2016

Glasgow Airport Investment Area Scoping Report

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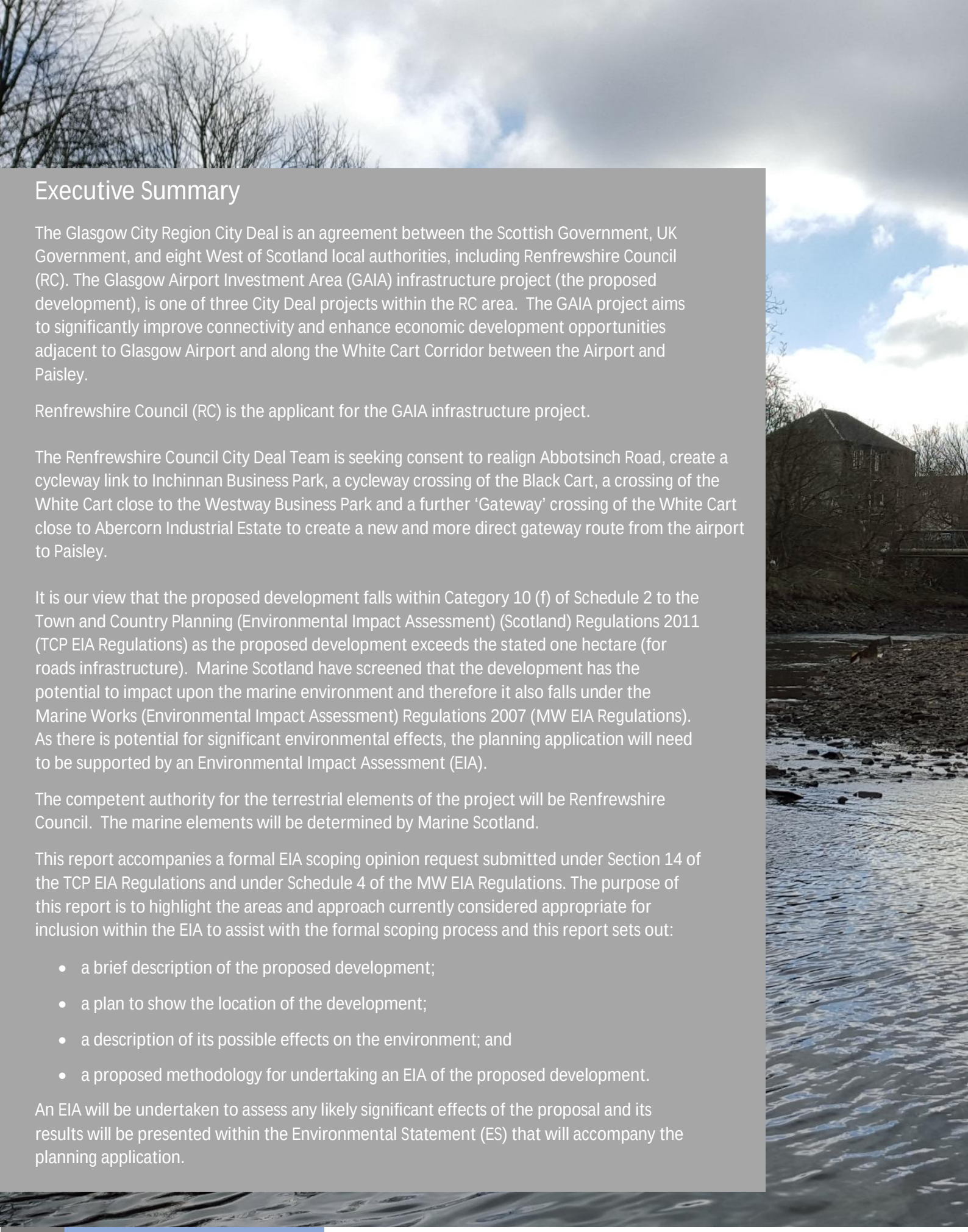


Executive Summary

The Glasgow City Region City Deal is an agreement between the Scottish Government, UK Government, and eight West of Scotland local authorities, including Renfrewshire Council (RC). The Glasgow Airport Investment Area (GAIA) infrastructure project (the proposed development), is one of three City Deal projects within the RC area. The GAIA project aims to significantly improve connectivity and enhance economic development opportunities adjacent to Glasgow Airport and along the White Cart Corridor between the Airport and Paisley.

