161       |             |
| SAAR   | 1161.00           | DPLBAR     | 1.240      | URBEXT     | 0.449       | RLAG        | 0           |             |
| BFI  | 0.42              | PROPWET    | 0.610      | RC         | 0.35        | ARF         | 0.946       |             |
| Estimate Tp(0) and Unit Hydrograph                                       |                   |            |            |            |             |             |             |             |
| Tp(0)  | 0.22              |            |            |            |             |             |             |             |
| 20% Tp(0)  | 0.04              |            |            |            |             |             |             |             |
| ΔT   | 0.10              |            |            |            |             |             |             |             |
| Tp(ΔT)   | 0.27              |            |            |            |             |             |             |             |
| Up   | 9.56              |            |            |            |             |             |             |             |
| TB   | 0.67              |            |            |            |             |             |             |             |
| Calculation of Design Storm Duration D                                   |                   |            |            |            |             |             |             |             |
| D  | 0.58              |            |            |            |             |             |             |             |
| <b>D</b>   | <b>0.50 hours</b> |            |            |            |             |             |             |             |
| Rounded to nearest odd integer multiple of ΔT                            |                   |            |            |            |             |             |             |             |
| Unit Hydrograph Response (m <sup>3</sup> /s)                             |                   |            |            |            |             |             |             |             |
|  |                   |            |            |            |             |             |             |             |
| Summary of Design Storm Depths (P) and Peak Flows (Qt) for Design Storms |                   |            |            |            |             |             |             |             |
| Tf (return period flow) [years]  | 2.33              | 5          | 10         | 25         | 50          | 100         | 200         | 200+CC      |
| Tr (return period storm) [years]   | 2                 | 8          | 17         | 44         | 81          | 140         | 240         | -           |
| M(Tr)-(D)h(point) [mm]   | 9                 | 13.7       | 16.8       | 21.7       | 25.4        | 29.3        | 33.7        | 40.4        |
| P (catchment) [mm]   | 8.5               | 13.0       | 15.9       | 20.5       | 24.0        | 27.7        | 31.9        | 38.3        |
| <b>Peak Flow Qt [m<sup>3</sup>/s]</b>                                    | <b>3.6</b>        | <b>5.4</b> | <b>6.6</b> | <b>8.5</b> | <b>10.0</b> | <b>11.5</b> | <b>13.3</b> | <b>15.9</b> |

### Greenfield Runoff Rates and Storage Volumes

A number of SuDS features are proposed for inclusion in the Nitshill master plan. The catchment area to each of these features was estimated using topographic data (Figure A 1) and the greenfield runoff rate calculated using IH124 (Table A 6 and Table A 7). An urban adjustment was not applied.



# hydrological calculations

Table A 6: Nitshill Greenfield Runoff Rat

| Feature | Description   | Catchment area (ha) | Greenfield Runoff (m³/s) |      |
|---------|---|---------------------|--------------------------|------|
|         |   |                     | T2                       | T200 |
| 1a      | Linear swale adjacent to Nitshill Road – northern section | 2.9                 | 0.02                     | 0.07 |
| 1b      | Linear swale adjacent to Nitshill Road – southern section | 4.6                 | 0.03                     | 0.11 |
| 2       | Open linear water feature along Woodhead Road             | 36.7                | 0.27                     | 0.87 |
| 3       | Open water feature at upstream extent of Peat Road        | 16.7                | 0.12                     | 0.40 |
| 4       | Linear swale adjacent to Dunside Drive                    | 13.8                | 0.10                     | 0.33 |
| 5       | Linear swale from Glenmuir Drive to Peat Road             | 8.2                 | 0.06                     | 0.20 |
| 6       | Linear wetland along Peat Road                            | 48.9                | 0.35                     | 1.16 |

