gcv green network

Integrated Green Infrastructure Design Study

Spango Valley: Inverclyde

INTERREG IVC
INNOVATION & ENVIRONMENT
REGIONS OF EUROPE SHARING SOLUTIONS

international resources and recycling institute

Client:

The Glasgow &
Clyde Valley Green Network Partnership

Lead Consultant:

erz Limited

Landscape
Urbanism
Design
Strategy

Consultants:

The EnviroCentre

Armour Construction Consultants

Funding Partners

Europe

InterReg

International Resources & Recycling Institute

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contents:

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

The Scottish Government

preface


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introduction:

Erz Limited were appointed by the Glasgow and Clyde Valley Green Network Partnership 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. 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 directed by 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 area is focused on the former IBM site, but considers the wider Spango Valley, to the immediate south-west of Greenock.

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 Spango Valley 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, patterns of movement, anticipated change and 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:

- The Spango Burn is the main watercourse flowing through the site and it has been heavily modified throughout the site.
- There is extensive impermeable surfacing over the site area & large roof areas increasing the rate of flow / return of water falling on site (circa 10% of the total Spango Burn flow).
- Sections of the Spango Burn and its tributaries are culverted through the site.
- Tributaries demonstrate a sharp gradient change (esp. to the southern site edge - Hole of Spango etc.) increasing the risk of blockage of culverts.
-

Access & movement:

- Spango Valley represents a break between the main body of Clyde Muirshiel Regional Park and its western extent to Lunderston Bay.
- There is a lack of east-west connection within the existing core path network.

Anticipated change:

- The site is the subject of proposals for significant potential change. The site is split into 3 ownerships. Within each ownership intentions or proposals for development are at different stages. The Scottish Prison Service site has committed proposals for the construction of a new prison. The Highcross site is the subject of an outline development masterplan. There are presently no defined development intentions for the Sanmina site.

Habitat & ecological systems:

- The Spango Burn and various of its tributaries, including the Hole of Spango are culverted through the site. This breaks habitat connectivity: the site becomes a barrier rather that a pathway in ecological and habitat terms.
- Inverclyde Biodiversity Action Plan lists the following priority habitats that may be relevant to this area: rivers and standing water, unimproved grassland, dwarf heath shrub, mires and open standing water. In addition, there may be opportunities to enhance the area for the following priority species: greater and lesser butterfly orchids, spignel, common juniper and otters. These findings have informed the development of a series of strategic goals for the site and the development of an integrated green infrastructure masterplan for the site.

The strategic goals and the masterplan are outlined over the following pages.

The outputs of the study, 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.

Strategic goals:

1. Enhance the watercourses through the site.

- improve the channel condition of the Spango Burn
- daylight the culverted sections of the Spango Burn and its tributaries
- enhance the habitat value of the watercourses

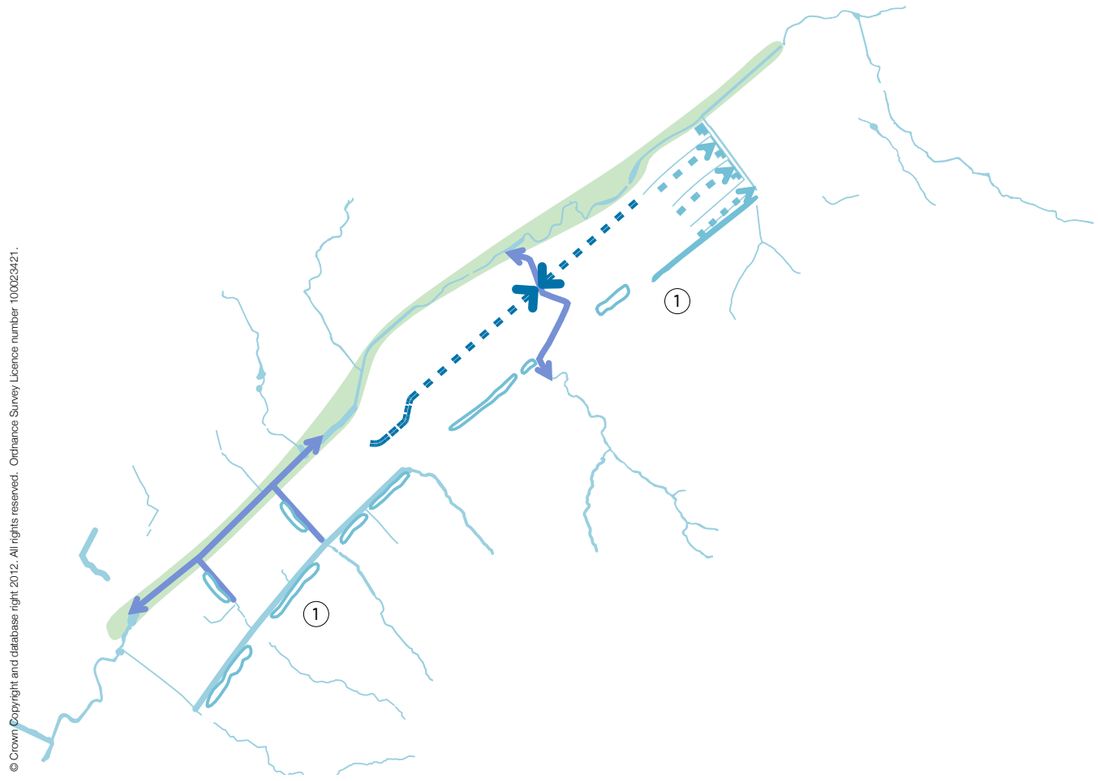
2. Improve the SUDs functioning of the site.

- refit and renew buildings & surfaces to enhance SUDs function as part of the ongoing programme of site development and maintenance work. This will include a phased increase in permeable surface and integration of SUDs features within existing layouts. Refurbishment of buildings should include water management features, for example the integration of green roofs where possible.
- redevelopment proposals should positively integrate SUDs function as a core part of the masterplanning process

3. Integrate the site into wider access and habitat networks and form green network links across the site.

- form an east-west green network link across the site to better connect the eastern and western portions of the Clyde Muirshiel Regional park.
- emphasise the rail station as a point of arrival to the Greenock Cut & Clyde Muirshiel Regional Park. Notably it is only a 500m walk from the rail station, parallel to the Hole of Spango to reach the Greenock Cut.
- form a legible pedestrian route along the Spango Burn corridor - forming a link north-south through the site.
- Create habitat network connections across the site using the watercourses

executive summary:



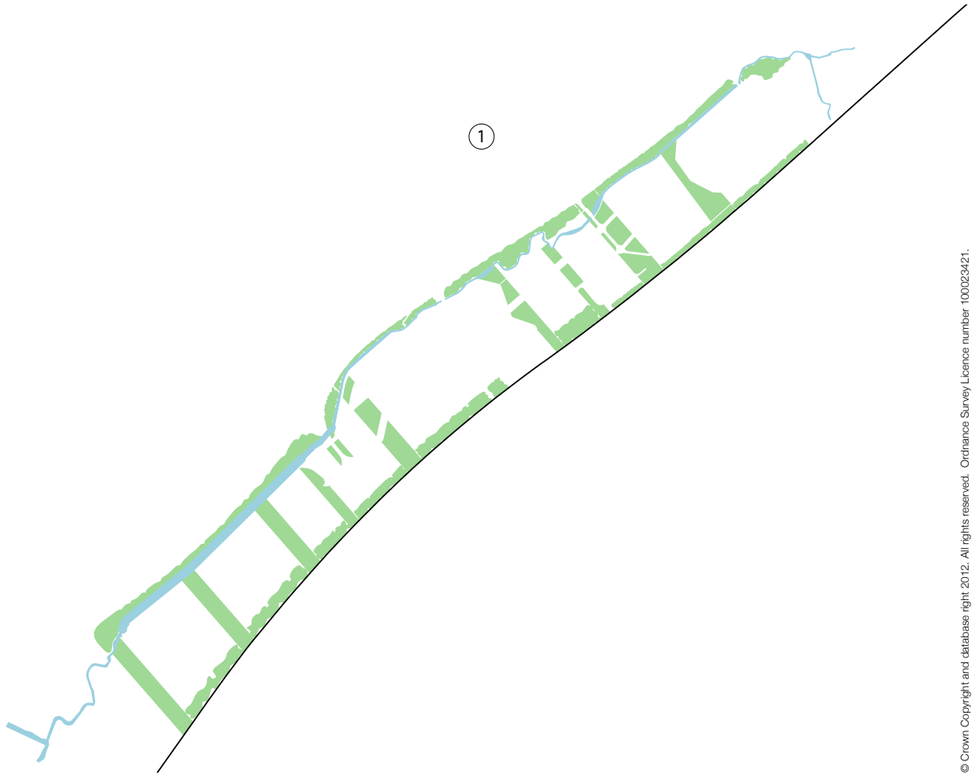
water management strategy

- daylighting / reforming of Hole of Spango burn (within Highcross site)
- daylighting / reforming of Spango Burn & tributaries (within Sanmina site)
- creation of linear wetland (within Highcross site)
- swales & ponds associated with proposed housing

1. swales, retention features to upper edge of site

The proposals associated with the watercourses and water management on site include the daylighting and restoring reaches of the Spango Burn and its tributaries as identified above. This will include the channel, connection with local floodplain and riparian zone habitat. Additional water management features such as swales and ponds are integrated into the planted framework across the site. Within the Highcross site, 2 main features are proposed: the creation of a linear wetland associated with the main spine road through the site and the reforming of the Hole of Spango. The daylighting and restoration of corridors alongside the watercourses will improve the flood dynamics across the site. It will not prevent flooding, but can be designed to reduce the overall flood risk by encouraging it without adversely impacting the existing built development.

This approach of creating a natural channel with adjacent floodplain will not only improve water management, but also satisfy a number of IGI objectives including improved biodiversity corridor, access routes alongside the burn and reduced maintenance requirements. The extent of flooding can be managed within the detailed design and areas if the site can be developed.



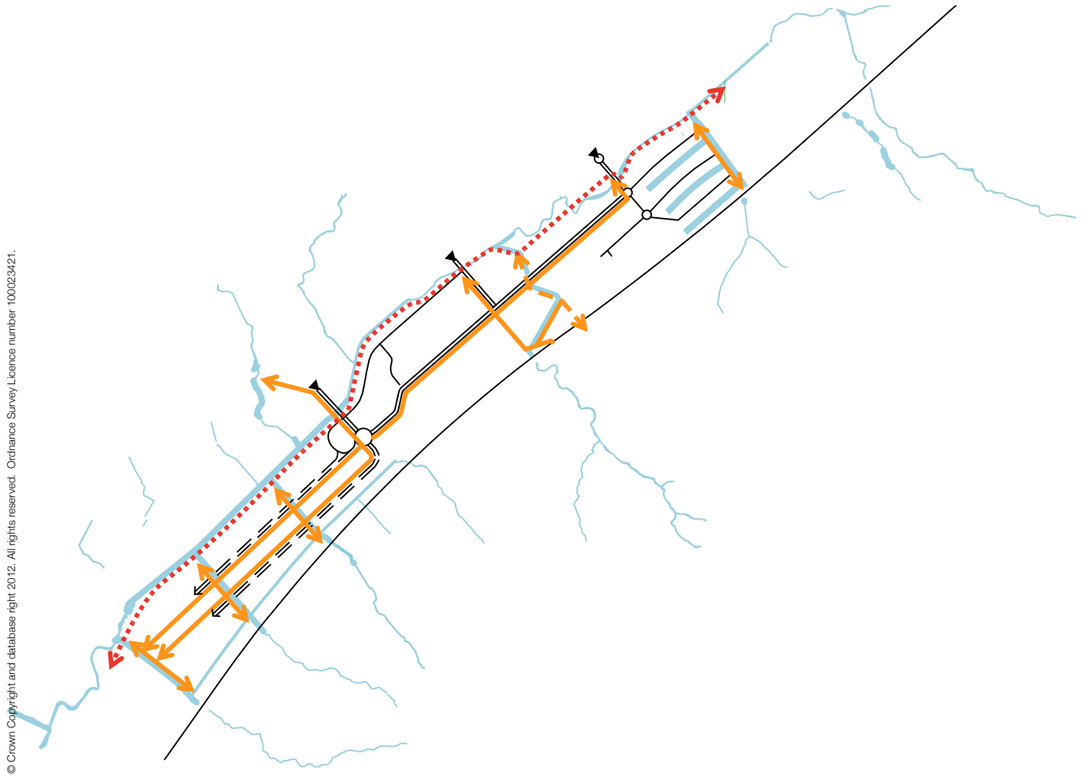
spatial subdivision / compartmentalisation of site

1. proposed woodland framework

A core principle of the proposed masterplan is of spatial subdivision / compartmentalisation of the site. It is proposed that this is achieved through a robust framework of woodland and structural tree planting. This framework can accommodate many of the access and water management features in a coherent and legible manner.

It is also thought that this approach will benefit the character and flexibility of the site in development terms. The stated development intentions will result in a mix of uses across the site, which are likely to be developed in a phased manner. This spatial subdivision of the site helps to manage the relationship between uses in the longer term and to manage conflicts between ongoing development and active parts of the site.

executive summary:



movement: vehicular & pedestrian

- pedestrian route linking across site following Hole of Spango burn & linking to Greenock Cut
- other pedestrian links across site incorporated within landscape belts
- continuous pedestrian route created along enhanced Spango Burn corridor
- pedestrian routes associated with vehicle circulation spine

The vehicular circulation network within the site is broadly as proposed within the outline Highcross development plan. Localised modification has been proposed in the northern portion of the site (proposed housing area). As indicated, there is flexibility in the location of vehicle access routes in the Sanmina portion of the site.

Pedestrian routes are identified including the strategic links across the site associated with the Spango Burn and the Hole of Spango. Within the site, links across the site (north-west / south-east) are focused within the planted / woodland belts that subdivide the site. Pedestrian movement south-west / north-east (the long dimension of the site) is associated with the main spine roads through the site. It is proposed that these are treated as ‘boulevards’ - the linear wetland, and avenue tree planting creating a high quality pedestrian route.

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 green space when it is of a scale and level of interest can become a 'destination' in its own terms. However, within an urban area, much green space 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 environments.

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: NHS
- environmental agencies such as: SNH / 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 aims 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: '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 co-ordinate and inform the actions of a range of agencies and partners.

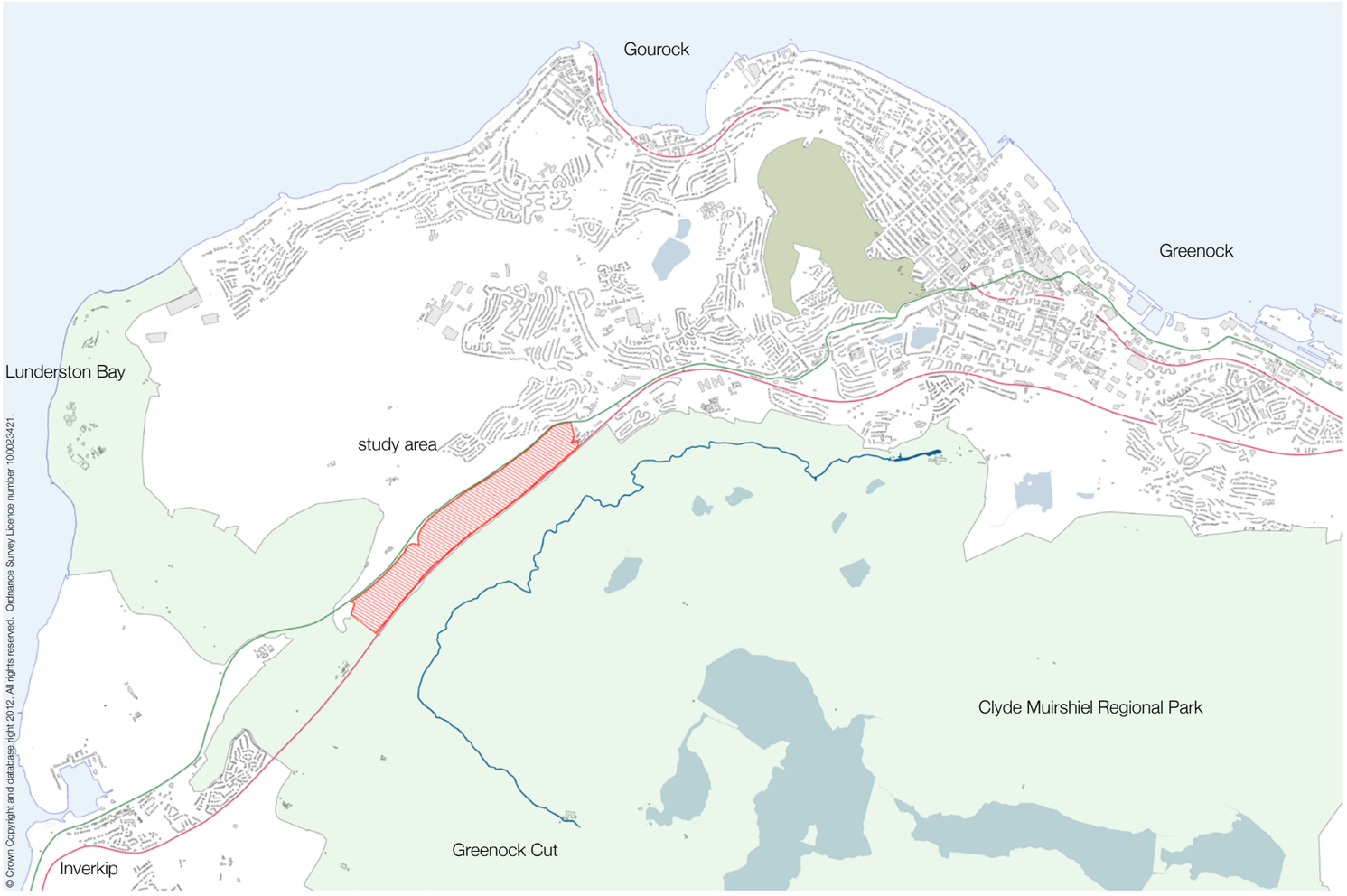
Through the evolution of a co-ordinating design response at a strategy level, it enables a common dialogue to take place that can meaningfully engage the community in the shaping of proposals.

- 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

site / development context



wider context

The study area is located to the immediate south west of Greenock.

The core site is bounded to the west by the A78 and to the east by the rail line to Wemyss Bay.

The site lies to the immediate western edge of the core area of Clyde Muirshiel Regional Park.