Renfrewshire Council (RC) is the applicant for the GAIA infrastructure project.

The Renfrewshire Council City Deal Team is seeking consent to realign Abbotsinch Road, create a cycleway link to Inchinnan Business Park, a cycleway crossing of the Black Cart, a crossing of the White Cart close to the Westway Business Park and a further 'Gateway' crossing of the White Cart close to Abercorn Industrial Estate to create a new and more direct gateway route from the airport to Paisley.

It is our view that the proposed development falls within Category 10 (f) of Schedule 2 to the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 (TCP EIA Regulations) as the proposed development exceeds the stated one hectare (for roads infrastructure). Marine Scotland have screened that the development has the potential to impact upon the marine environment and therefore it also falls under the Marine Works (Environmental Impact Assessment) Regulations 2007 (MW EIA Regulations). As there is potential for significant environmental effects, the planning application will need to be supported by an Environmental Impact Assessment (EIA).

The competent authority for the terrestrial elements of the project will be Renfrewshire Council. The marine elements will be determined by Marine Scotland.

This report accompanies a formal EIA scoping opinion request submitted under Section 14 of the TCP EIA Regulations and under Schedule 4 of the MW EIA Regulations. The purpose of this report is to highlight the areas and approach currently considered appropriate for inclusion within the EIA to assist with the formal scoping process and this report sets out:

- a brief description of the proposed development;
- a plan to show the location of the development;
- a description of its possible effects on the environment; and
- a proposed methodology for undertaking an EIA of the proposed development.

An EIA will be undertaken to assess any likely significant effects of the proposal and its results will be presented within the Environmental Statement (ES) that will accompany the planning application.

1. Introduction and Approach to Scoping

1.1 Background

The Glasgow City Region Deal[1] is an agreement between the Scottish Government, UK Government, and eight West of Scotland local Authorities, including Renfrewshire Council (RC).

This City Deal established a £1.13 billion Infrastructure Fund to progress 20 projects across the eight council areas. The City Deal is also to support further growth in the life science sector; provide additional business incubator and grow-on space; establish programmes to support 16-24 year olds and vulnerable adults back into employment; seek new ways to boost the incomes of people on low wages within the City Region.

Sweco is the lead consultant to the applicant for the Glasgow Airport Investment Area (GAIA) infrastructure project (the proposed development), which is one of three City Deal projects within the RC area. The GAIA project aims to significantly improve connectivity and enhance economic development opportunities adjacent to Glasgow Airport and along the White Cart Corridor between the Airport and Paisley.

The GAIA project aims facilitate the growth of existing businesses and create opportunities for new businesses by opening up and improving access to economic development locations adjacent to Glasgow Airport and along the White Cart Corridor between the Airport and Paisley.

The GAIA project is adjacent to the Clyde Waterfront and Renfrew Riverside (CWRR) project with which it has a strong synergy. The completed project will be designed to complement the other City Deal projects and potential cumulative environmental effects will be considered in the preparation of the GAIA Environmental Statement. A separate Scoping Report has been prepared for the CWRR project.

1.2 The Applicant

Renfrewshire Council (RC) City Deal Team is the applicant for the GAIA project.

The planning application will be supported by an Environmental Statement (ES) to meet the requirements of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 ('TCP EIA Regs')). The project requires Environmental Impact Assessment (EIA) following screening determinations made by Renfrewshire Council (the local authority within which the proposed development is located).