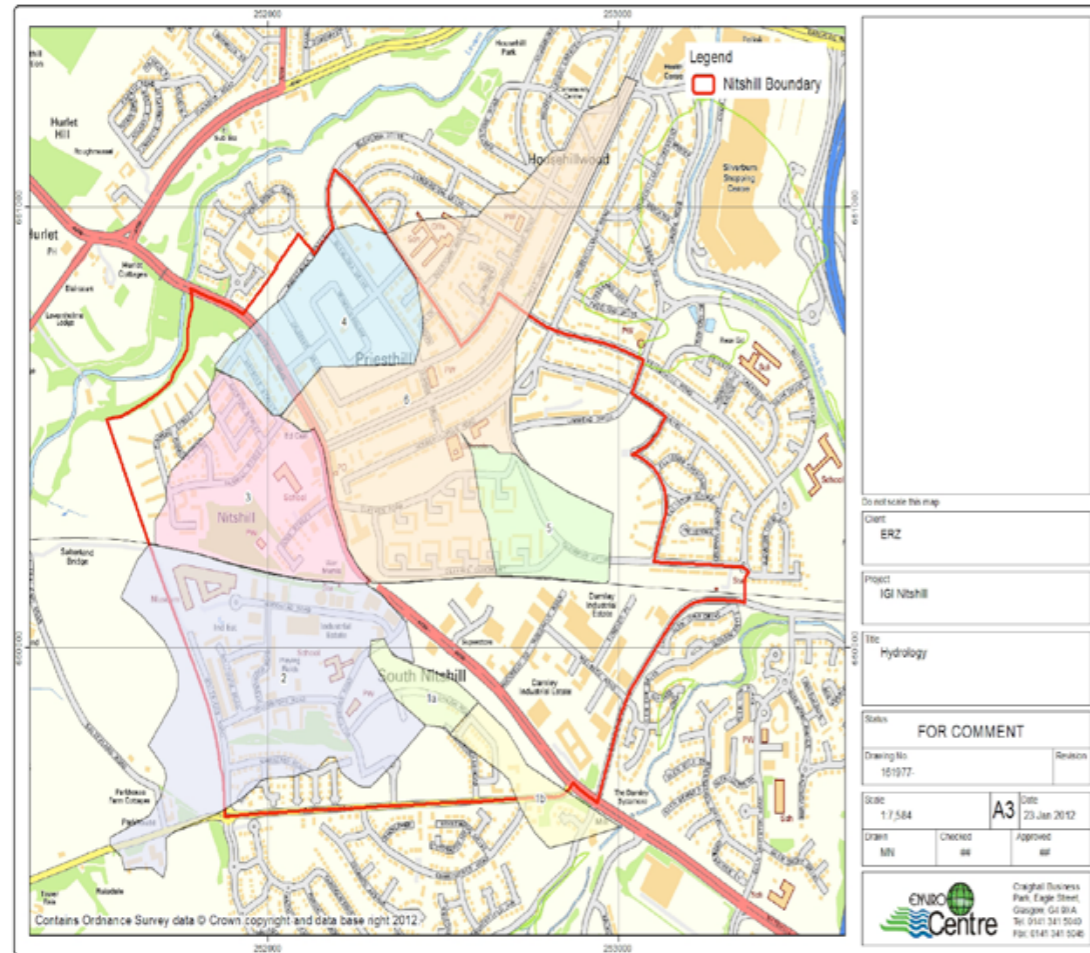


Figure A 1: Nitshill Catchments to Proposed SuDS Features

Table A 8: Nitshill Storage Volumes

| Feature | Catchments | Storage Volumes (m³) |               |                | Approx Length of Feature (m) | Storage Volume per meter length (m³) |      |
|---------|------------|----------------------|---------------|----------------|------------------------------|--------------------------------------|------|
|         |            | T2 Greenfield        | T30 Developed | T200 Developed |                              | T30                                  | T200 |
| 1a      | 1a         | 14                   | 52            | 92             | 295                          | 0.18                                 | 0.31 |
| 1b      | 1b         | 22                   | 82            | 146            | 500                          | 0.16                                 | 0.29 |
| 2       | 2 (+1a)    | 175                  | 658           | 1163           | 420                          | 1.60                                 | 2.80 |
| 3       | 3          | 80                   | 299           | 529            |                              |                                      |      |
| 4       | 4          | 66                   | 247           | 437            | 380                          | 0.65                                 | 1.15 |
| 5       | 5          | 39                   | 147           | 260            | 165                          | 0.89                                 | 1.58 |
| 6       | 6 (+3+4+5) | 233                  | 876           | 1550           | 1270                         | 0.84                                 | 1.55 |