The Greenock Cut runs broadly parallel to the eastern site boundary.

site / development context

the spango valley - taken from Flatterton Road

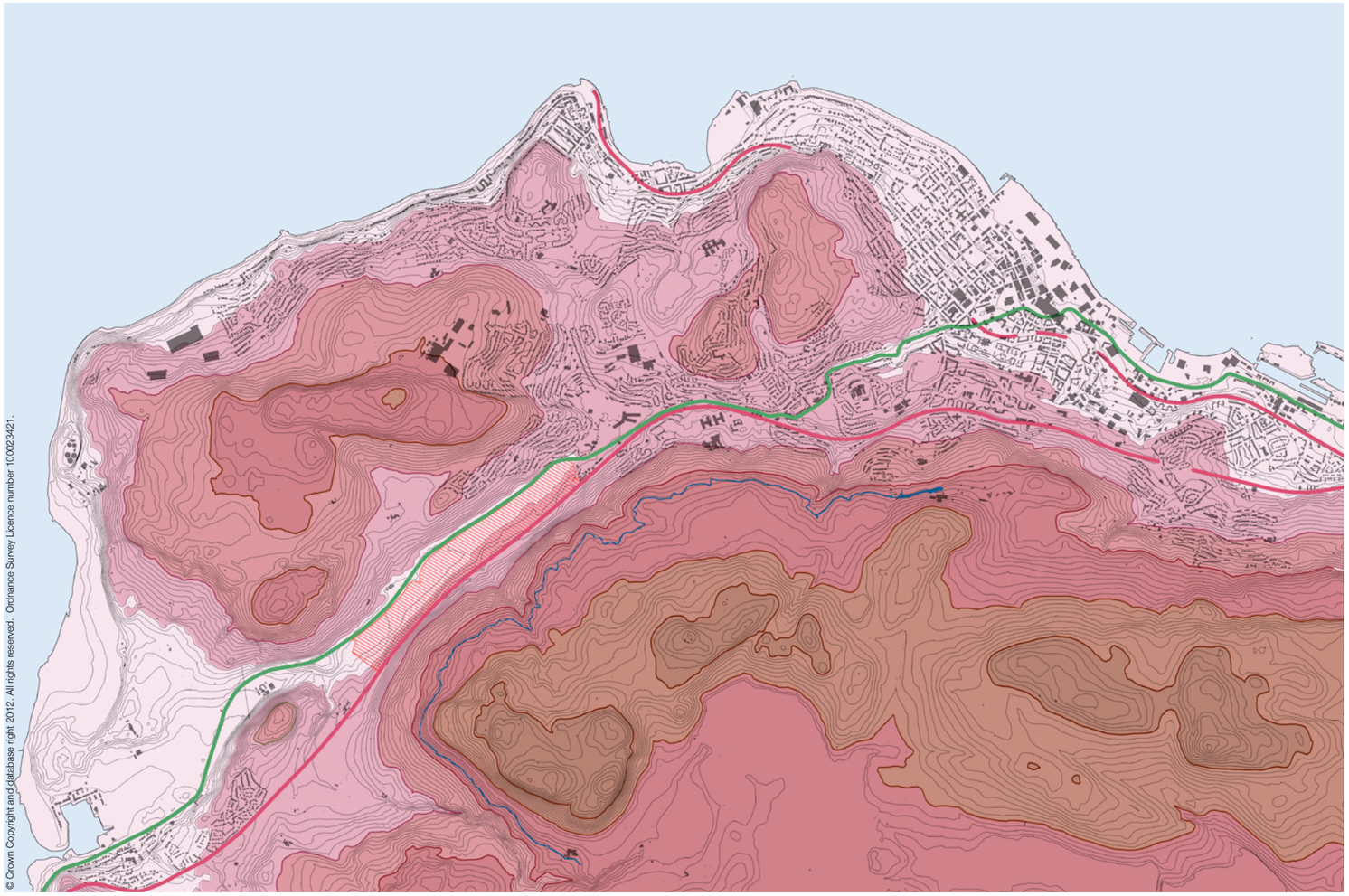
The core site sits within the well defined Spango Valley. The site was home to the large former IBM plant. Some parts of the site are still active, whilst other land and buildings are disused or have been cleared.

analysis

geomorphology / hydrology:

B

geomorphology / hydrology:



topography - elevation

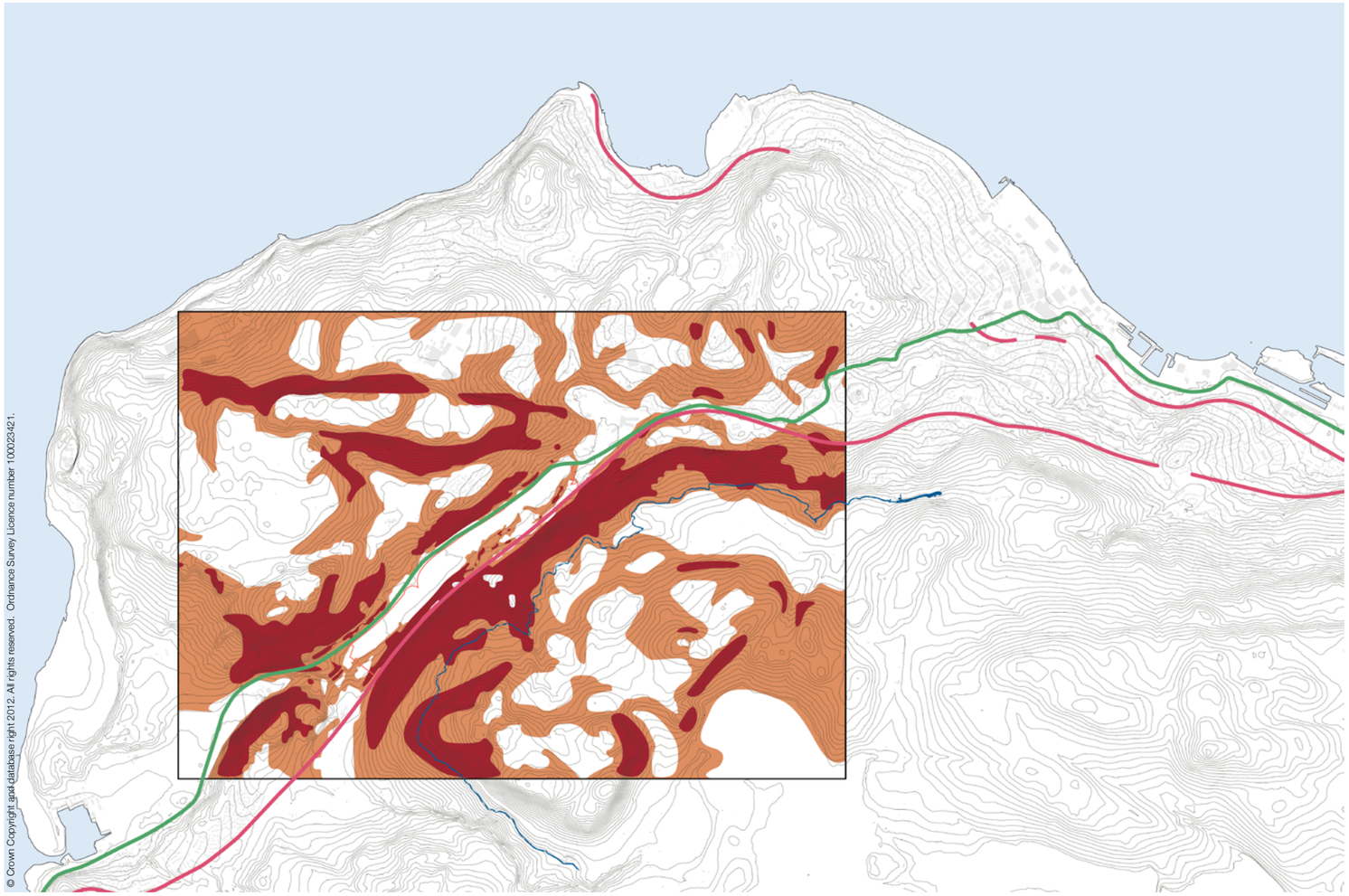
- 0 - 50m
- 50 - 100m
- 100 - 150m
- 150 - 200m
- 200 - 250m
- 250 - 300m

A graphic analysis of topography highlights the strongly defined Spango Valley which is orientated broadly North-East – South-West.

The valley floor lies at an elevation of roughly 50m – cutting through upland which rises to an elevation of 250-300m. The valley is a strong landscape / topographical feature.

The valley, which is a focus for transport routes, forms a strong gateway to the urban area of Inverclyde approaching from the south.

geomorphology / hydrology:



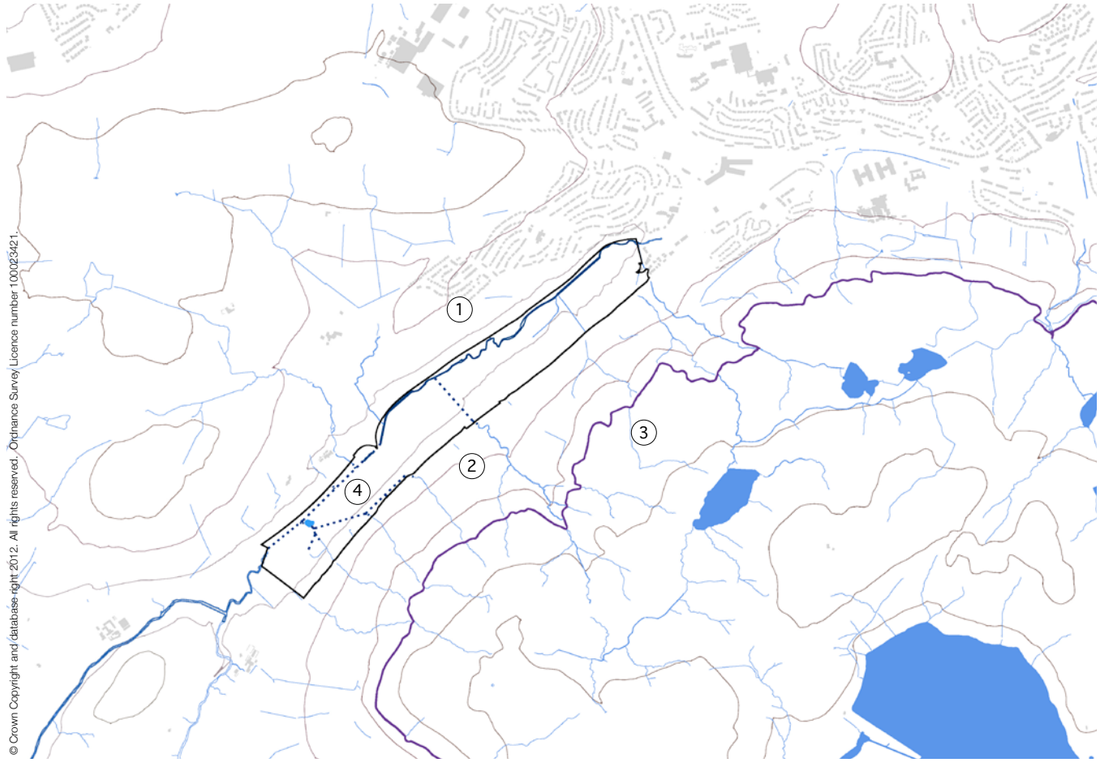
topography - slope

- 1:5 or steeper
- 1:5 to 1:10
- 1:10 or shallower

A graphic analysis of slopes highlights the steepness of the valley sides – most notably to the eastern / southern valley edge.

The two sides of the valley are of significantly different character. This difference arises primarily from the relative steepness of the valley sides & their orientation. The northern valley edge is of agricultural character (with field boundaries & shelter belt planting); whilst the southern edge has a ‘wilder’ character (primarily moorland, bare rock & natural pioneer woodland).

geomorphology / hydrology:

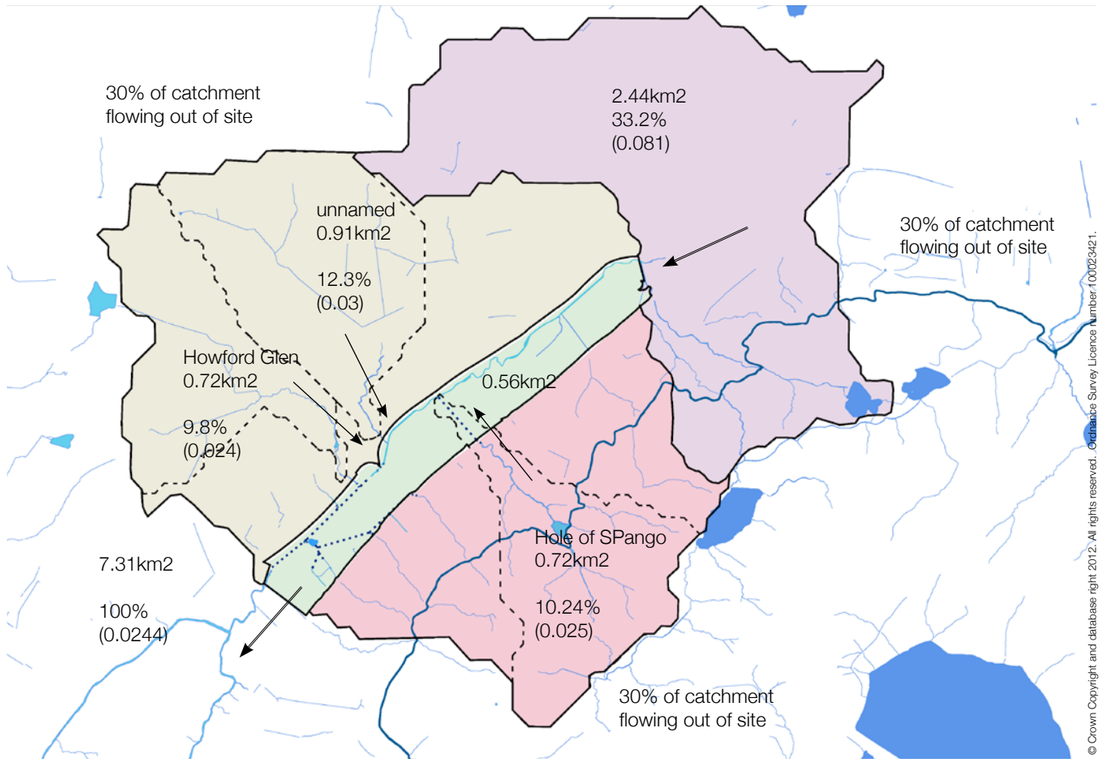


hydrology - baseline

1. Spango Burn
2. Hole of Spango
3. Greenock Cut
4. culverted watercourses

The Spango Burn is the main watercourse in Spango Valley, flowing to the south-west. The Hole of Spango is one of the major tributaries to the Spango Burn and flows down the steeply sloped south-east side of the Valley.

The Greenock Cut aqueduct (a Scheduled Ancient Monument) runs broadly parallel to the eastern / southern site boundary. Notably. a sluice from the Greenock Cut opens into the Hole of Spango.



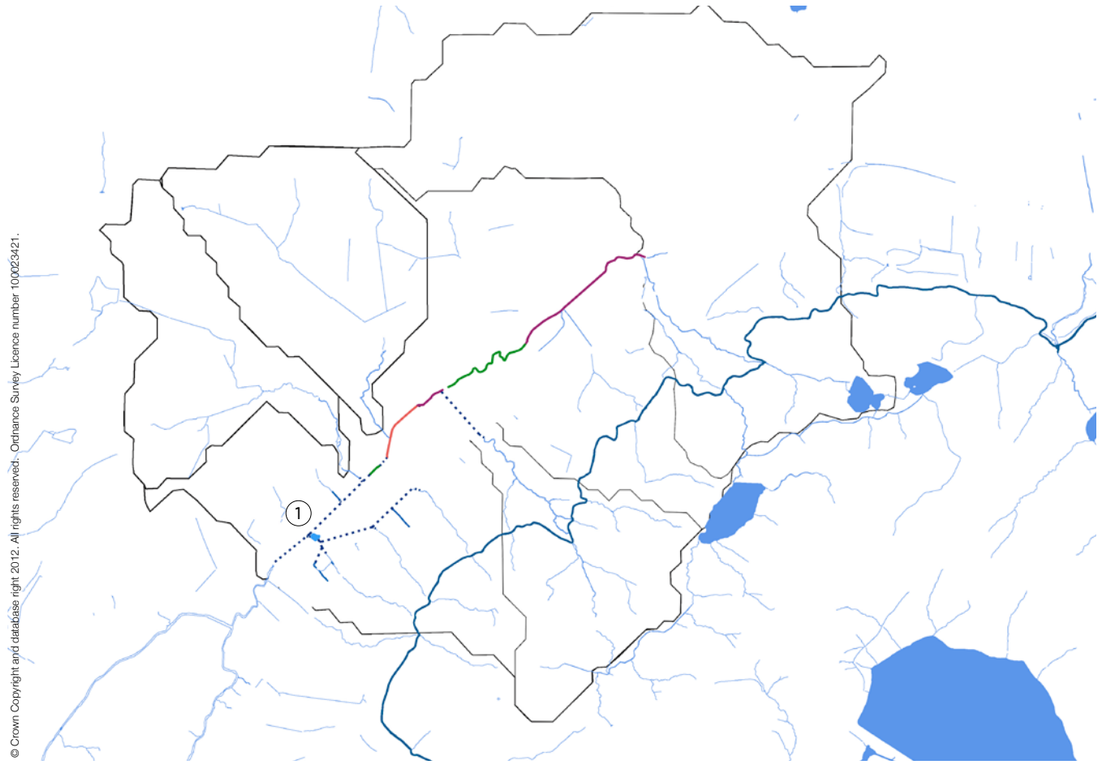
hydrology - catchments

- larchfield/ branchton
- SE catchment
- NW catchment
- site

Key: xx km2 - sub-catchment drainage area, xx% - percentage flow contribution to outflow from Spango site, (xx)m3/s - Mean Annual Flow

The contribution of flows to the Spango Burn as it flows out of the site are approximately 10% from the site itself and 30% each from the upstream inflow, and inflowing tributaries from the North-Western and South-Eastern boundaries to the site.

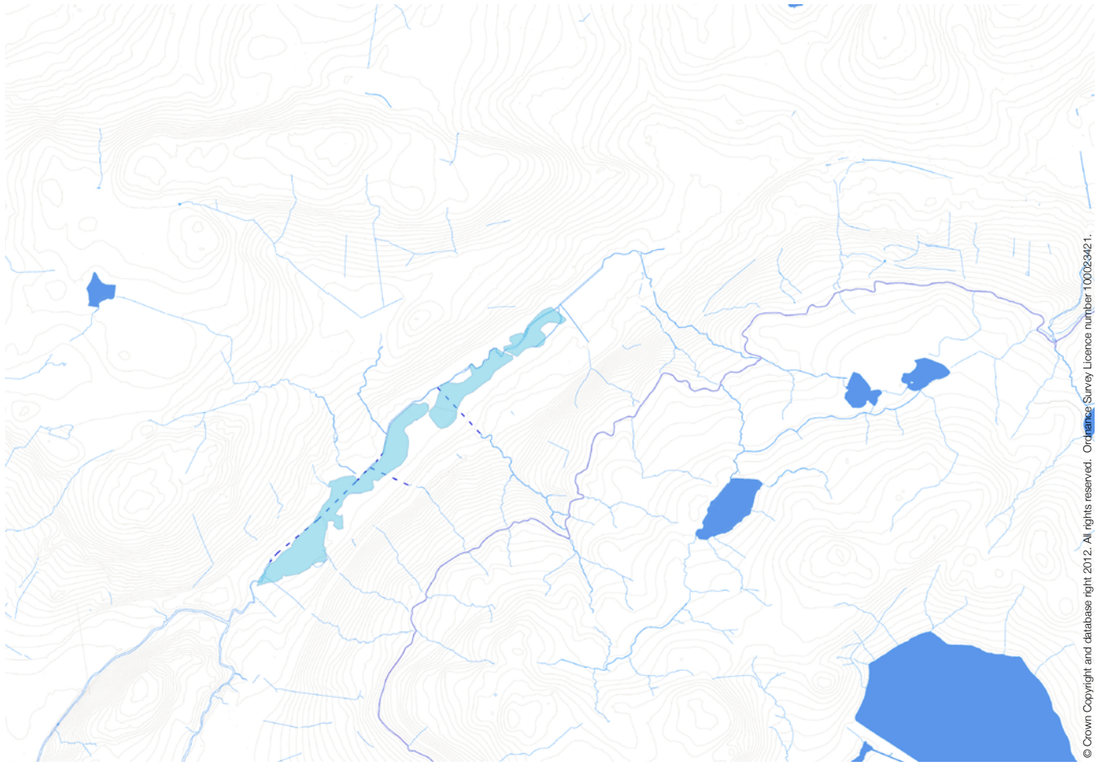
geomorphology / hydrology:



hydrology – channel type

- modified channel
- natural channel
- concrete channel
- culvert locations
- 1. pond / water feature

Inspection of the Spango Burn reveals that it has been heavily modified though realignment, engineered bank works and culverting. Tributaries to the Spango Burn, have been culverted as they cross the site. The reduction in bed gradient of tributaries around the culvert entrances (notably the Hole of Spango) increases the risk of blockage from sediment and debris within the channel.



hydrology – flooding issues

- SEPA 1 in 200 year return period flood extent

The SEPA flood map is based on large catchment scale mapping and is indicative without a detailed flood risk assessment given the extent of channel modification and culverting to the Spango Burn.

The Hole of Spango is known to be at risk of flooding at the entrance to the culvert, as the site visits undertaken in December 2011 witnessed. However this is not shown on the SEPA flood map as the catchment area is <3km2 which is the threshold for the mapping.

All of the smaller tributaries which are culverted under the site will have an associated flood risk, which will be mainly associated with potential blockages to the culverts due to sediment and debris.

geomorphology / hydrology:

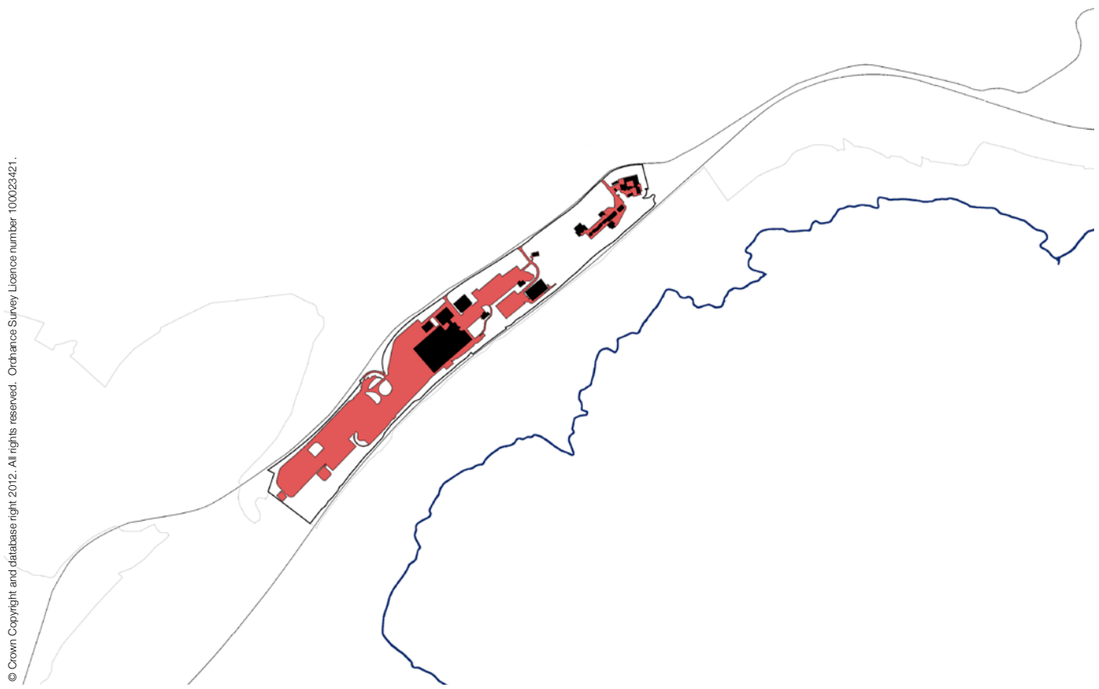
issues with culvert

Flooding issues were observed on site (01/12/2011), associated with the start of the Hole of Spango culvert.