Consultation with Marine Scotland has confirmed that EIA is also required for the GAIA project works with the potential to affect the marine environment under the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) ('MW EIA Regs'). The EIA will therefore be undertaken with reference to both sets of EIA Regulations.

[1] www.glasgowcityregion.co.uk

Figure 1.1 shows the site context, **Figure 1.2** the indicative boundary[2] of the new and upgraded road, bridge crossings and new and upgraded cycleways that make up the proposed development and **Figure 1.3** presents an overview of key environmental constraints in the study area.

1.3 Approach to Scoping

This document forms the Scoping Report for the EIA of the proposed development, to be submitted to Renfrewshire Council and Marine Scotland (the competent authorities) in support of a request for a formal Scoping Opinion under the provisions of Regulation 13 of the TCP EIA Regulations and Schedule 4 of the MW EIA Regulations. This report presents the EIA competent authorities and consultees with sufficient information to provide consultation feedback on the proposed scope of the EIA, in particular the approach to assessment and any relevant survey methodologies. This Scoping Report includes a preliminary environmental assessment of the proposed development to identify where there is the potential for significant environmental effects and to propose the level of detail of assessment for each key topic in the EIA.

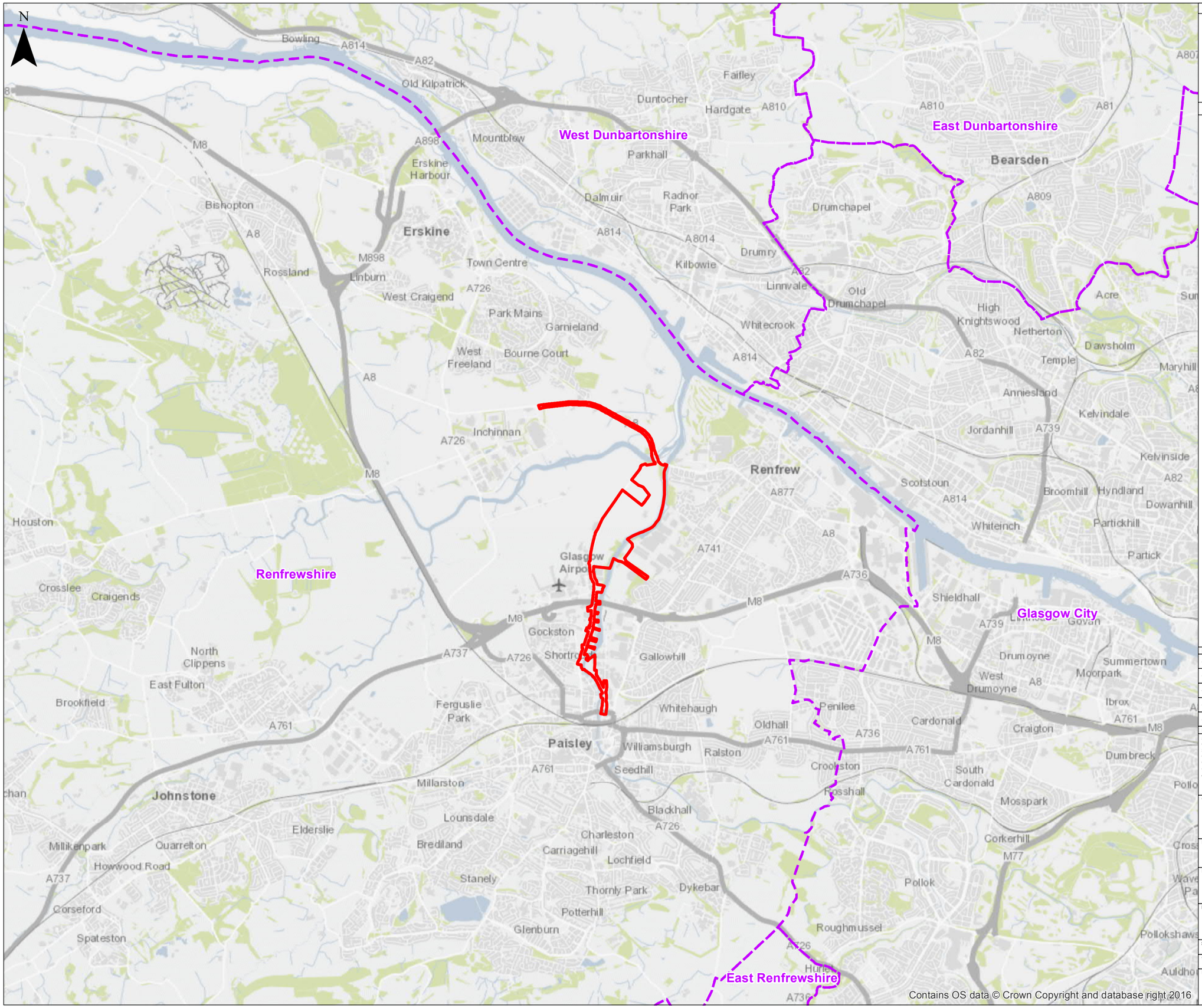
Prior to writing this report, Sweco held Scoping Interviews with each of the technical teams, who were tasked with presenting a summary of the initial baseline assessments, the likely 'significant' effects and any elements that they considered could be 'scoped out'. The reason for holding these interviews was to ensure that a pragmatic approach is adopted for this complex project and that the resulting ES is focused and effective. The outcome of these interviews is the proposed methodology and scope that is presented in the following technical chapters.