Table A 7: Feature 1a IH124 calculation sheet

**Institute of Hydrology Report No.124 - Flood Estimation for Small Catchments (IH124)**

**Flow Calculation**

User Defined  
Calculated

**Project No.** 161977  
**Project Title** IGI Spango  
**Version No.** 1

**Calculation by:** HB Date: 16/04/2012  
**Checked by:** KMD Date: 17/04/2012

**Catchment:** Nitshill site - calculation of greenfield runoff rate Feature 1a

| Return Period (years) | Flow (m³/s) | Flow (l/s) | Flow (MI/d) |
|-----------------------|-------------|------------|-------------|
| 2                     | 0.02        | 21         | 1.81        |
| 5                     | 0.03        | 26         | 2.21        |
| 10                    | 0.03        | 33         | 2.83        |
| 25                    | 0.04        | 42         | 3.60        |
| 50                    | 0.05        | 50         | 4.32        |
| 100                   | 0.06        | 61         | 5.23        |
| 200                   | 0.07        | 69         | 5.97        |
| 200+cc                | 0.08        | 83         | 7.16        |

OS Grid Ref: Feature 1a

AREA: 2.9 Ha, 0.03 km²

SAAR: 1161 mm (From FEH CD-ROM / literature. NB SAAR for Johns Burn used)

SOIL: 0.45 (SOIL = 0.15 x (WRAP1) + 0.30 x (WRAP2) + 0.40 x (WRAP3) + 0.45 x (WRAP4) + 0.50 x (WRAP5) (See Winter Rain Acceptance Potential Map))

| WRAP Class | 1    | 2   | 3   | 4    | 5   |
|------------|------|-----|-----|------|-----|
| Factor     | 0.15 | 0.3 | 0.4 | 0.45 | 0.5 |
| Fraction   | 0    | 0   | 0   | 1    | 0   |

**QBAR<sub>rural</sub>**

QBAR<sub>rural</sub>: 0.40 m³/s (QBAR = 0.00108 \* AREA<sup>0.89</sup> \* SAAR<sup>1.17</sup> \* SOIL<sup>2.17</sup>)

if site is <50ha: 0.02 m³/s (Area Reduction: 0.06 (ratio of size of site to 50ha))

Hydrometric Area: 2 (See map opposite for hydrometric areas within Scotland)

Growth Curve Factors

| Region                            | Hydrometric Area | Return Period |      |      |      |      |      |      |      |
|-----------------------------------|------------------|---------------|------|------|------|------|------|------|------|
|                                   |                  | 2             | 5    | 10   | 25   | 50   | 100  | 200  | 500  |
| N Scotland                        | 1                | 0.9           | 1.2  | 1.45 | 1.81 | 2.12 | 2.48 | 2.8  | 3.25 |
| S Scotland                        | 2                | 0.91          | 1.11 | 1.42 | 1.81 | 2.17 | 2.63 | 3    | 3.45 |
| Q <sub>return period</sub> (m³/s) |                  | 0.02          | 0.03 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 |