Spango Burn Channel

As described on the previous page the channel condition of the Spango Burn varies considerably.

geomorphology / hydrology:



hydrology – on site impermeable surface

impermeable surface

buildings

A large proportion of the site has impermeable surfaces or roof cover.

This results in a rapid rate of flow / return of surface water from the site to the drainage system and watercourse.

As noted, surface water from the site represents approximately 10% of the total flow of the Spango Burn.

geomorphology & hydrology - summary

- Spango Valley is a strongly defined, steep sided valley.
- The Spango Burn has been heavily modified through the site.
- There is extensive impermeable surfacing over the site area & large roof areas increasing the rate of flow / return of water falling on site (circa 10% of the total Spango Burn flow).
- Sections of the Spango Burn and its tributaries are culverted through the site.
- Tributaries demonstrate a reduction in gradient as they enter the site increasing the risk of blockage of culverts.
- A sluice from the Greenock Cut opens into the Hole of Spango which could potentially alter natural flows, depending upon how it is managed.

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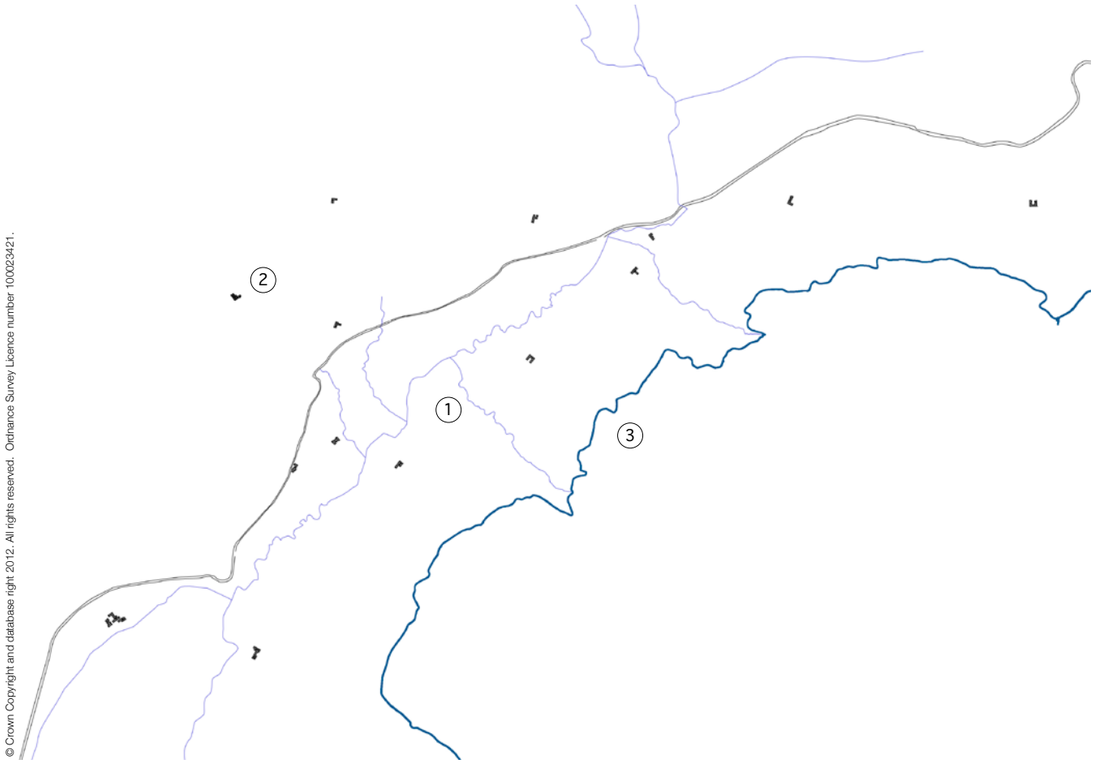
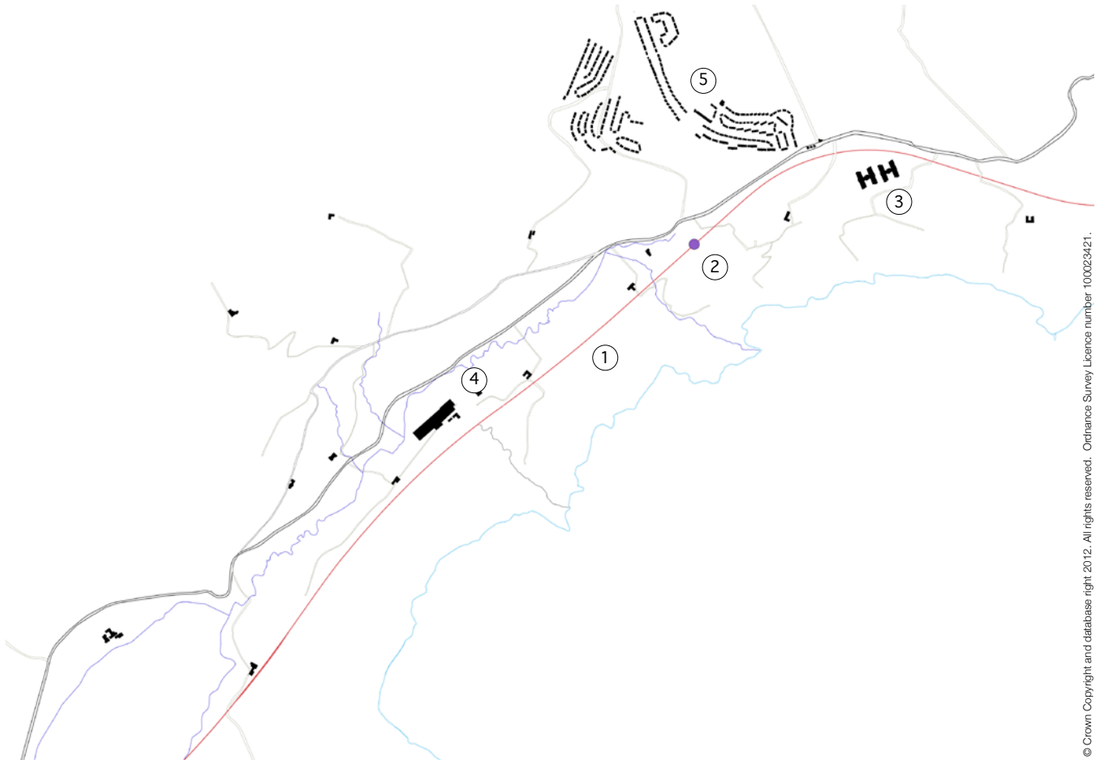
urban structure: process of change



historical development -1747 / 1827

1. Spango Burn
2. farm dwellings
3. Greenock Cut (constructed 1827)

The early settlement of the Spango Valley was in the form of scattered farm dwellings in the lower part of the valley. The road through the valley skirted to the north of the Spango Burn and its major tributaries. The Greenock Cut was constructed on the eastern / southern side of the valley in 1827.



historical development – 1950's plan

1. Greenock/Wemyss Bay rail line: 1865
2. Ravenscraig Station: opened 1865 / closed 1944
3. Ravenscraig Hospital: 1875
4. IBM factory: 1951
5. Housing estates: 1954

Through the 19th and early 20th centuries, Spango Valley saw the realignment of the main road closer to the Spango Burn and the construction of the Greenock / Wemyss Bay rail line and associated stations. The IBM factory was constructed in 1951 and housing estates extended into the northern portion of the valley.

urban structure: process of change

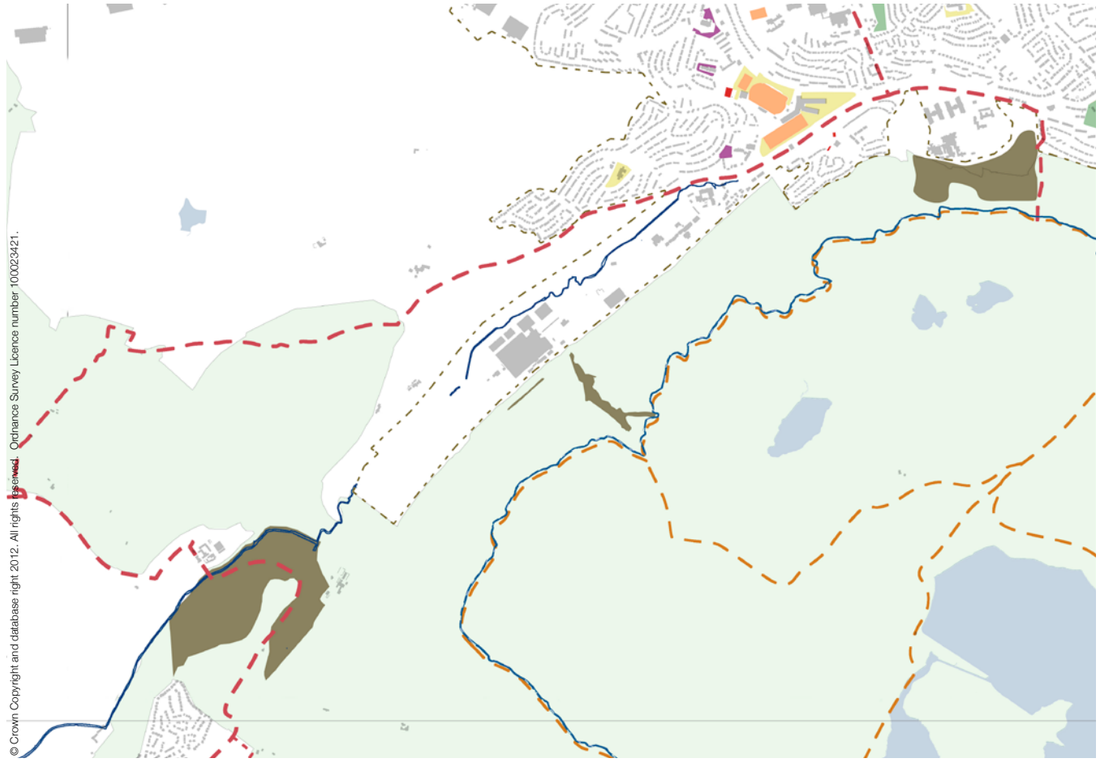
historical development - current

1. Branchton rail station – 1965
2. IBM rail station – 1978
3. Dual carriageway upgraded – 1984
   expansion of IBM plant & residential development

The latter part of the 20th century saw the expansion of the IBM plant, expansion of housing to the north and the upgrading of transport infrastructure including the dual carriageway and the creation of new rail stations including the bespoke IBM station.

More recently in the early 21st century, the IBM presence on the site has contracted, with currently partial use of the site and the clearance of land and buildings.

urban structure: the green network routes and spaces



green network – routes & spaces

- Clyde Muirshiel Regional Park
- woodland
- sports pitches
- church grounds
- schools
- play
- public open space
- core paths
- core paths in CMRP

Sitting on the edge of the urban area Spango Valley extends out into the rural landscape to the south-west of Greenock. Developed green spaces/ facilities are located some distance away within the urban area.

The Clyde Muirshiel Regional Park forms boundaries to over half the Spango Valley site. The CMRP is one of the largest regional parks in Scotland and a significant focus for outdoor activities and recreation in Inverclyde.

Spango Valley represents a break between the main body of Clyde Muirshiel Regional Park and its western extent to Lunderston Bay.

There is a lack of east-west connection within the existing core path network.

green network – wider landscape

The wider study area demonstrates a high quality rural landscape setting to the south. As shown in the image above along Dunrod Road and looking towards Dunrod Hill.

green network – Greenock Cut

The Greenock Cut is a Scheduled Ancient Monument and a significant heritage / cultural feature in Inverclyde. The Greenock Cut offers an excellent level walk with coast & mountain views. It is a key feature within Clyde Muirshiel Regional Park.

'The Cut' as it is locally known is significant because;

'The monument is intimately linked to industrial progress and expansion in Greenock. It was the main conveyor of water to the town for over 150 years and its ability to satisfy the demand of a growing industry contributed to the success story of the town during this period.' (Historic Scotland, Scheduled Monuments)

The cut was managed with a series of innovative sluices and overflows. A few masonry sluice houses remain along the walk.

'The monument informs our understanding of a large and innovative scheme to manipulate the landscape to harness rainwater and to provide a water supply. The monument has the potential to further our understanding of the architecture and the construction techniques used to build the aqueduct, reservoir and associated sluices. The monument also has the capacity to further our knowledge of the way in which the system was designed to control and direct large volumes of water around the landscape using inter-related elements and the force of gravity.' (Historic Scotland, Scheduled Monuments)

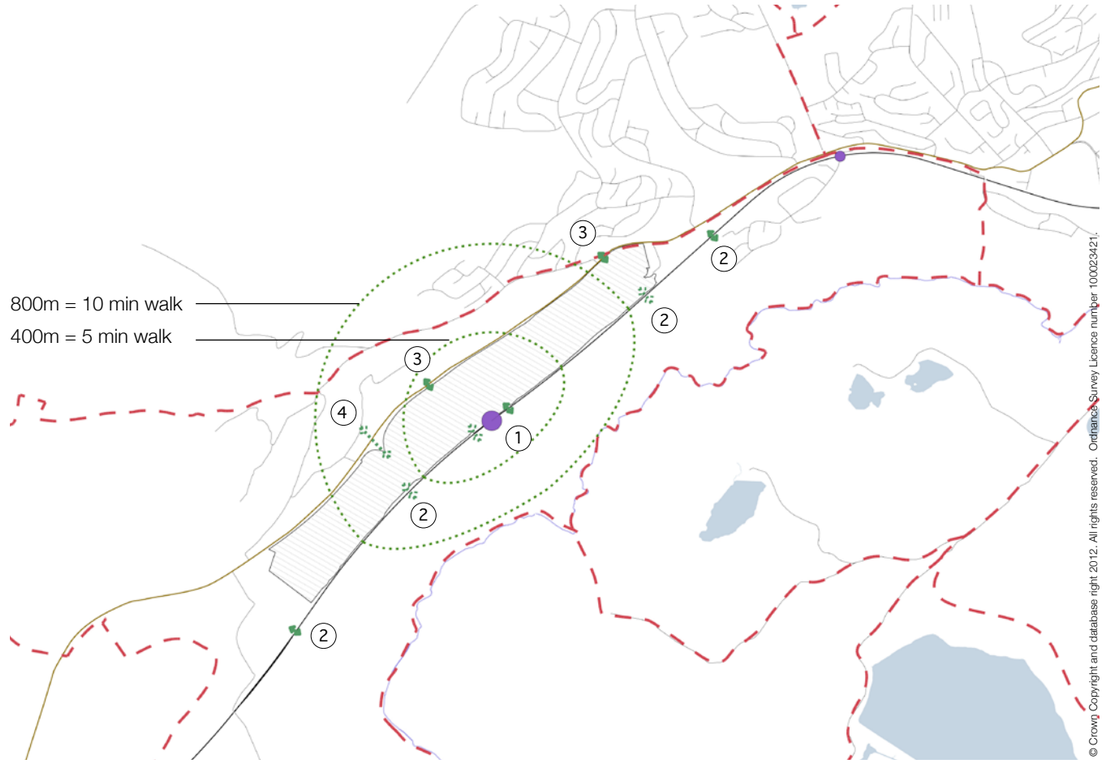
B

urban structure: access / movement

vehicular access & connectivity

- trunk road – A78
- 1. overpass vehicular access
- 2. junction vehicular accesses
- connecting roads
- local access/loop roads
- dead ends / culs – de – sac

The site is disconnected from the wider road network other than via 4 access points direct from the A78. This is a busy dual carriageway and services both local and regional traffic in the area.



pedestrian movement / access

1. rail station
2. potential access over/under rail line
3. formalised at grade crossings of A78
4. overpass route
- core paths

The site is disconnected from wider access networks and the rail station is disconnected from the wider area.

urban structure: access / movement

IBM Station

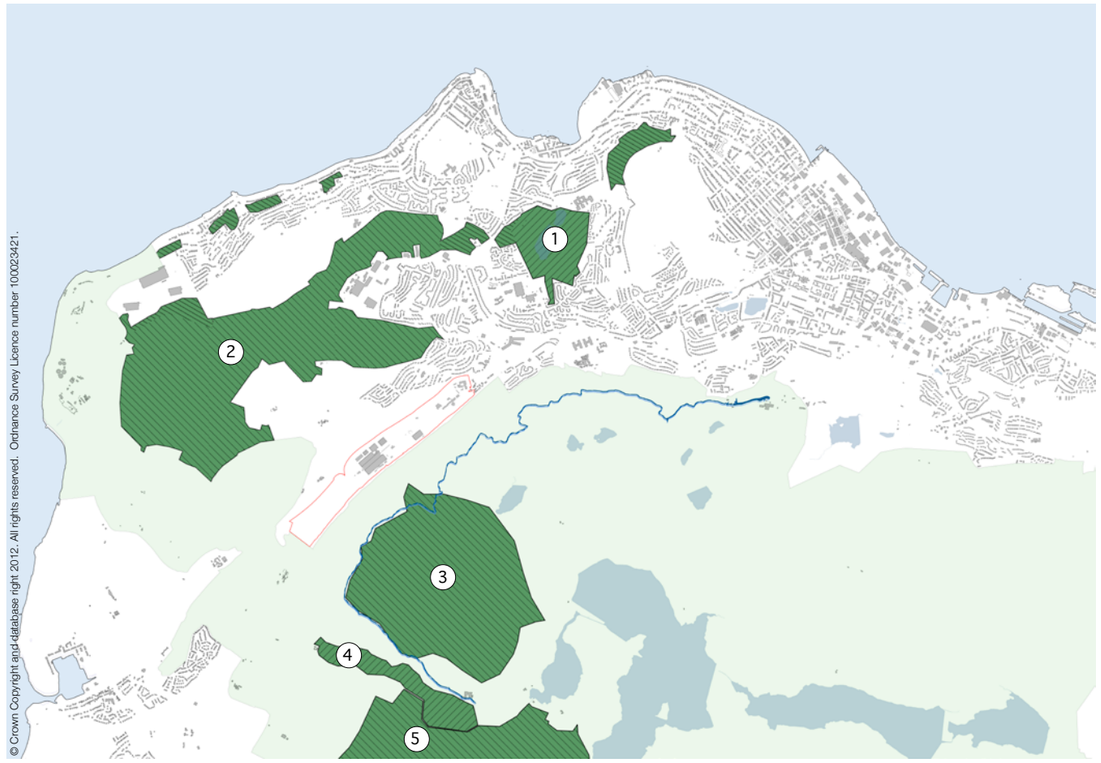
The IBM rail station is located in a discrete cut in the hill to the rear of the site. Originally opened in 1978 to serve the large IBM workforce. working on the site at the time.

Due to the disconnection from the wider access networks the rail station is a significant asset to the site.

access over rail line

This bridge over the railline to the immediate east of the rail station provides access to the farmland and CMRP behind. It is the only significant crossing over the railine within the site.

habitat and ecological systems



environmental designations

1. Coves Community Park SINC: heathland, woodland & grassland habitats
2. Burneven Hill SINC
3. Dunrod Hill SSSI: geological value
4. Shielhill Glen SSSI: fen, meadow & lowland neutral grassland
5. Renfrewshire Heights SPA: population of breeding Hen harriers (Circus cyaneus)

- There are no locally or nationally designated sites for nature conservation within the site, however there are several in the vicinity of the study area (See plan above).