EIA is an iterative process which identifies the potential environmental effects that in turn inform the eventual design of the proposal. It seeks to avoid, reduce, offset and minimise any adverse environmental effects through careful design and mitigation. It takes into account the effects arising during the construction and operational phases. Consultation is an important part of the EIA process and assists in the identification of potential effects and mitigation measures.

The consideration of the scope of the various technical assessments has taken into account broad mitigation which has been assumed as part of best practice construction and design of the road and bridge interventions. The following mitigation has been assumed in the assessments:

- construction of the proposals will follow good site practice to avoid or reduce the potential for environmental effects associated with construction activities (e.g. increased sediment in surface water runoff, noise and vibration from construction plant and traffic, accidental water and soil pollution from fuel and oil spills, damage to soils, dust emissions etc.);

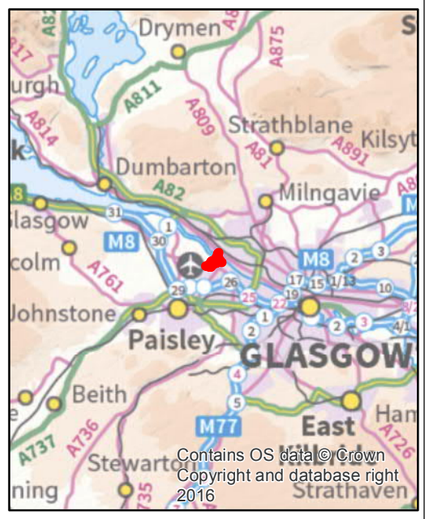
[2] This figure provides a 'red line' boundary around the land which is currently anticipated may be required to construct and operate the scheme (allowing space for mitigation and landscaping). The red line is indicative since project design development is not yet complete and does not necessarily represent the formal red line boundary which will be used for the planning application(s).