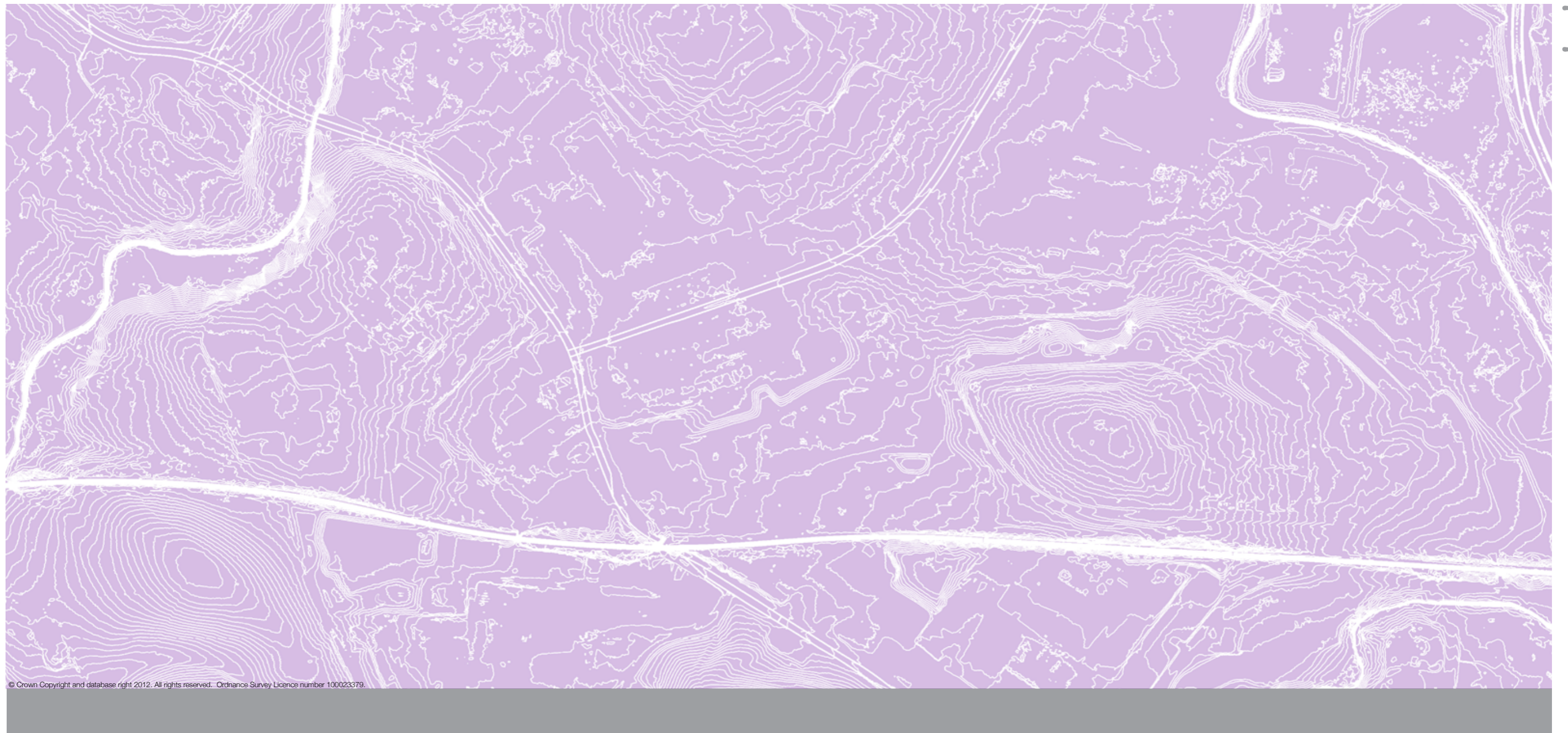
(Growth factors and hydrometric areas taken from CIRIA SUDS Manual C697)

The storage volume required for each feature has been calculated based on a 60 minute design storm duration and attenuation to greenfield conditions (1 in 2 year return period - T2), assuming 100% impermeability following development (Table A 8). A volume per unit length of each feature has then based calculated, based on approximate lengths. The SuDS features are designed as a management train, and as such the T30 (or T200) storage volume has been used for the catchment draining directly to the feature, plus the T2 greenfield volume for any additional catchments draining to it that have a SuDS feature upstream providing attenuation.



appendices

list of consultees





# list of consultees

## local area steering group

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Glasgow City Council  
Gillian Black - Planner  
Donna Brooks - Land and Property Development  
Eddie Warde - Housing Services  
David McAllister - Development Plan, DRS  
Pete Miller - Greenspace, land and environment services  
Mic Ralph - Roads, land and environment services

## executive steering group

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Iain Gilzean - Scottish Government  
Les Watson - Scottish Environment Protection Agency  
Diarmaid Lawlor - Architecture and Design Scotland  
Jeremy Osborne - Metropolitan Glasgow Strategic Drainage Partnership  
Doug Buchan - Scottish Water  
Tom Lindsay - Metropolitan Glasgow Strategic Drainage Partnership  
Deborah Sandals - Scottish Natural Heritage