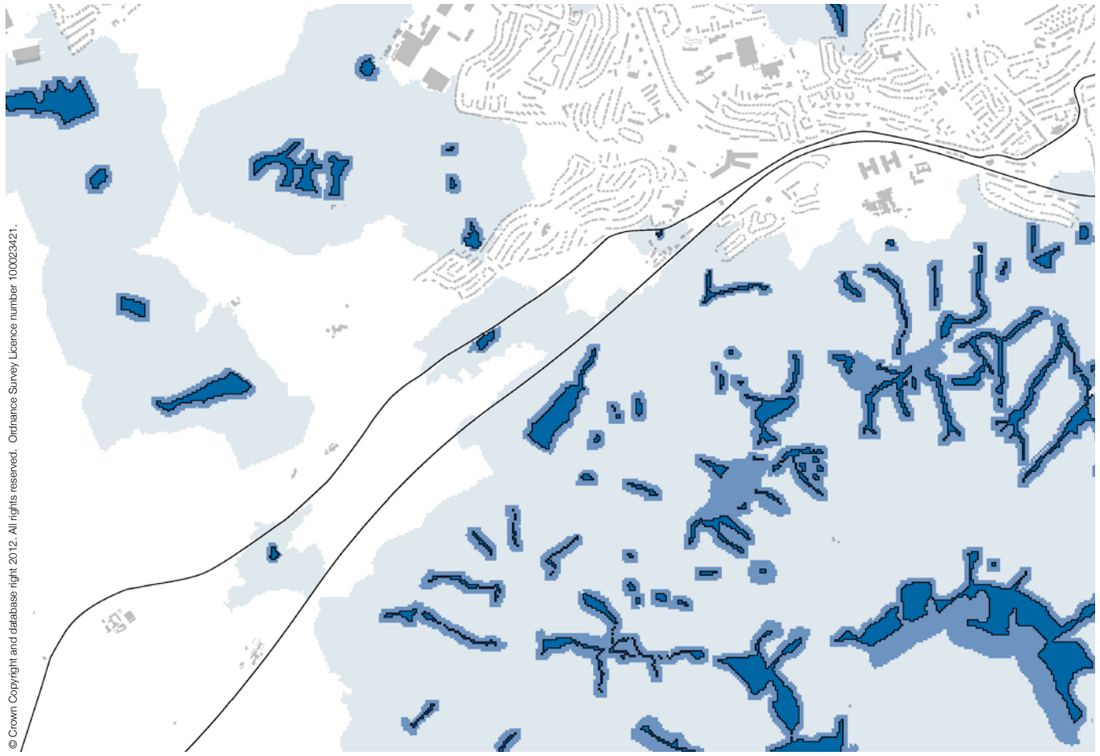
integrated habitat network - grassland

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

- To the west of the site there is the potential to introduce a new green corridor to increase habitat connectivity between the north and south of the site. This area could incorporate various Local Biodiversity Action Plan Habitats depending on the intended use of this area e.g. surface water management and public open space.

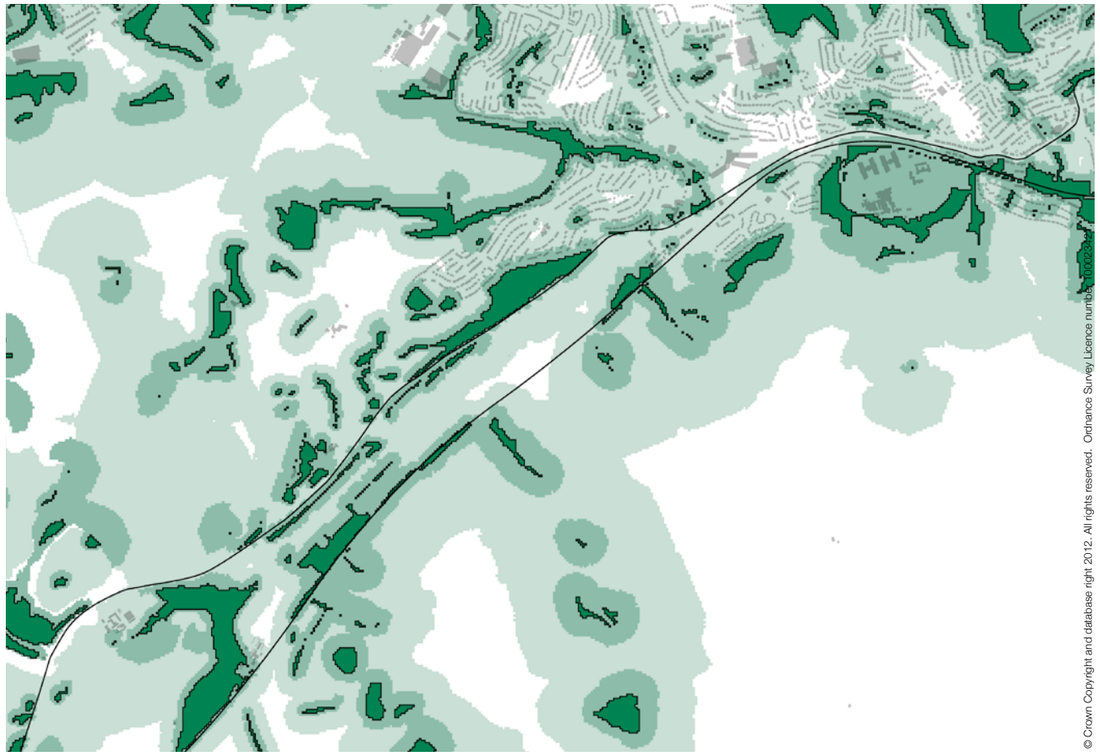
- The Spango Valley area is dominated by industrial land uses, with the west of the site recently cleared for re-development. There is a marshy grassland/ heathland area located to the east of the site. The surrounding area is dominated by marsh, grassland and woodland habitats.

habitat and ecological systems



integrated habitat network - wetland: fen, marsh, swamp

- wetland: fen, marsh, swamp habitat
- wetland: fen, marsh, swamp 500m network
- wetland: fen, marsh, swamp 2km network

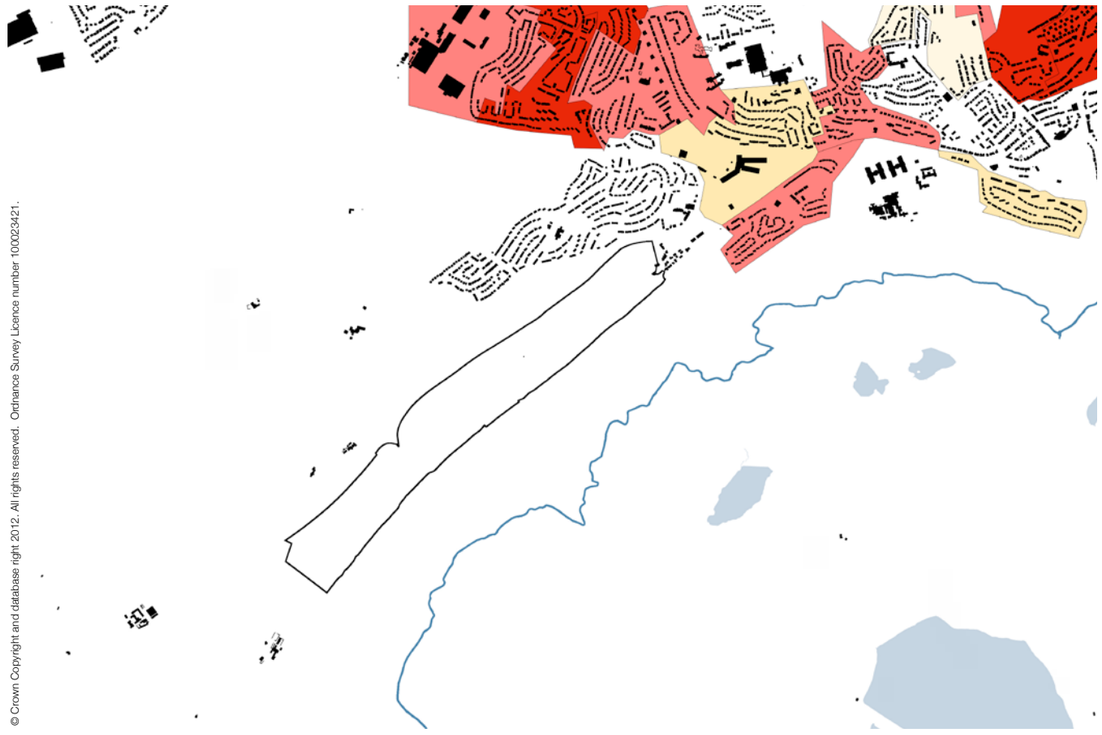


integrated habitat network - woodland

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

- The Spango Burn has been heavily modified and culverted in this area, there may be opportunities to re-naturalise sections of the burn to both manage surface water within the catchments and increase the habitat connectivity of the burn for local wildlife.
- An area of marshy grassland is present to the east of the catchment, there may be potential to make this area wetter to both manage surface water in the catchment and to improve the quality of the marshy grassland habitat in this area.

social & 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.

anticipated change

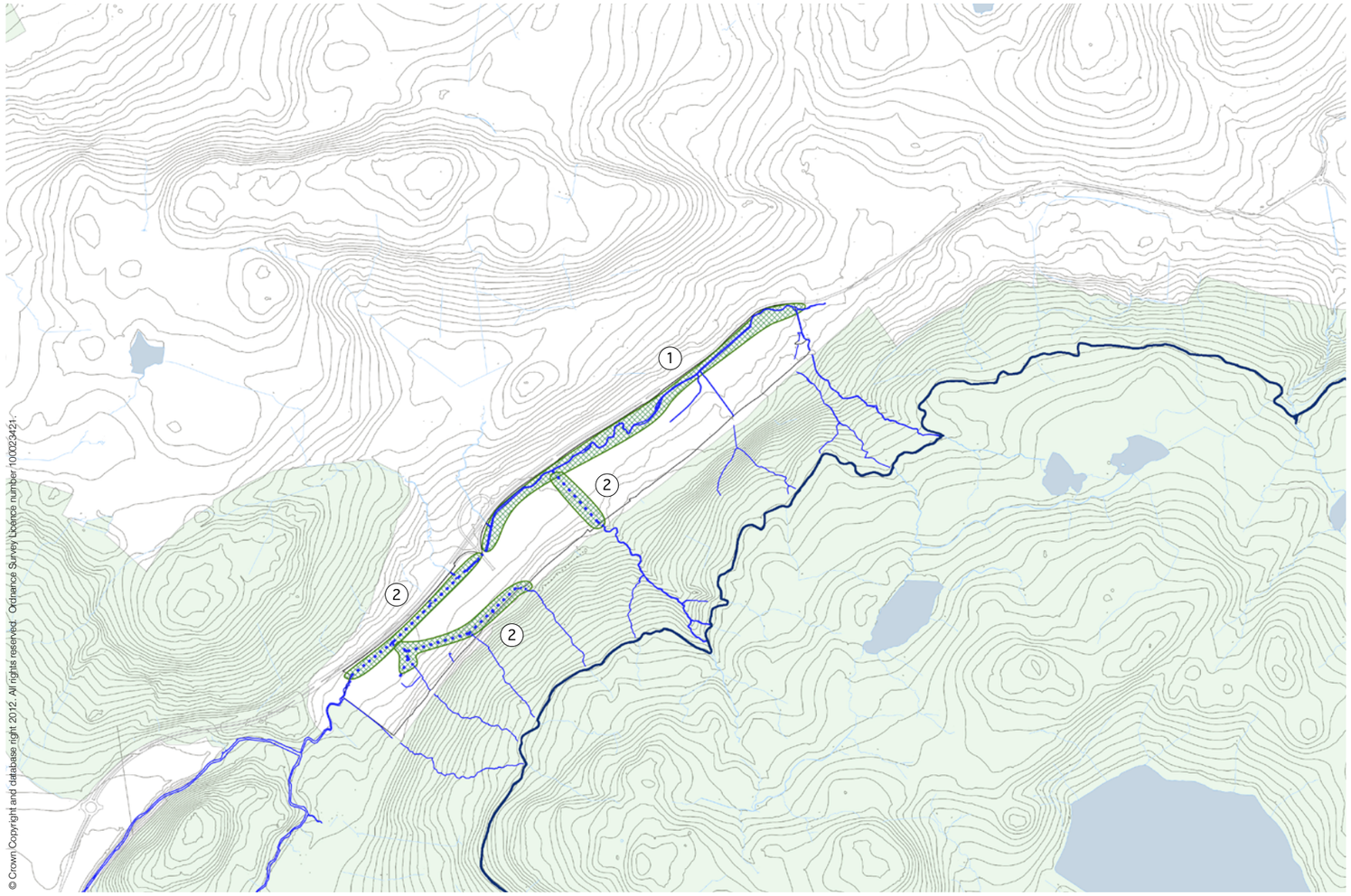
ownership & current development intentions

- Sanmina ownership
- Highcross ownership
- Inverclyde Council / Scottish Prison Service ownership
- Highcross proposed reconfigured industrial / business use building layout
- Highcross proposed housing development
- Scottish Prison Service proposal

The site is the subject of proposals for significant potential change. The site is split into 3 ownerships as identified above. Within each ownership intentions or proposals for development are at different stages. The Scottish Prison Service site has committed proposals for the construction of a new prison. The Highcross site is the subject of an outline development masterplan. There are presently no defined development intentions for the Sanmina site.

strategy

strategy response



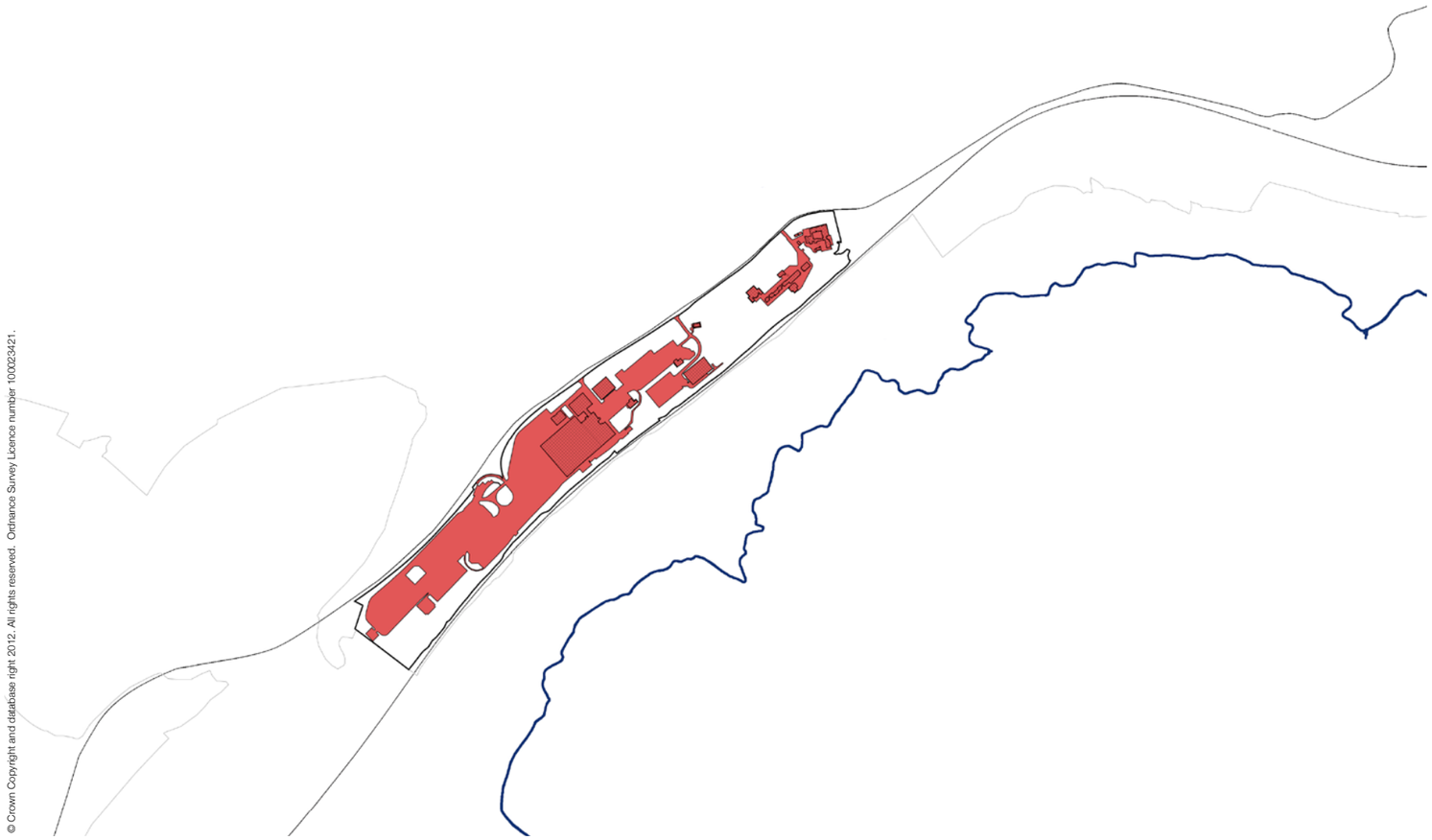
strategic goal 1: enhance watercourses through the site

1. improve channel condition
2. daylight culverted sections

Informed by the analysis stage work, a number of strategic goals have been defined for the site. The first of these is to enhance the watercourses through the site. This includes:

- improving the channel condition of the Spango Burn by returning it to a more natural state
- daylighting the culverted sections of the Spango Burn and its tributaries
- enhancing the habitat value and improve the ecological condition of the watercourses

strategy response



strategic goal 2: improve SUDS functioning of site

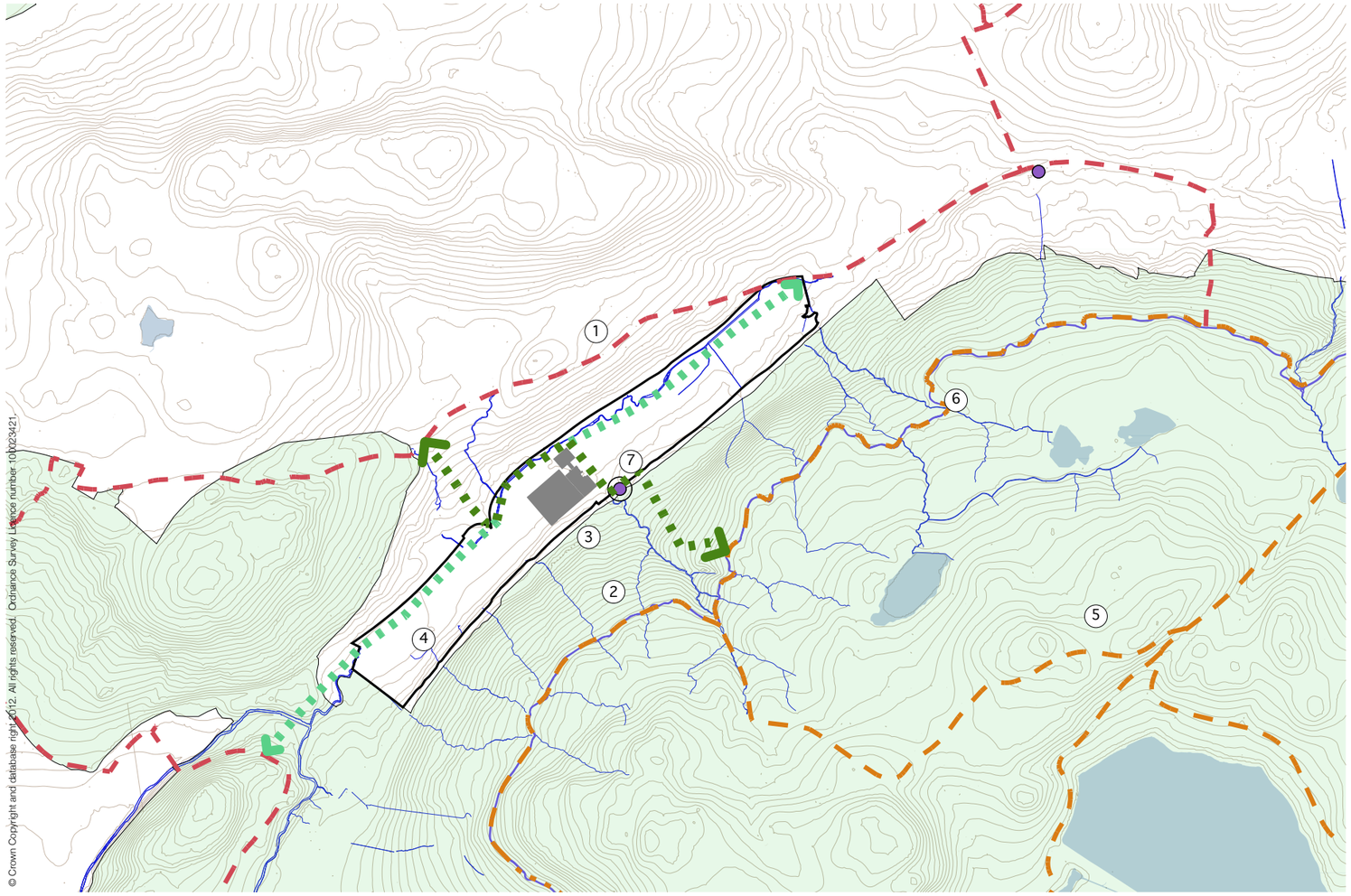
impermeable surface

buildings

A further strategic goal is to improve the SUDS functioning of the site. This involves:

- refitting and renewing buildings & surfaces to enhance SUDS function as part of the ongoing programme of site development and maintenance work. This will include a phased increase in permeable surface and integration of SUDS features within existing layouts. Refurbishment of buildings should include water management features, for example the integration of green roofs where possible.
- redevelopment proposals should positively integrate SUDS function as a core part of the masterplanning process

strategy response



strategic goal 3: form green network links across site

1. existing core paths
2. Hole of Spango
3. IBM halt rail station
4. Spango Burn path
5. Clyde Muirshiel Reginal Park
6. Greenock Cut and associated path route
7. proposed green link accross site; linking Greenock Cut with Flatterton Road core path

A strategic goal for the site is to integrate it into wider access networks and to form green network links across the site. This includes:

- forming an east-west green network link across the site to better connect the eastern and western portions of the Clyde Muirshiel Regional park.
- emphasising the rail station as a point of arrival to the Greenock Cut & Clyde Muirshiel Regional Park. The Cut is a 500m walk at 1:5 gradient from the rail station, parallel to the Hole of Spango to reach the Greenock Cut.
- forming a legible pedestrian route along the Spango Burn corridor - forming a link north-south through the site.