Notes

Key

- Indicative Boundary of Proposed Development
- Council Boundary



0 125 250 500 750 Metres

Reference Drawings					
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REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D

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SWECO

Client: RENFREWSHIRE COUNCIL

Drawing Status: FINAL

Suitability: S0

Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure1.1: Site Location

Scale	Designed	Drawn	Checked	Approved
1:50,000	HC	FC	xxx	xxx
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/09/2016	01/09/2016		

Drawing Number: Project / Originator / Volume / Location / Type / Role / Number
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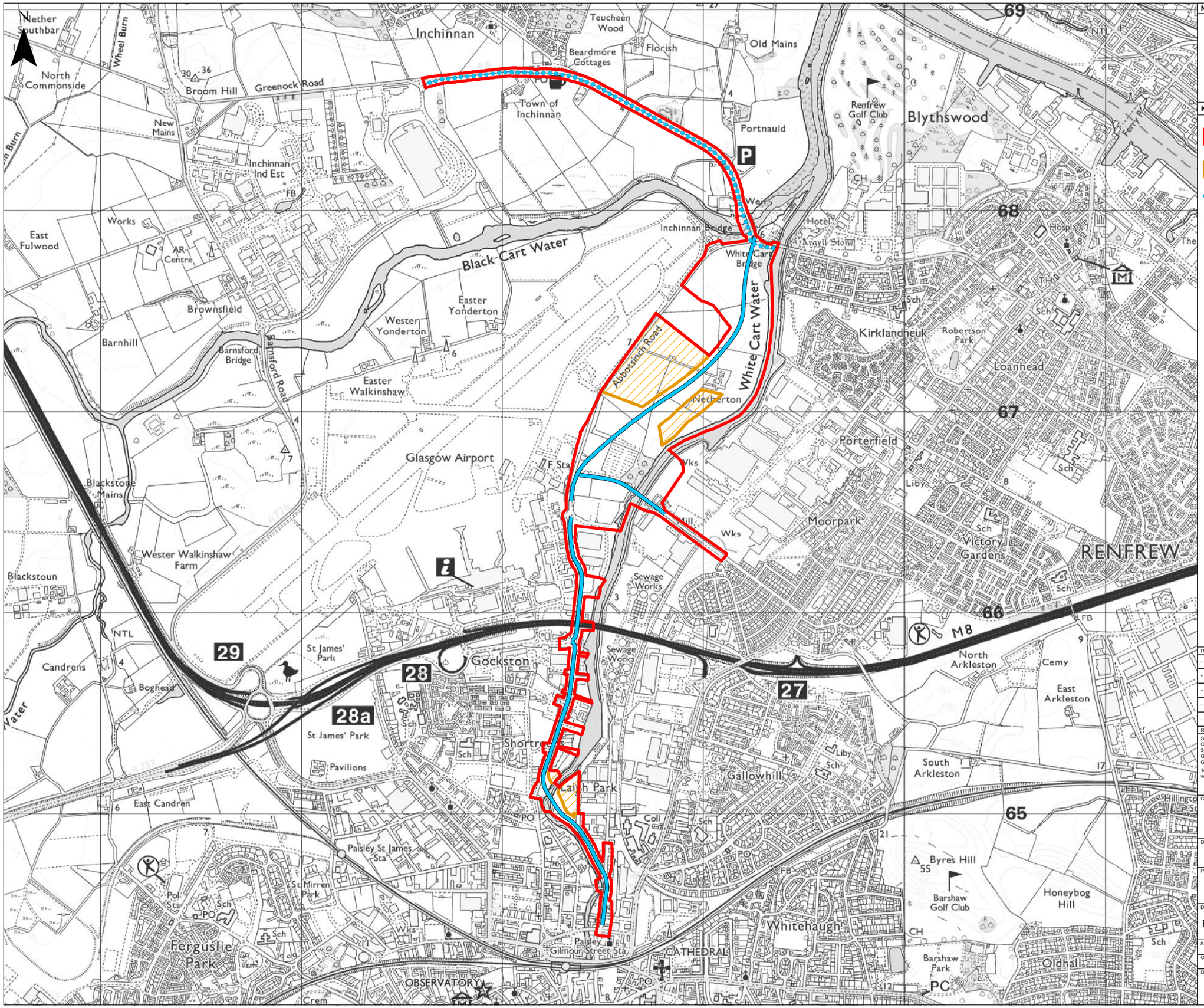
Project Ref. No.: 117084 (R06)