Hole of Spango seen from opposite side of the Valley

bridge over rail line

view from greenock cut

strategy response

green link across the site & day lighting of Hole of Spango

The creation of a green link, east-west across the site, combined with the daylighting and reforming of the Hole of Spango is an obvious intervention to realise two of the strategic goals. The green link takes account of the existing site layout and outline masterplan proposed by Highcross and will provide many additional benifits in terms of creating a high value landscape setting.

view along Greenock Cut

sluice from Greenock Cut flowing into the Hole of Spango

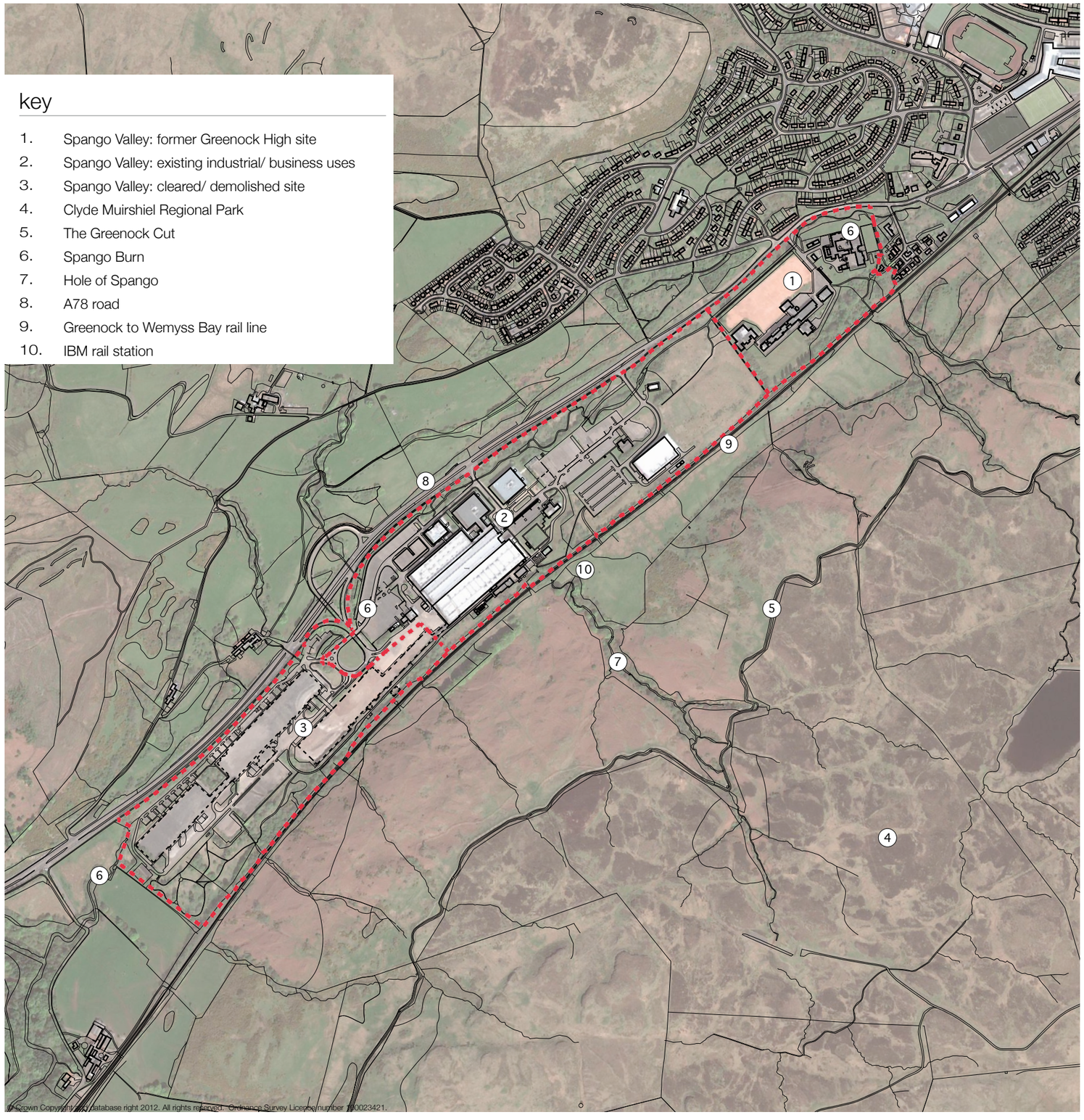
view from Greenock Cut, along Hole of Spango

design studies: scope

As highlighted at the start of the report, the study does not seek to generate a comprehensive urban regeneration plan for Spango Valley 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.

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 studies



Spango Valley - existing situation

The wider setting of the core site and its evolution over time has been examined in the previous sections of the report.

The core site is bounded to the north/west by the A78 dual carriageway and to the south/west by the Greenock to Wemyss Bay rail line.

The Spango Burn flows through a modified channel, which is in part culverted, in close proximity to the north/west site boundary and A78.

As described previously the site was formerly dominated by the IBM works, which are now only partially in use, with a number of existing buildings vacant and with some former buildings having been demolished.

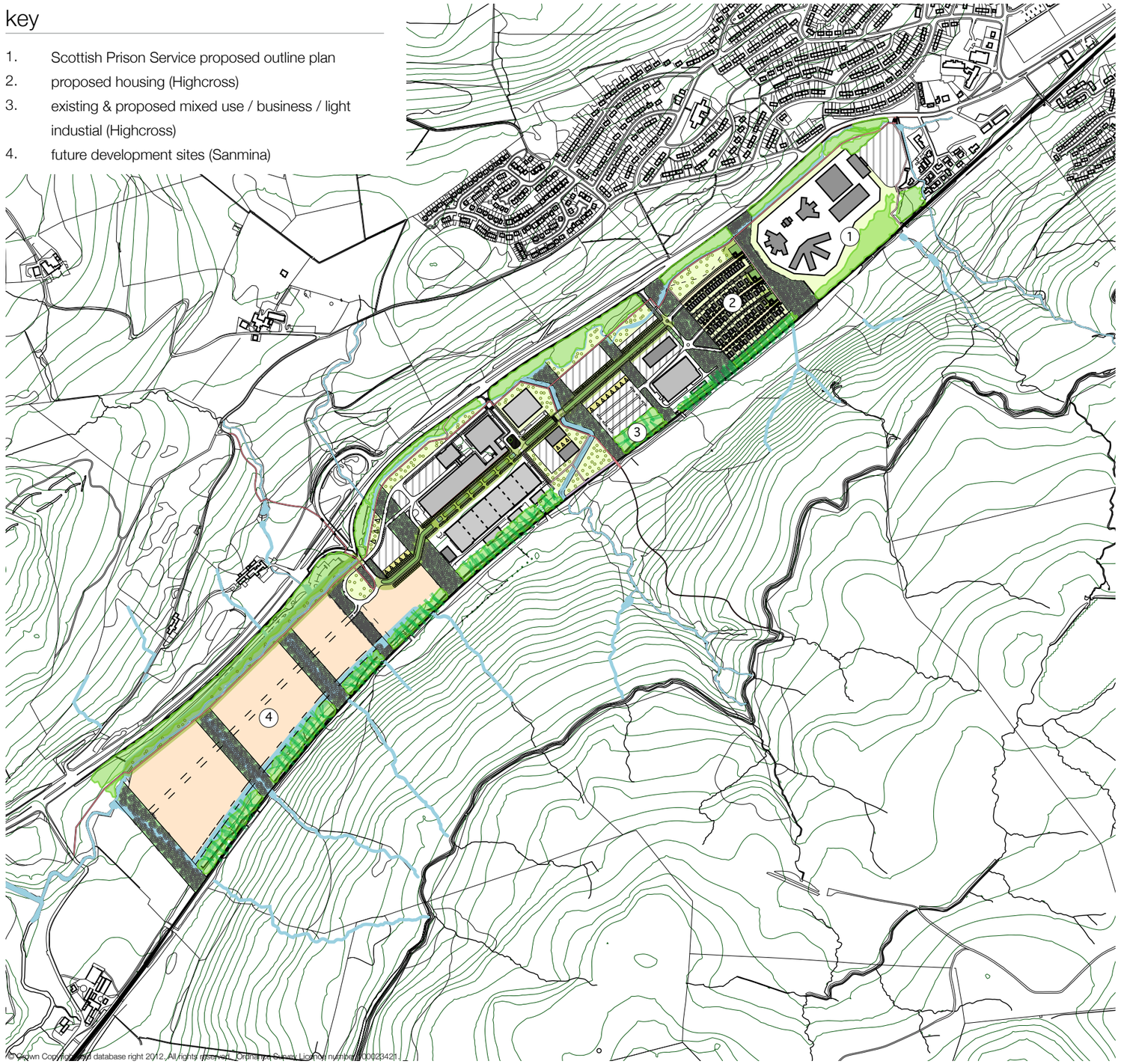
The site defined for the purposes of this study notably extends beyond the former IBM site / ownership to include the former school sites to the north (again vacant).

As noted earlier, the site is split into 3 ownerships, with different development intentions / aspirations.

design study - masterplan

key

1. Scottish Prison Service proposed outline plan
2. proposed housing (Highcross)
3. existing & proposed mixed use / business / light industial (Highcross)
4. future development sites (Sanmina)



Spango Valley - proposed masterplan

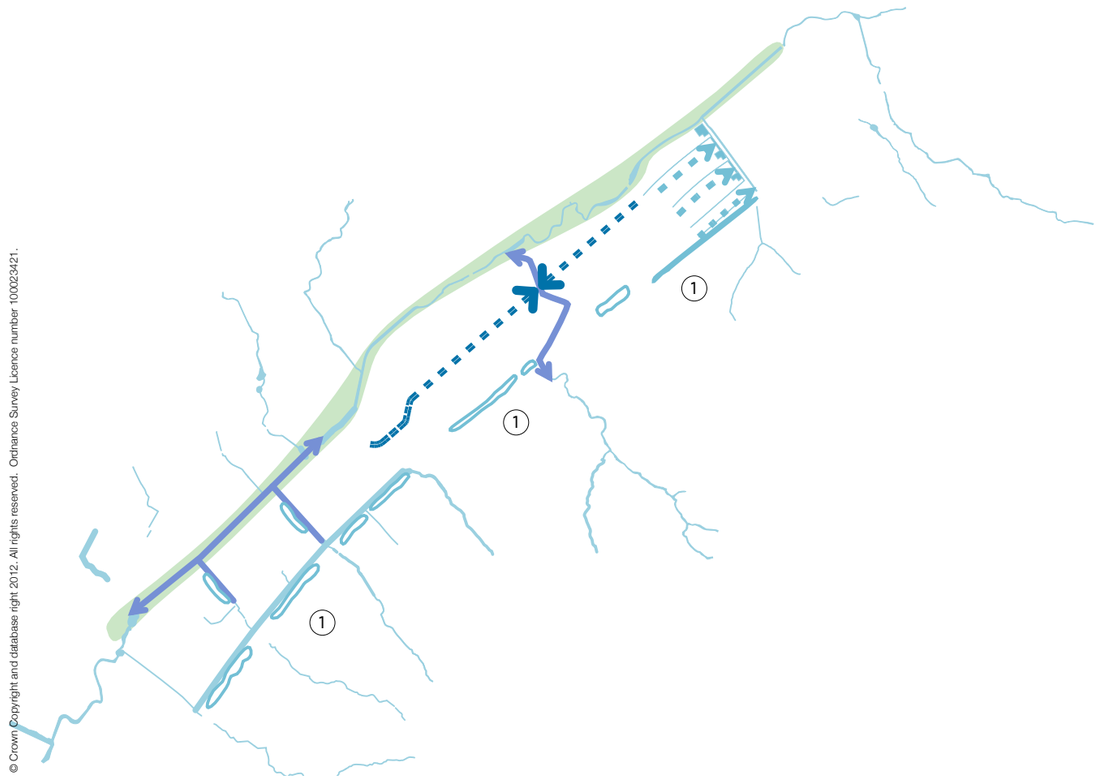
The proposed 'integrated green infrastructure' masterplan takes into account the existing development proposals / aspirations for the site as described by representatives of the 3 owners (the Scottish Prison Service, Highcross and Sanmina).

The development intentions for the 3 parts of the site are at different stages. The Scottish Prison Service has planning permission in principle for a prison on the site and for the purposes of this study was presented as 'fixed'. The Highcross site is the subject of an outline development plan, which describes broad development intentions and is currently the subject of discussion with the Local Planning Authority. There are no defined development proposals / intentions for the Sanmina portion of the site.

The proposed masterplan is therefore required to respond to varying degrees of 'specificity' of development intention across the site. The proposals broadly consider only the edges of the Scottish prison Service site. For the Highcross site, the intentions of the existing outline development plan have been adhered to, with modification to realise the aspirations of integrated green infrastructure. The Sanmina site has been approached in terms of creating a framework for future development that incorporates integrated green infrastructure, but that is flexible and does not constrain the development options or potential of the site.

The masterplan is described through a series of topic specific diagrams and detailed plans over the following pages.

design study - design principles



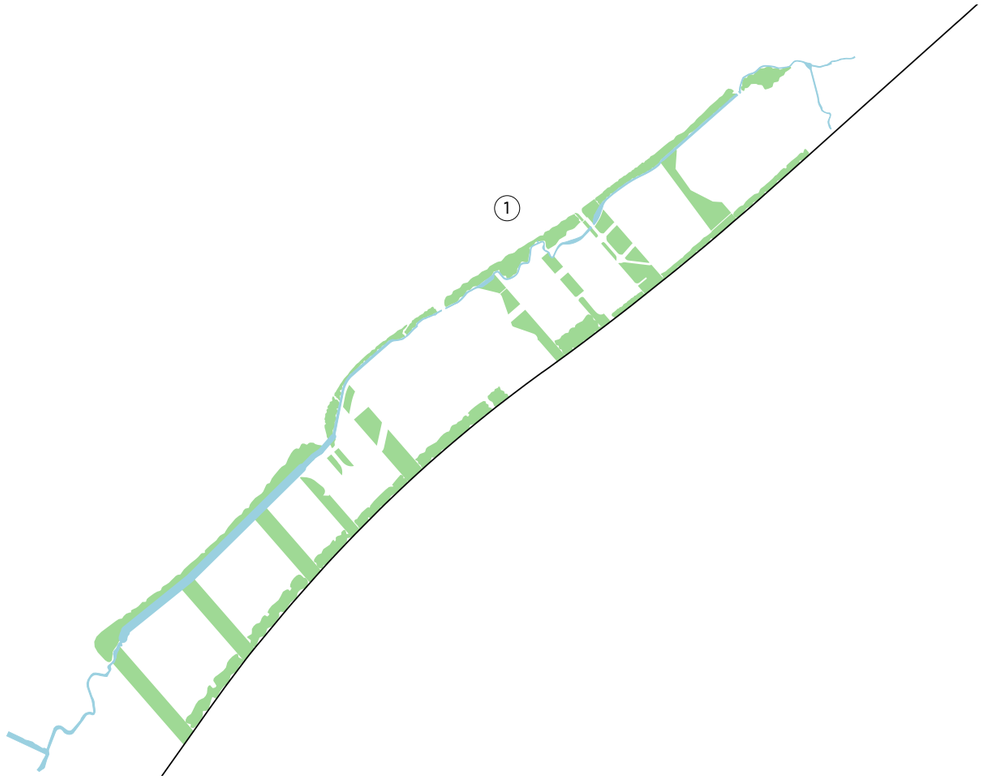
water management strategy

- daylighting / reforming of Hole of Spango burn (within Highcross site)
- daylighting / reforming of Spango burn & tributaries (within Sanmina site)
- creation of linear wetland (within Highcross site)
- swales & ponds associated with proposed housing

1. swales, retention features to upper edge of site

The proposals associated with the watercourses and water management on site include the daylighting and restoring reaches of the Spango Burn and its tributaries as identified above. This will include the channel, connection with local floodplain and riparian zone habitat. Additional water management features such as swales and ponds are integrated into the planted framework across the site. Within the Highcross site, 2 main features are proposed: the creation of a linear wetland associated with the main spine road through the site and the reforming of the Hole of Spango. The daylighting and restoration of corridors alongside the watercourses within the site will improve the flood dynamics across the site. It will not prevent flooding, but can be designed to reduce the overall flood risk by encouraging it without adversely impacting the existing built development.

This approach of creating a natural channel with adjacent floodplain will not only improve water management, but also satisfy a number of IGI objectives including improved biodiversity corridor, access routes alongside the burn and reduced maintenance requirements. The extent of flooding can be managed within the detailed design and areas if the site can be developed.



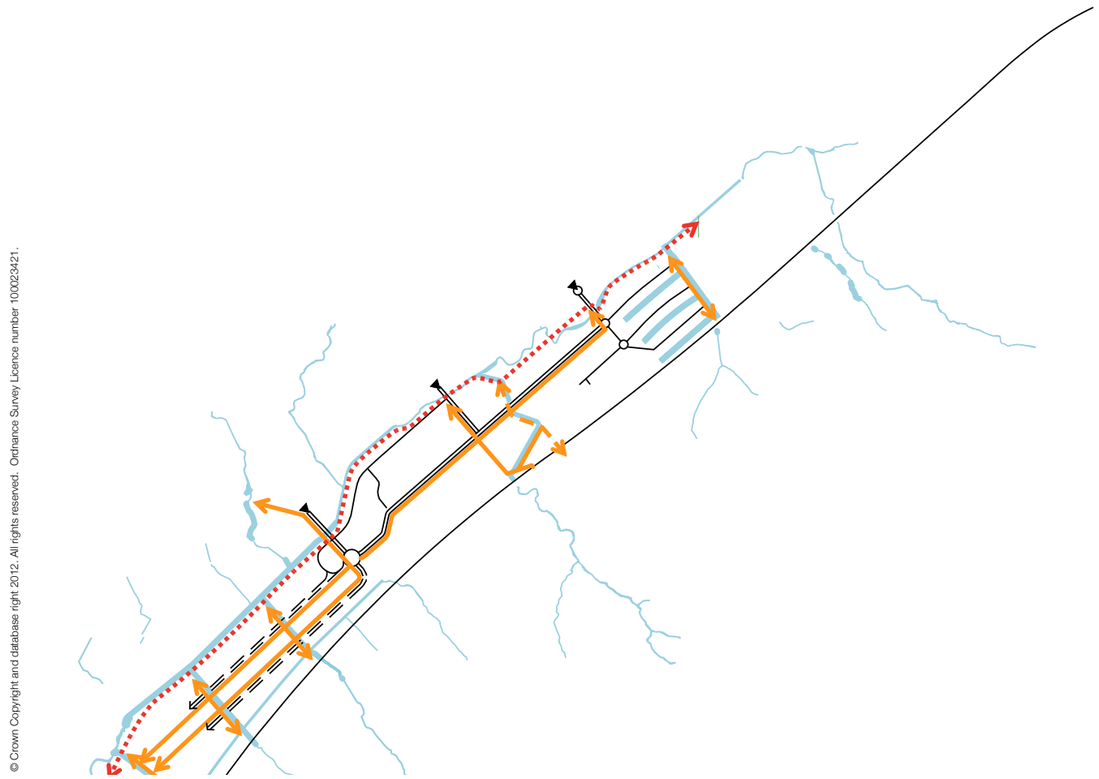
spatial subdivision / compartmentalisation of site

1. proposed woodland framework

A core principle of the proposed masterplan is of spatial subdivision / compartmentalisation of the site. It is proposed that this is achieved through a robust framework of woodland and structural tree planting. This framework can accommodate many of the access and water management features in a coherent and legible manner.

It is also thought that this approach will benefit the character and flexibility of the site in development terms. The stated development intentions will result in a mix of uses across the site, which are likely to be developed in a phased manner. This spatial subdivision of the site helps to manage the relationship between uses in the longer term and to manage conflicts between ongoing development and active parts of the site.

design study - design principles



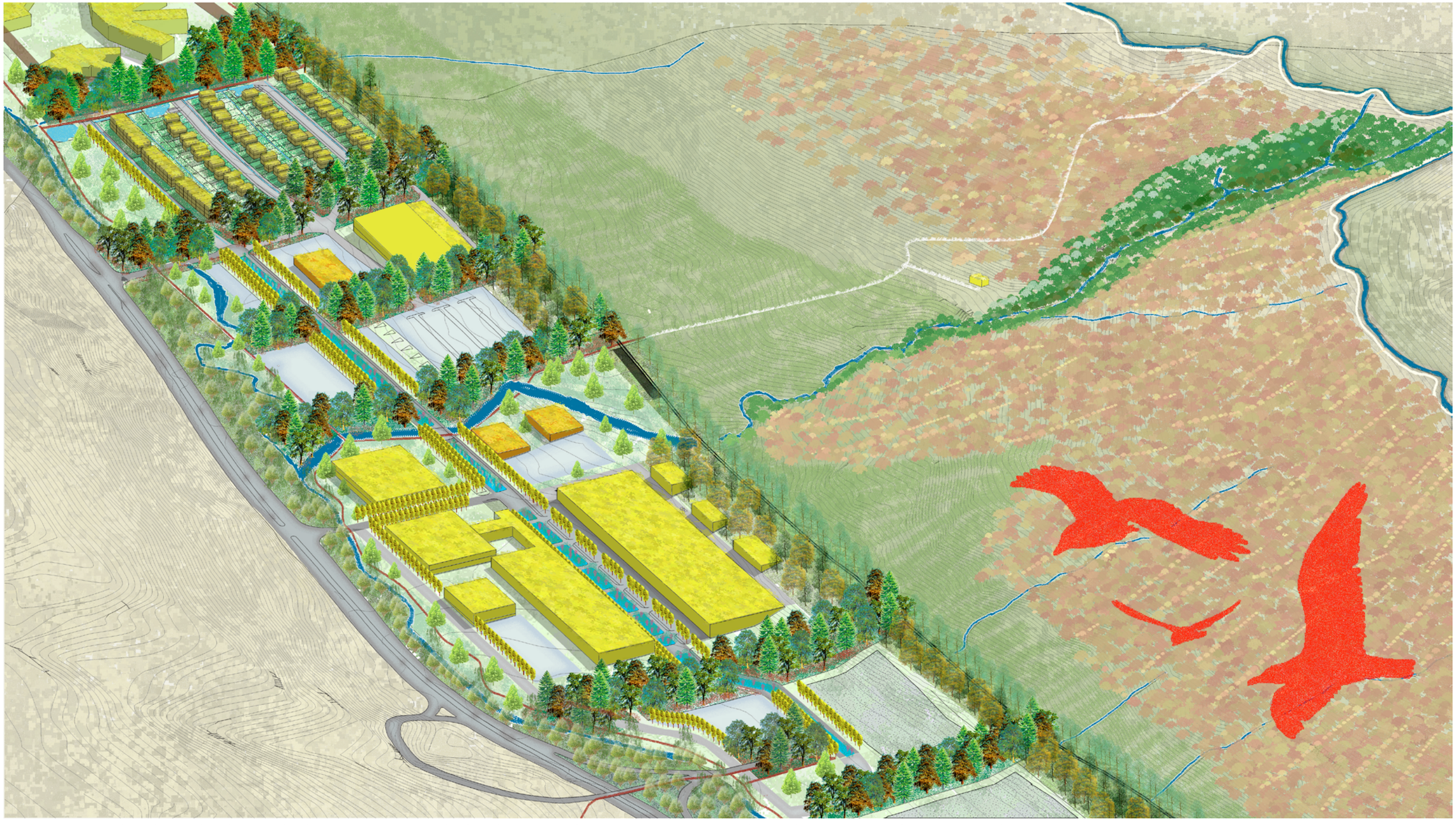
movement: vehicular & pedestrian

- pedestrian route linking across site following Hole of Spango & linking to Greenock Cut
- other pedestrian links across site incorporated within landscape belts
- continuous pedestrian route created along enhanced Spango burn corridor
- pedestrian routes associated with vehicle circulation spine

The vehicular circulation network within the site is broadly as proposed within the outline Highcross development plan. Localised modification has been proposed in the northern portion of the site (proposed housing area). As indicated, there is flexibility in the location of vehicle access routes in the Sanmina portion of the site.

Pedestrian routes are identified including the strategic links across the site associated with the Spango Burn and the Hole of Spango. Within the site, links across the site (north-west / south-east) are focused within the planted / woodland belts that subdivide the site. Pedestrian movement south-west / north-east (the long dimension of the site) is associated with the main spine roads through the site. It is proposed that these are treated as ‘boulevards’ - the linear wetland, and avenue tree planting creating a high quality pedestrian route.

design study - visualisation

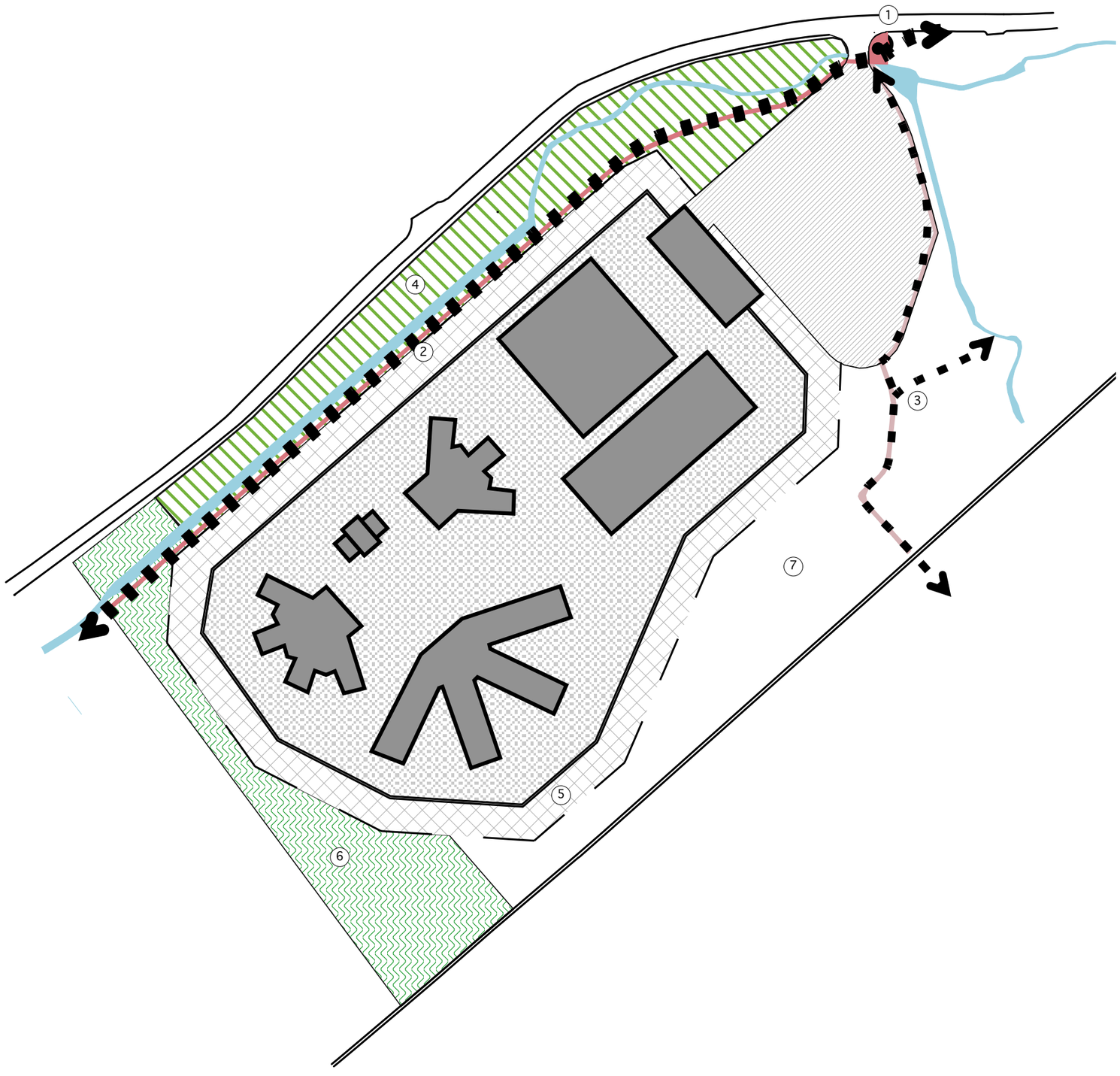


aerial view looking north east across the site highlighting the proposed landscape structure of woodland belts, green access links, green roofs, reconfigured development and improved water courses.

key

1. proposed prison complex (as per indicative plan)
2. 5.2m high prison wall
3. 15m planting exclusion zone around prison
4. parking area associated with prison
5. spango burn path
6. planted landscape structure

design study - north east section of site: scottish prison service



key features:

1. pedestrian entry point to Spango Valley from main road
2. pedestrian route along Spango Burn (outwith 15m zone, to be designed in agreement with SPS)
3. access link relating to existing path routes
4. improvement of burn corridor
5. 15m exclusion zone
6. woodland planting to form edge / definition between proposed prison and proposed housing (outwith 15m zone, to be designed in agreement with
7. SPS)
   existing woodland

design summary:

The design proposals for the prison site focus on delivering the following strategic outcomes:

- enhancing the habitat value and improving the ecological condition of the Spango Burn

- providing a robust planting framework for the site that compartmentalises the different uses and ambitions through woodland planting

- creating a safe and legible pedestrian access route along the Spango Burn

Key to delivering the strategic outcomes is the aspiration that the Spango Burn improvements and access path are delivered in an acceptable form for the Scottish Prison Service.

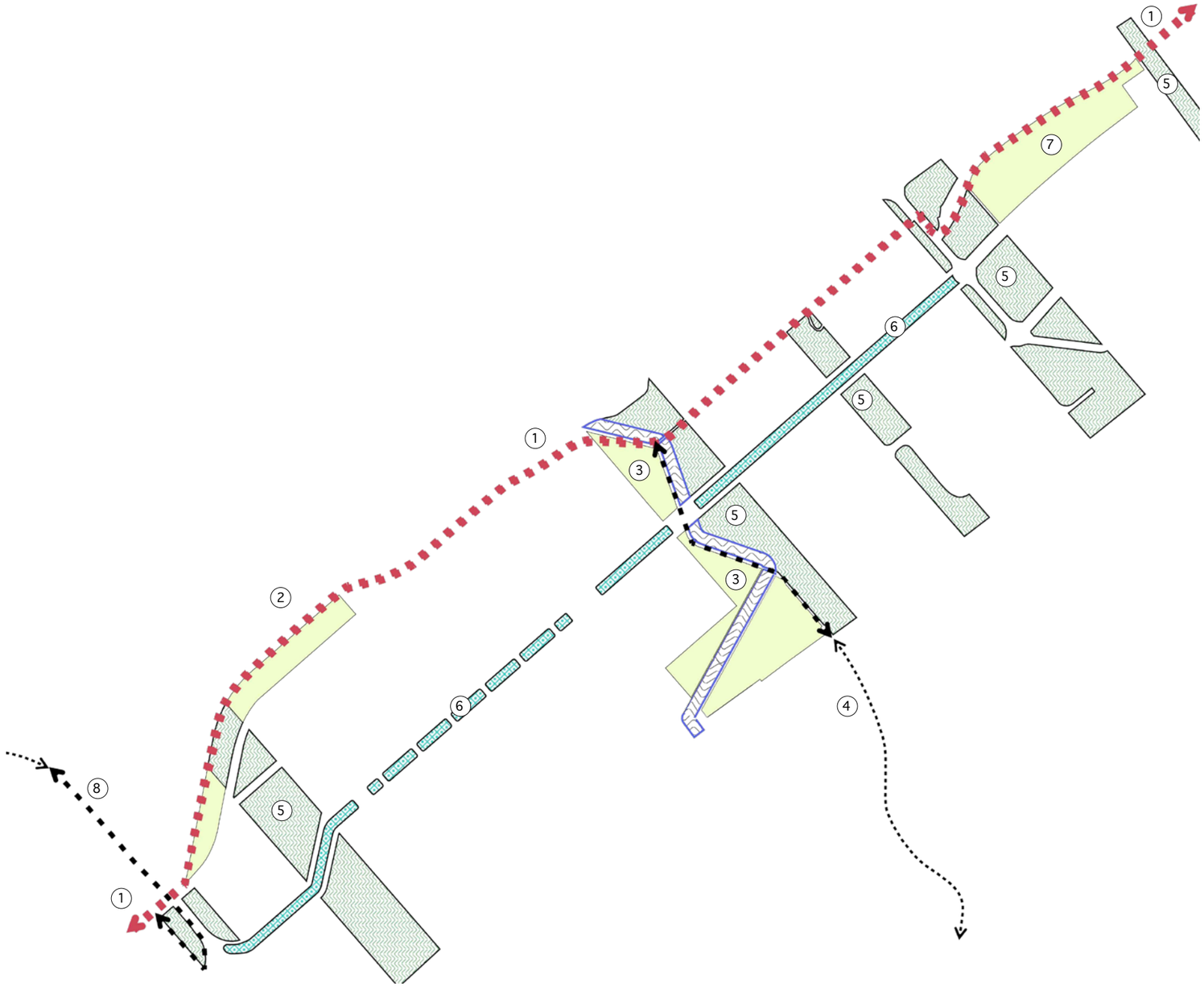
The proposals do not seek to compromise the design and security of the prison and only seek to guide the development to gain the best combined outcomes.

NB this plan / layout is based on the indicative drawings submitted for the proposed prison at planning permission in principle stage - the detail of the proposed development may change. IGI proposals are limited to the site edges.

key

1. existing buildings
2. reconfigured IBM factory units
3. proposed new built development (locations altered from Highcross masterplan)
4. planted landscape structure
5. proposed linear wetland
6. improved Spango Burn corridor
7. green link thro' site

design study - middle section of site: highcross



key features:

1. continuous pedestrian access along Spango Burn
2. improvement of Spango Burn channel / corridor
3. reforming of Hole of Spango & green link thro' site
4. path link along Hole of Spango to Greenock Cut
5. woodland planting to define spaces on site
6. linear wetland associated with main spine route within site
7. areas of public open space
8. path link over A78 overpass to Flatterton Road core path

design summary:

The design proposals for the Highcross section focus on increasing the aspirations of the existing development plan in relation to integrated green infrastructure.

The strategy seeks to integrate water management features within the proposed new development in an innovative way. The proposals seek to improve the character and landscape value of the site whilst delivering the statutory requirement for SUDS and water management. The plan also proposes to meet SEPA and other agencies strategic objectives for improving and restoring watercourses to improve their habitat and ecological condition.

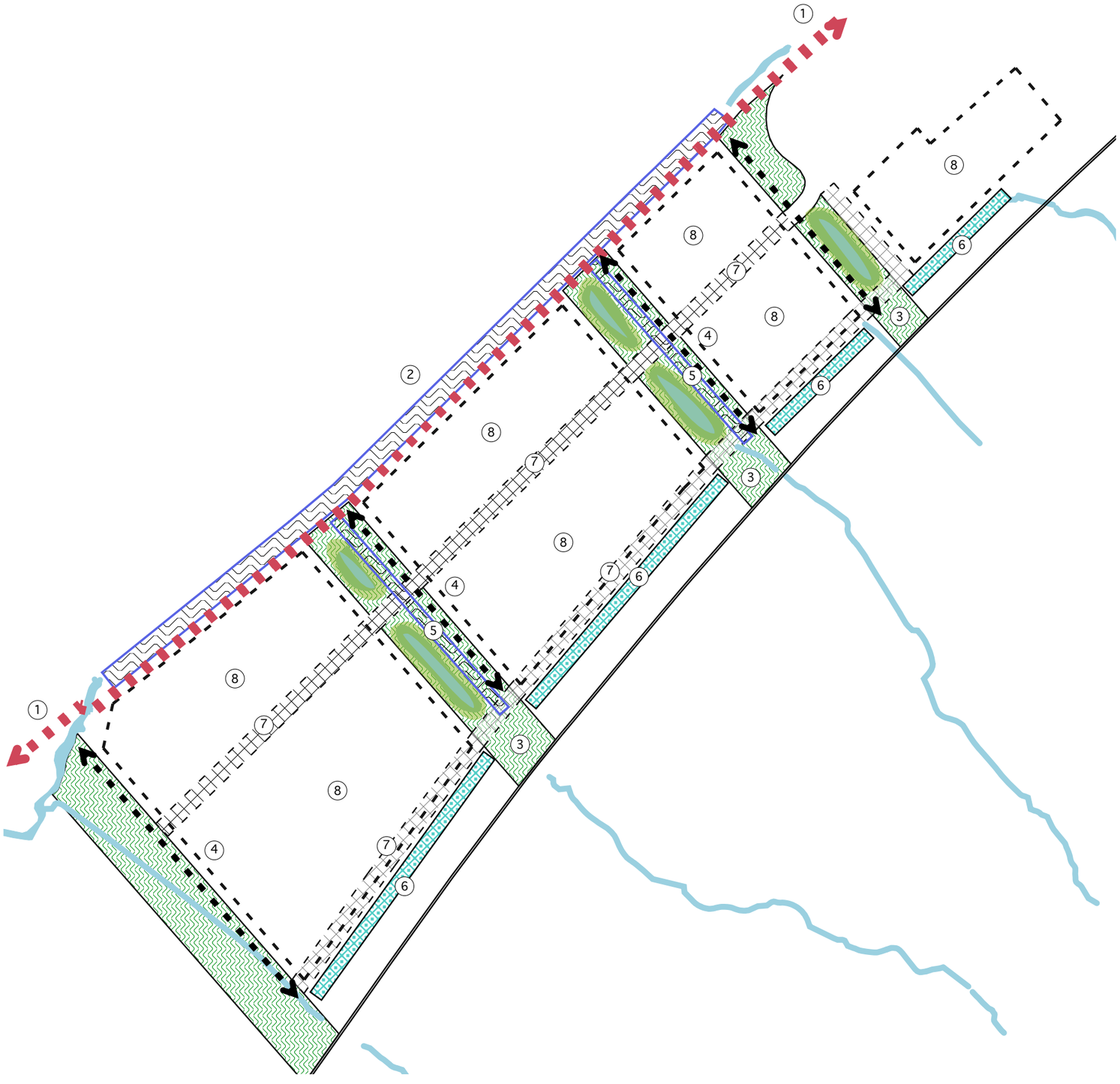
The planted woodland framework within the Highcross site is proposed to subdivide the site to enhance both the character and flexibility of the development, whilst also improving habitat connectivity.

examples of linear wetland / water management features

key

1. improved Spango Burn corridor
2. deculverted Spango Burn & widened/ naturalised channel
3. planted landscape structure
4. flexible development parcels
5. path link to Dunrod Road and South to Inverkip

design study - south west section of site: sanmina ownership



key features:

1. continuous pedestrian route along Spango Burn
2. daylighting of Spango Burn & forming of wetland / flood zone
3. woodland belt incorporating water management features for future development
4. pedestrian access routes across site
5. daylighting of Spango Burn tributaries across site
6. upgradient contour swales to upper edge of site
7. potential alternative positioning of vehicle spine road
8. flexible development parcels

design summary:

The design proposals for the Sanmina section focus on creating a positive framework for future development.

Water Management Strategy:
The proposals seek to improve the character and landscape value of the site whilst delivering the statutory requirement for SUDS and water management. The plan also proposes to meet SEPA and other agencies strategic objectives for improving and restoring watercourses to improve their habitat and ecological condition.