Revision: 0A



Notes

Key

- Indicative Boundary of Proposed Development
- Potential Location for Construction Compound
- Indicative Line of New Cycle Link
- Indicative Line of New / Upgraded Road

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Reference Drawings

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Client: RENFREWSHIRE COUNCIL

Drawing Status: FINAL

Suitability: S0

Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure1.2: Site Layout

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Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/09/2016	01/09/2016		

Drawing Number: Project Originator Volume Location Type Role Number
117084 - SWEC0 - EAC - 00 - SP - EN - 00003

Project Ref. No.: 117084 (R06)

Revision: 0A

East Dunbartonshire

Forth and Clyde Canal
Ref: SM6777

All Hallows Church
Ref:SM2792

Paisley Abbey
Ref:SM8078

Glasgow City

Renfrewshire

1.

2.

Notes

1. Westway Industrial Park
2. Laigh Industrial Park

Key

- GAIA Wider Study Area
- GAIA Core Study Area
- Air Quality Management Area
- Ancient Woodland Inventory (AWI)
- Tree Preservation Orders (TPO)
- Site of Importance for Nature Conservation (SINC)
- Renfrewshire Council Greenbelt
- Fluvial 200yr+Climate Change
- Tidal 200yr +Climate Change
- Scheduled Monument (SM)
- Listed Buildings:
  - Cat. A
  - Cat. B
  - Cat. C
- Council Boundary

0 250 500 1,000 1,500 Metres

Reference Drawings

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SWECO

Client: RENFREWSHIRE COUNCIL

Drawing Status: FINAL

Suitability: S0

Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure1.3: Key Environmental Constraints

Scale	Designed	Drawn	Checked	Approved
1:35,000	HC	FC	xxx	xxx
Original Size	**Date**	**Date**	**Date**	**Date**
A3	05/09/2016	05/09/2016		

Drawing Number: Project / Originator / Volume / Location / Type / Role / Number
117084 - SWEC0 - EAC - 00 - SP - EN - 00003

Project Ref. No.: 117084 (R06)

Revision: 0A

- new road infrastructure will be designed in accordance with relevant standards and good practice including for drainage (following SuDS principles), wildlife porosity (e.g. mammal underpasses) and to mitigate adverse effects on communities through noise reducing measures (e.g. acoustic barriers) where appropriate and through effective integration with community facilities such as core paths and cycle routes;
- new bridge designs will aim to fit aesthetically with their surrounding landscapes and townscapes, will accommodate non-motorised users and be designed wherever possible to avoid in-channel structures and works which affect the riparian zone;
- opportunities will be sought wherever possible to enhance local biodiversity through scheme design/landscaping works and habitat enhancement;
- invasive non-native plant species, for example giant hogweed, will be appropriately contained and treated within the boundary of the project;
- crossings and other accommodation works for core paths and national cycling routes will be incorporated in the design to mitigate the effects of crossing these facilities for pedestrians and cyclists and to increase opportunities for accessibility;
- impacts on archaeological resources will be mitigated through avoidance and design iteration where practicable and otherwise through appropriate investigation and recording of sites; and
- infrastructure designs will be developed and specified to take account of local townscape context and conservation/heritage sensitivities and landscape designs will provide appropriate visual screening of road and traffic and connect with areas of greenspace and local habitat networks.

Where relevant, additional mitigation measures specific to each environmental topic have been set out in the technical chapters of this report.

1.4 Description of the Site

The study area defined for the environmental assessment of the proposed development is located just to north of Paisley Ring Road, approximately 10km to the west of Glasgow City Centre on the south side of the River Clyde. The study area is bisected by the White Cart Water, with Glasgow Airport located in the west of the study area. Renfrew Town is located within the east and north eastern parts of the area, with Paisley Town situated in the south.