Spatial subdivision of the site:
The planted woodland framework is proposed to subdivide the site to enhance both the character and flexibility of the development site, whillst also improving habitat connectivity.

outline costing summary

The outline costs have been prepared by Armour Construction Consultants with input from both erz Ltd and EnviroCentre. The costs provided are fully detailed in the appendices and include elements such as paths, woodland planting strips, SUDS features, swales, burn daylighting and reorganised parking etc.

Please note that the costs presented in this document are not necessarily separate or additional to the 'normal' costs that would be incurred through implementing development on this site. The proposed elements will all be required in one form or another and will have an associated cost. Some of the green infrastructure elements may also qualify for funding from external sources.

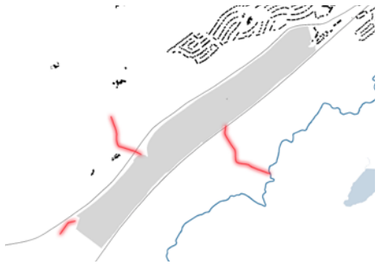
north east section (SPS Prison) £252,165.00

middle section (Highcross): £342,810.00
development associated costs (parking etc)

middle section (Highcross): £1,468,689.67
green infrastructure

middle section (Highcross): £155,124.77
housing development (green infrastructure)

south west section (Sanmina) £1,649,880



path network outwith site £44,395.00

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
8. Spango Valley Housing/Commercial accommodation
9. Parking areas within Spango Valley area

E

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 Inverclyde 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.

Inverclyde Council level:

The findings of the Spango Valley area study and the resultant strategy need to be adopted by Inverclyde 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.

Site level:

The design studies describe a range of specific projects and interventions in Spango Valley. 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 key stakeholders.

F

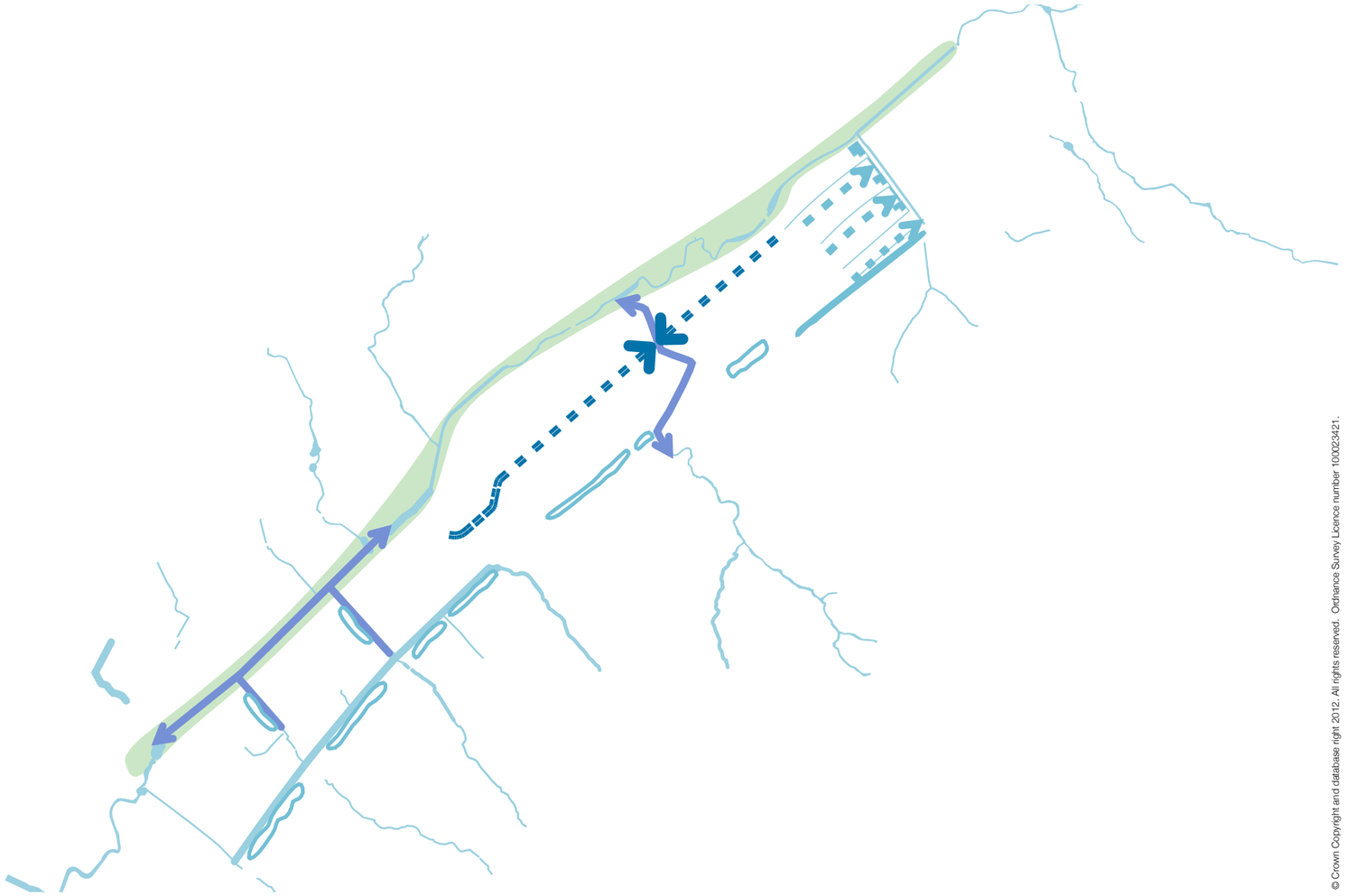
design proposal review / testing:

The development of integrated green infrastructure proposals for Spango Valley has been informed by comprehensive and detailed analysis across a broad range of topics.

To test the process and the outcomes, this section of the report aims to review the 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 design proposals will be reviewed in terms of each topic in turn to attempt to assess the outcomes.



design proposal review / testing: water management strategy

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:

- Managing surface water on the ground surface
- Integrate management features with wider aims of IGI
- Treatment train where runoff is initially managed close to source, with measures linked to form regional control
- Designing to present standards with capacity up to the 0.5% annual exceedance probability / 1 in 200 year return period event including an allowance for climate change
- Daylighting culverted watercourses

The masterplan design recognises that the existing surface water drainage network is presently a piped system with a number of natural watercourses also culverted throughout the site area. The aim would be eventually to reach the situation where an open surface water drainage system is present across the site. Treatment and attenuation of surface water runoff can be provided by linear features close to restored watercourses which will facilitate the staged development of individual 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. Common to the entire masterplan area, linear contour swales should be adopted along the entire south-east boundary to initially attenuate overland flows from the hillside.

The areas of water management within the masterplan are:

1. Scottish Prison Service

This area has largely been designed already and will include provision for a SUDS feature to manage runoff from the site. An upgradient contour swale should be considered to manage runoff from the hillside onto the site.

2. Highcross

There are a number of measures proposed to enhance water management in this area which have been identified and take into consideration the future development aims of the landowner.

Linear wetland

A linear wetland will form part of the core spine through the site. This will collect runoff from the adjacent car parking and roof areas before discharging to the Hole of Spango and the Spango Burn.

Hole of Spango – Daylighting and Restoration

The burn is presently culverted under the entire site from the railway to the Spango Burn. A new channel and corridor for the burn would be created which would aim to restore the burn to natural conditions which would be expected using hydrologic, hydraulic, geomorphic and ecologic input. Daylighting would need to take account of flood risk and flooding would be contained within the wider corridor created and local SUDS could discharge to the burn.

Residential SuDS

The residential area will be formed in a terraced arrangement due to the slope across the site. Local surface water management is proposed at each terrace by means of a grassed detention area which would then flow down towards the Spango Burn via cascades and swales.

Spango Burn

The margins of the burn will be used to provide treatment via linear swales to runoff from areas not picked up by the central linear wetland. This area will be further enhanced by restoring the channel margins of the burn and making provision for local channel migration.

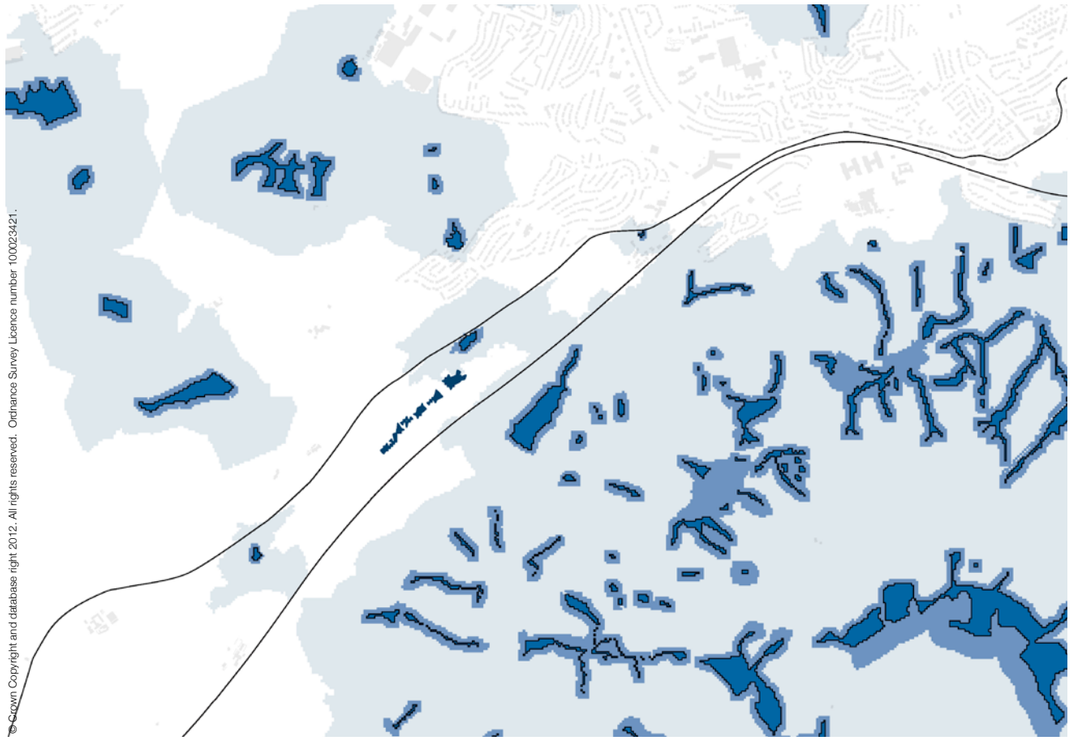
3. Sanmina

Spango Burn – Daylighting and Restoration

The Spango Burn is presently culverted along almost the entire length of this area. The burn will be restored to a naturalised channel within a wider river corridor using natural restoration design techniques. This would improve flood management and create margins which could also be used for treatment of local surface water runoff prior to discharge.

Culverted Tributaries – Daylighting and Restoration

A number of small burns which formerly crossed the site have been diverted, collected and culverted under the site. These would be daylighted and new channels created to provide open conveyance of surface water at the ground surface. These channels would be formed within a landscaped corridor which would allow the channels to meander through with a low sinuosity and provide areas of treatment to surrounding surface water runoff through linear swales and/or local wetland areas.



design proposal review / testing: habitat networks

The extent and variety of habitat and their associated networks will be increased through the proposed IGI measures. These will largely be provided in tandem with the water management measures, where improvements to watercourse corridors through daylighting and restoration will directly provide improved habitat in accordance with the local biodiversity action plan along with corridors to improve wider connectivity.

The impacts of the proposals were analysed by Scottish Natural Heritage utilising the Integrated Habitat Network Model. The findings demonstrate that gains are made across the site with much improved connectivity. are outlined here:

fen, marsh, swamp

broadleaved and yew woodland habitat
broadleaved and yew woodland 500m network
broadleaved and yew woodland 2km network

proposed improvement to broadleaved and yew woodland 500m network

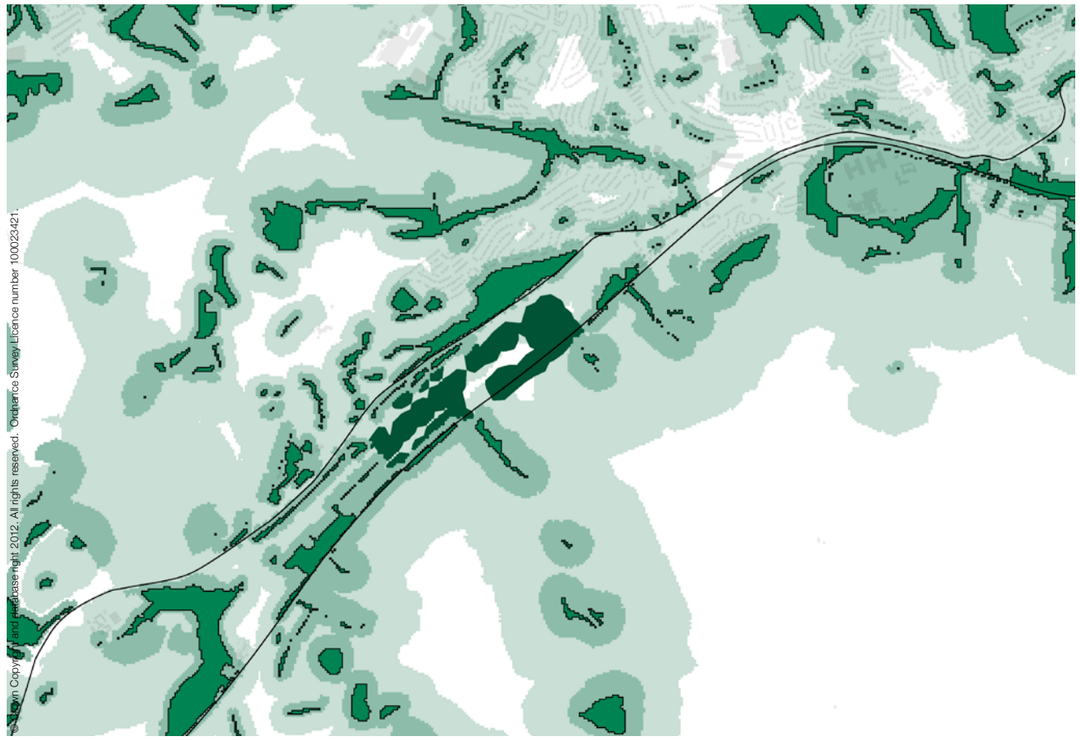
Wetland (Fen Marsh Swamp):
The site as existing has 2 networks intersecting its boundary. The indicative total area is 1.28 Ha.

The proposed scheme will create a collection of 5 small networks.

Wetland network area is lost to southern corner of the site, however loss is minimal, 0.08Ha.

Within the site networks created is 0.71 Ha, resulting in an overall again of 0.68 Ha

Wetland	Networks Ha
Network area	1.28
Loss of existing network area	0.08
Increased networks size	0.05
New networks	0.71
Proposed network area	1.96
Overall change	0.68



broadleaved and yew woodland

broadleaved and yew woodland habitat
broadleaved and yew woodland 500m network
broadleaved and yew woodland 2km network

proposed improvement to broadleaved and yew woodland 500m network

Broadleaved Woodland:
The site as existing has 5 woodland networks intersecting its boundary. The indicative total area is 210.6 Ha.
The proposed scheme consolidates the networks from 5 to 3, linking southern networks west east across the site and also both northern networks west east across the site. The creation of stronger larger networks is generally better for biodiversity. The northern most network remains as is. The proposal will not create further networks. No woodland network area is lost. The proposed scheme indicative total broadleaved woodland area is 231.0 Ha.

Broadleaved Woodland	Networks Ha
Network area	210.6
Loss of existing network area	0
Increased networks size*	20.4
New networks	0
Proposed network area	231.0
Overall change	20.4

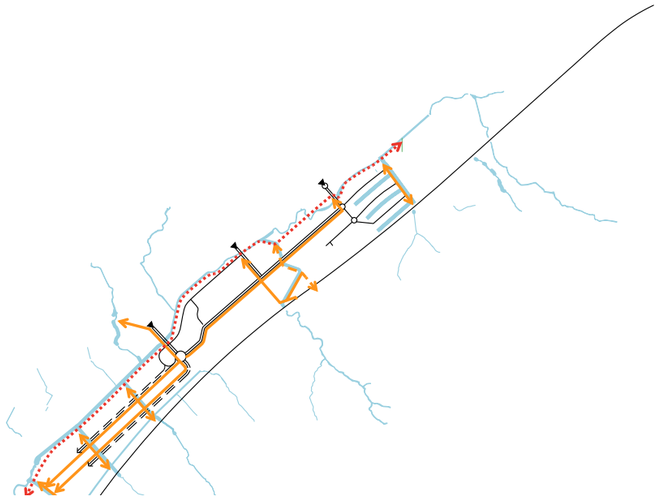
*network to the north +16.2 Ha, network to south +4.2 Ha

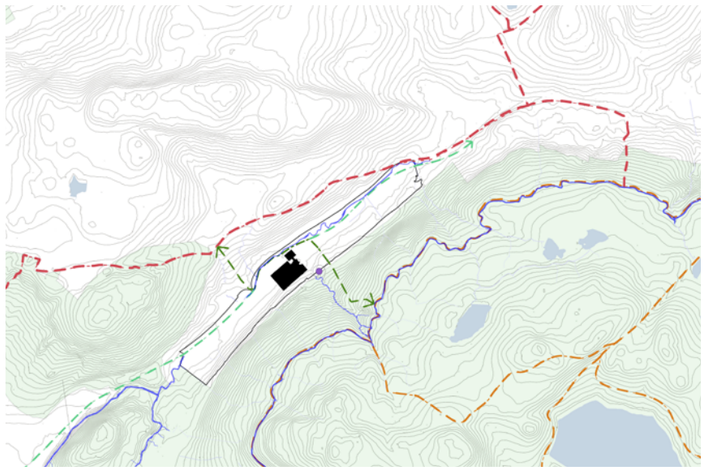
neutral grassland

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

proposed improvement to neutral grassland 300m network

Neutral grassland:
The site as existing has no networks intersecting its boundary. The proposed scheme has no impacts.





design proposal review / testing: access networks

As described in the strategy plan and site masterplan, the proposals include a number of moves to improve access across the wider area as well as within the site itself.

design proposal review / testing: open space

Modest areas of open space have been generated across the site, as part of the masterplanning process. These are focused along the main access routes associated with the Spango Burn and the Hole of Spango.

design proposal review / testing: stewardship over time

The site is currently in a state of flux, part derelict and vacant, partly in use, with a range of development intentions either committed or subject to preliminary discussion.

The successful redevelopment of the site, incorporating the integrated green network proposals is the key route to realise stewardship over time.

F

North East Section (Scottish Prison Service)

Planted Landscape Structure

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

generally	9,680.00	m2	@	10.50	101,640.00

Drainage

SUDS pond; excavating approx 1800 deep; retaining material; forming embankment

generally	650.00	m2	@	32.00	20,800.00

Parkland/Amenity Greenspace

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

generally	12,193.00	m2	@	2.50	30,482.50

Woodland Belt

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

full works	4,021.00	m2	@	10.50	42,220.50
minor works	9,261.00	m2	@	2.00	18,522.00

New footpaths

50 thick bound gravel footpath on 150 thick blinded type 1 base; timber edgings including all excavations, disposal, preparation etc

2.00m wide	1,540.00	m2	@	25.00	38,500.00
					252,165.00

outline costs

Middle Section (Highcross): Development Costs

Car Parking

100 base course and 40 wearing course tarmac parking on 600 thick blinded type 1 base; including all excavations, diposal, preparation etc					
generally	3,809.00	m2	@	90.00	342,810.00
					342,810.00

Middle Section (Highcross): Green Infrastructure

Planted Landscape Structure

Dense mix of trees, shrubs, bushes, etc; including removal of material off site; imported topsoil and granular soil improver etc					
generally	24,970.00	m2	@	10.50	262,185.00

Drainage

Drainage swale; excavations approx 750 deep; infilling with 300 deep topsoil; seed planting as required; removal of material off site; earthwork support etc					
generally	832.00	m2	@	18.00	14,976.00

Linear Wetland

Formation of new linear wetland; excavating approx 850 deep; infilling with 300 deep free draining gravel and average 100 deep topsoil; seed planting as required; removal of material off site; earthwork support etc					
generally	1,269.17	m	@	104.00	131,993.33
extra; breaking out tarmac road surface	1,269.17	m2	@	5.00	6,345.83
extra; culvert at crossings	112.00	m	@	200.00	22,400.00

Road Kerbs					
New road kerbs including all associated excavations, foundations, haunching etc					
generally	1,604.00	m	@	25.00	40,100.00
extra; forming neat joint with existing road	1,604.00	m	@	5.00	8,020.00
Parkland/Amenity Greenspace					
Good quality British seed mix; grading and preparing existing soil, weeding, ferilizing					
generally	27,544.00	m2	@	2.50	68,860.00
Planted Slope					
Meadow; wildflower/british seed mix; whip planting; grading and preparing existing soil					
generally	3,802.00	m2	@	2.50	9,505.00
Woodland Belt					
Dense mix of trees, shrubs, bushes, etc; including removal of material off site; imported topsoil and granular soil improver etc					
minor works	10,823.00	m2	@	2.00	21,646.00
full works	26,077.00	m2	@	10.50	273,808.50
Trees					
Trees; forming pit; removal of excavated material off site; imported topsoil and granular soil improver; clean stone drainage layer, stakes etc					
generally	629.00	nr	@	250.00	157,250.00

Water Course - Spango Burn					
Water course; excavating approx 1100 deep; infilling with 200 deep free draining gravel and average 300 deep topsoil; shrub/reed planting as required; removal of material off site; earthwork support etc					
generally	286.00	m	@	1,083.00	309,738.00
Water Course - Hole of Spango					
Water course; excavating approx 1550 deep; infilling with 200 deep free draining gravel and average 300 deep topsoil; shrub/reed planting as required; removal of material off site; earthwork support etc					
generally	286.00	m	@	192.00	54,912.00
New footpaths within landscape structure					
50 thick bound gravel footpath on 150 thick blinded type 1 base; timber edgings including all excavations, diposal, preparation etc					
2.00m wide	3,478.00	m2	@	25.00	86,950.00
					1,468,689.67

outline costs

Middle Section (Highcross): Housing Development

Planted Landscape Structure

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

generally	9,306.18	m2	@	10.50	97,714.89

Drainage

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

generally	1,207.24	m2	@	27.00	32,595.48

Parkland/Amenity Greenspace

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

generally	6,462.27	m2	@	2.50	16,155.68

Planted Slope

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

generally	1,508.81	m2	@	2.50	3,772.03

Woodland Belt

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

minor works	2,443.35	m2	@	2.00	4,886.70
					155,124.78

Shared Surface

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

generally	5,767.00	m2	@	140.00	807,380.00

South West Section (Sanmina)

Woodland Belt

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

minor works	23,167.00	m2	@	2.00	46,334.00
limited works	22,510.00	m2	@	5.00	112,550.00

Planted Landscape Structure

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

generally	33,366.00	m2	@	10.50	350,343.00

Drainage

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

generally	8,200.00	m2	@	27.00	221,400.00

Water Course - Spango Burn

Water course; excavating approx 1100 deep; infilling with 200 deep free draining gravel and average 300 deep topsoil; shrub/reed planting as required; removal of material off site; earthwork support etc

generally	594.00	m	@	1,083.00	643,302.00

Water Course - Smaller Water Courses Within Landscape Structure

Drainage swale; de-culverting burns and forming in new channel; excavations approx 750 deep; infilling with 300 deep topsoil; seed planting as required; retaining of material on site; earthwork support etc

generally	705.00	m	@	80.00	56,400.00

New footpaths

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

Spango Burn Path; 2.00m wide	1,584.00	m2	@	40.00	63,360.00

50 thick bound gravel footpath on 150 thick blinded type 1 base; timber edgings including all excavations, disposal, preparation etc

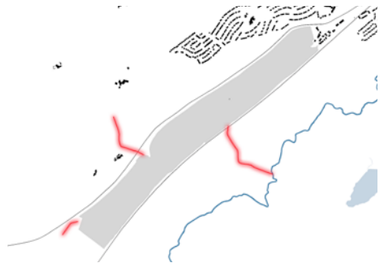
paths withing Landscape structure; 2.00m wide	1,775.00	m2	@	25.00	44,375.00

Development Plots

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

generally	111,816.00	m2	@	1.00	111,816.00
					1,649,880.00

outline costs



Path Network Outwith Site

Over-pass to Flatterton Road

50 base course and 30 wearing course tarmac path on 150 thick blinded type 1 base; including all excavations, disposal, preparation etc					
generally	265.00	m2	@	40.00	10,600.00
50 x 200 roundtop kerb to paths; excavations and removal of material off site; foundations and haunchings etc					
generally	265.00	m	@	15.00	3,975.00
New road kerbs including all associated excavations, foundations, haunching etc					
generally	265.00	m	@	25.00	6,625.00
extra; forming neat joint with existing road	265.00	m	@	5.00	1,325.00
50 thick bound gravel footpath on 150 thick blinded type 1 base; timber edgings including all excavations, disposal, preparation etc					
generally	838.00	m2	@	25.00	20,950.00

Rail Station to Greenock Cut

50 thick bound gravel footpath on 150 thick blinded type 1 base; timber edgings including all excavations, disposal, preparation etc					
generally	1,050.00	m2	@	25.00	26,250.00
Allowance meantime for bridge over water course					
generally	1.00	item	@	7,500.00	7,500.00

Southern path link from Spango Burn to Dunrod Road

50 thick bound gravel footpath on 150 thick blinded type 1 base; timber edgings including all excavations, disposal, preparation etc					
generally	444.00	m2	@	25.00	11,100.00
					88,325.00

outline costs

Summary

Spango Valley	
North East Section (Scottish Prison Service)	252,165.00
Middle Section (Highcross): Development Costs	342,810.00
Middle Section (Highcross): Housing Development	155,124.78
Middle Section (Highcross): Green Infrastructure	1,468,689.67
South West Section (Sanmina)	1,649,880.00
Path Network Outwith Site	88,325.00

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
8. Spango Valley Housing/Commercial accommodation
9. Parking areas within Spango Valley area

Appendix A – Spango Valley 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 for a range of return periods using the Flood Estimation Handbook (FEH) rainfall-runoff method or the IH124 method for small catchments, depending upon the size of the catchment. There are no flow gauges within the Spango Burn catchment. The rural QMED (median annual maximum flood) has also been calculated based on FEH catchment descriptors. The annual mean flow and the low flow - Q_{95} (flow which is exceeded 95% of the time) were calculated using the LowFlows2 software. A summary of these methods is outlined in Table A 1 and the flow estimates are provided in Table A 2. Calculation sheets are provided in Table A 3 to Table A 7.

The Greenock Cut aqueduct runs along the upper slopes of the area to the south-east of the site, this intersects the catchments of the Hole of Spango and the minor tributaries which drain to steep ground between the Greenock Cut and the site. The natural catchment area, based on the FEH CD-ROM, has been used to derive the flow estimates in Table A 2 and the potential impact of the Greenock Cut either to increase or decrease peak or mean flows has not been assessed. It is recommended that this is taken into consideration during future design stages.

Table A 1: Spango Valley Flow Estimation Methods

Parameter	Method	Location
Peak flows	FEH rainfall-runoff	• Spango Burn, to downstream extent of site; • Hole of Spango, to confluence with Spango Burn • Howford Glen, to confluence with Spango Burn; and • The unnamed tributary located near Flatterton flowing southwards to confluence with Spango Burn.
	IH124	• Unnamed tributary of Spango Burn flowing northwest from Greenock Cut, to confluence with Spango Burn.
QMED	FEH catchment descriptor	• Spango Burn, to downstream extent of site; • Hole of Spango, to confluence with Spango Burn
Low flow (Q_{95})	LowFlows2	• Spango Burn, to downstream extent of site
Annual mean flow	LowFlows2	• Spango Burn, to downstream extent of site

Table A 2: Spango Valley Flow Estimates

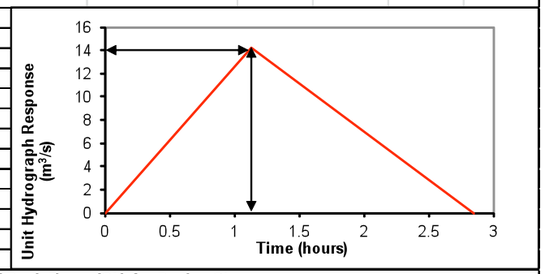
Catchment	Catchment Area (km^2)	Flows (m^3/s)				
		Peak		QMED	Annual mean flow	Low flow
		T2	T200*			
Spango Burn	7.31	8.2	29.4	6.0	0.29	0.03
Hole of Spango	0.72	0.9	3.2	0.9		
Howford Glen	0.72	0.6	2.3			
Unnamed tributary – Flatterton	0.91	0.9	3.1			
Unnamed tributary – Greenock Cut	0.15	0.2	0.7			

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

Table A 3: Spango Burn FEH calculation sheet

Catchment Characteristics							
AREA	7.31	DPSBAR	143.00	CWI	125	D/Tp	2.602
SAAR	1602.00	DPLBAR	2.400	URBEXT	0.105	RLAG	0
BFI	0.509	PROPWET	0.610	RC	0.39	ARF	0.946

Estimate Tp(0) and Unit Hydrograph	
Tp(0)	1.01
20% Tp(0)	0.20
ΔT	**0.25**
Tp(ΔT)	1.13
Up	14.22
TB	2.85
Calculation of Design Storm Duration D	
D	2.94
D	**2.75 hours**
Rounded to nearest odd integer multiple of ΔT	

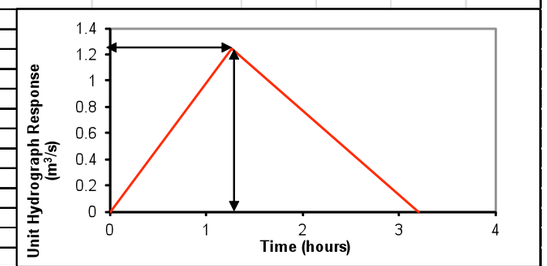


Summary of Design Storm Depths (P) and Peak Flows (Qt) for Design Storms								
Tf (return period flow) [years]	2.33	5	10	25	50	100	200	200+CC
Tr (return period storm) [years]	2	8	17	44	81	140	240	-
M(Tr)-(D)h(point) [mm]	19.8	29.3	35.5	44.7	51.8	59.1	67.3	80.8
P (catchment) [mm]	18.7	27.7	33.6	42.3	49.0	55.9	63.7	76.4
Peak Flow Qt [m^3/s]	**8.2**	**11.9**	**14.4**	**18.3**	**21.8**	**25.4**	**29.4**	**35.3**

Table A 4: Hole of Spango FEH calculation sheet

Catchment Characteristics							
AREA	0.72	DPSBAR	157.20	CWI	125	D/Tp	2.666
SAAR	1666.00	DPLBAR	1.160	URBEXT	0.004	RLAG	0
BFI	0.392	PROPWET	0.610	RC	0.39	ARF	0.977

Estimate Tp(0) and Unit Hydrograph	
Tp(0)	1.15
20% Tp(0)	0.23
ΔT	**0.25**
Tp(ΔT)	1.27
Up	1.25
TB	3.20
Calculation of Design Storm Duration D	
D	3.39
D	**3.25 hours**
Rounded to nearest odd integer multiple of ΔT	



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]	21.7	32	38.6	48.5	56.1	63.9	72.6	87.1
P (catchment) [mm]	21.2	31.3	37.7	47.4	54.8	62.4	70.9	85.1
Peak Flow Qt [m^3/s]	**0.9**	**1.3**	**1.5**	**2.0**	**2.4**	**2.7**	**3.2**	**3.8**

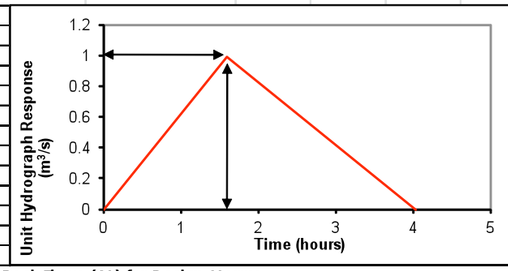
hydrological calculations

Table A 5: Howford Glen FEH calculation sheet

Catchment Characteristics							
AREA	0.72	DPSBAR	84.40	CWI	125	D/Tp	2.584
SAAR	1584.00	DPLBAR	1.220	URBEXT	0.002	RLAG	0
BFI	0.496	PROPWET	0.610	RC	0.39	ARF	0.979

Estimate Tp(0) and Unit Hydrograph	
Tp(0)	1.48
20% Tp(0)	0.30
ΔT	**0.25**
Tp(ΔT)	1.61
Up	0.99
TB	4.05

Calculation of Design Storm Duration D	
D	4.15
D	**4.25 hours**
Rounded to nearest odd integer multiple of ΔT	



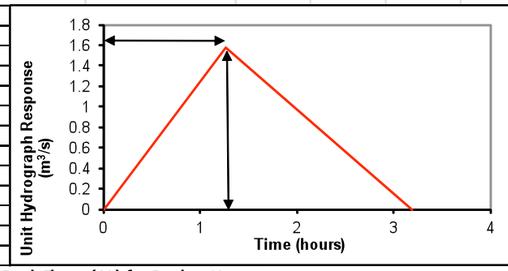
Summary of Design Storm Depths (P) and Peak Flows (Qt) for Design Storms								
Tf (return period flow) [years]	2.33	5	10	25	50	100	200	200+CC
Tr (return period storm) [years]	2	8	17	44	81	140	240	-
M(Tr)-(D)h(point) [mm]	24	35.1	42.1	52.7	60.8	69	78.2	93.8
P (catchment) [mm]	23.5	34.4	41.2	51.6	59.5	67.6	76.6	91.9
Peak Flow Qt [m^3/s]	**0.6**	**0.9**	**1.1**	**1.5**	**1.7**	**2.0**	**2.3**	**2.8**

Table A 6: Unnamed tributary (near Flatterton) FEH calculation sheet

Catchment Characteristics							
AREA	0.91	DPSBAR	148.80	CWI	125	D/Tp	2.581
SAAR	1581.00	DPLBAR	1.120	URBEXT	0.004	RLAG	0
BFI	0.545	PROPWET	0.610	RC	0.39	ARF	0.975

Estimate Tp(0) and Unit Hydrograph	
Tp(0)	1.14
20% Tp(0)	0.23
ΔT	**0.25**
Tp(ΔT)	1.27
Up	1.58
TB	3.20

Calculation of Design Storm Duration D	
D	3.27
D	**3.25 hours**
Rounded to nearest odd integer multiple of ΔT	



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]	21.2	31.2	37.6	47.3	54.7	62.3	70.8	85.0
P (catchment) [mm]	20.7	30.4	36.7	46.1	53.3	60.7	69.0	82.8
Peak Flow Qt [m^3/s]	**0.9**	**1.2**	**1.5**	**1.9**	**2.3**	**2.7**	**3.1**	**3.7**

Table A 7: Unnamed tributary (Greenock Cut) IH124 calculation sheet

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

User Defined
Calculated

ENVIRO Centre Catchment Management

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: Small Tributary draining to Spango Valley site from Greenock Cut

Flow Summary:	**Return Period (years)**	**Flow (m^3/s)**	**Flow (l/s)**	**Flow (Ml/d)**
	2	0.21	208	17.96
	5	0.25	254	21.91
	10	0.32	324	28.03
	25	0.41	413	35.72
	50	0.50	496	42.83
	100	0.60	601	51.91
	200	0.69	685	59.21
	200+cc	0.82	822	71.05

OS Grid Ref: NS227737

AREA: 15 Ha (0.15 km^2) — Catchment area.

SAAR: 1666 mm — From FEH CD-ROM / literature. NB SAAR from Hole of Spango catchment used

SOIL: 0.50 — 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	0	1

$QBAR_{rural}$

$QBAR_{rural}$: 0.76 m^3/s — $QBAR = 0.00108*AREA^{0.89}*SAAR^{1.17}*SOIL^{2.17}$

if site is <50ha — Area Reduction: 0.30 (ratio of size of site to 50ha

$QBAR_{rural\ (adjusted)}$: 0.23 m^3/s — Applicable if area is < 50 ha

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

Growth Curve Factors

Region	Hydrometric Area	Return Period 2	5	10	25	50
N Scotland	1	0.9	1.2	1.45	1.81	2.12
S Scotland	2	0.91	1.11	1.42	1.81	2.17
	$Q_{return\ period}$ (m^3/s)	0.21	0.25	0.32	0.41	0.50

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

Greenfield Runoff Rates

Greenfield runoff rates, shown in Table A 8, were calculated for four zones (Figure A 1) within the site area using the IH124 method.

Table A 8: Spango Valley Greenfield Runoff Rates

Zone	Area (ha)	Greenfield Runoff (m^3/s)	
		T2	T200
1. Sanmina	18.7	0.25	0.82
2. Highcross – Existing developed area	22.1	0.29	0.96
3. Highcross – Proposed residential	5.8	0.08	0.25
4. Scottish Prison Service	9.4	0.12	0.41

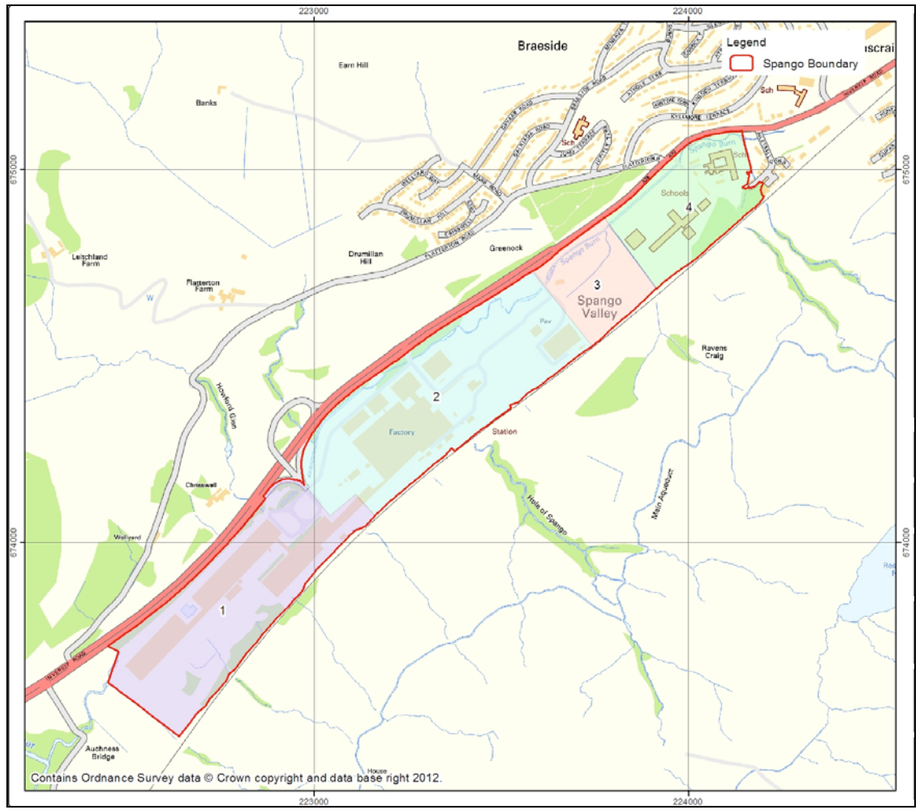


Figure A 1: Spango Valley Zones

Geomorphological Parameters

The reaches of the Spango Burn and Hole of Spango proposed for daylighting will be designed following a natural stable channel design approach. The channel will be designed to convey the QMED flow (Table A 2) and the wider channel corridor will be landscaped to convey the T200 year flow, including a climate change allowance.

Typical gradients, channel widths and the channel belt widths are provided in Table A 9, which are based on the following assumptions:

- The gradient is the average gradient of the current topography through the reach proposed for daylighting;
- The indicative channel width for conveying the QMED flow is based on a conveyance calculation using Manning's equation and Soar and Thorne (2001), and assumes riparian vegetation is present;
- Indicative sinuosity is based on the existing planform where open channel is present through the site and downstream of the site, and the 1857 planform; and
- Channel belt width is based on Soar and Thorne (2001), using the indicative channel width and assuming a 2m buffer strip on both banks.

These values indicate that the restoration of these watercourses to a more natural planform can be accommodated within the masterplan. Design of the channel morphology and planform will need to be undertaken at future design stages.

Table A 9: Spango Valley Geomorphological Parameters

Watercourse	QMED (m^3/s)	Gradient	Indicative Channel Width (m)	Sinuosity	Channel Belt Width (m)
Spango Burn	6.0	1:125	5-7	1.2 – 1.4	26 - 31
Hole of Spango	0.9	1:30	2-3		12 - 18

The existing topography along the south-eastern boundary of the site is generally very steep (1:4 – 1:5 in places) and the tributaries present in these area will be designed to convey the desired design flow; the steep gradient means that meandering is not appropriate and the natural stable channel design equations are not suitable. These can be designed with a low sinuosity and step-pool or cascade features as required.

F

list of consultees

local area steering group

Inverclyde Council
Fergus McLeod - Planning
Ron Gimby - Planning
Charlie Cairns - Greenspace
Mark Higgenbotham - Roads
Gordon Leitch - Roads

Charles Woodward -Clyde Muirshiel Regional Park
Gordon McGuire - Scottish Prison Service, Estates and Technical Services
John Handley - DPP, Planning Consultancy representing Highcross
Andrew Woodrow - CBRE, Planning Consultancy representing Sanmina

executive steering group

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
Scottish Natural Heritage