A description of the GAIA project proposals is set out in Chapter 2 of this report.

1.5 Structure of this Report

The remainder of the GAIA Scoping Report is structured as follows:

Chapter 2: describes the proposals and explains the project needs and objectives, socio-economic context, planning context and how the project interacts with the GAIA and CWRR Masterplan. A summary of the route options assessment process and the final alignment is also presented within this chapter.

Chapters 3 – 12 present the environmental technical chapters. These chapters identify the baseline conditions for each topic, present an initial environmental assessment, identify the predicted significant effects (including those to be scoped out), the proposed approach to the EIA and any remaining surveys to be undertaken. The technical subjects included in this scoping report are:

- **Chapter 3:** Land use and communities
- **Chapter 4:** Geology, hydrogeology, soils and contaminated land;
- **Chapter 5:** Water quality, drainage and flood defence;
- **Chapter 6:** Landscape and visual effects;
- **Chapter 7:** Ecology and nature conservation;
- **Chapter 8:** Archaeology and cultural heritage;
- **Chapter 9:** Traffic and transport;
- **Chapter 10**: Noise and vibration;
- **Chapter 11:** Air quality;
- **Chapter 12:** Carbon;

Chapter 13 outlines the overall approach to the EIA, by providing an overview of the approach to securing the required planning and other consents for the project. It highlights the overall methodology for the prediction and assessment of environmental impacts including cumulative effects and how the significance of environmental effects will be evaluated. **Chapter 14** presents a summary of the scope of the EIA and sets out the structure of the proposed ES.

2. The City Deals Proposals and Context

2.1 Introduction

The Glasgow City Region comprises the largest city region in Scotland and one of the largest in the United Kingdom, with a population of over 1.75 million people. The Glasgow City Region is a key area for economic growth for both the Scottish and UK economies, generating around 32% of Scotland's Gross Value Added, 33% of Scottish jobs and is home to over 29% of all businesses in Scotland.

2.2 Overall Project Needs and Objectives

The City Deal agreement aims to transform the City Region strengthening its position as a major centre for economic growth in the UK. The delivery of the new transport infrastructure will open up large areas of derelict and underused land for development and act as a catalyst for a transformational change in this area, which has the potential to be a very attractive business and residential destination. The overall key aim and objectives of City Deal is to provide opportunity for private sector investment creating employment, education and other key benefits. Over the lifetime it is estimated that the City Deal will:

- Support an overall increase in the economy of around 29,000 jobs in the city region;
- Work with 19,000 unemployed residents and support over 5,500 back into sustained employment;
- Greatly improve our local transport network (in terms of roads and public transport);
- Deliver key regeneration and development projects;
- Encourage private sector investment into the area;
- Ultimately provide an enormous boost to the city region's economy; and
- Secure £1 billion of Scottish Government and UK Government capital funding to support the proposed infrastructure.

2.3 Alternatives Considered

The proposed development is a result of an optioneering process that considered a number of potential alignments for roads, cycleways and bridge crossings in the four key components of the GAIA project, which are described in Section 2.4. The various corridors and options were assessed to determine which could best achieve the objectives detailed above. The results of that assessment identified the 'proposed development' components as the preferred scheme solution, which has now been taken forward for more detailed design.

2.4 Description of the Proposed Development

2.4.1 The Project Proposals

The proposed development comprises a number of infrastructure proposals that have been developed to meet the project aims. The main elements of the project are:

- **Inchinnan Cycleway**: a proposed cycleway between the Black Cart Water stone arch bridge in the north of the project area and Inchinnan Business Park following the corridor of the A8 Greenock Road.

- **Netherton Farm**: realignment of a section of Abbotsinch Road, to the west of the White Cart Water, from Arran Avenue in the south and up to and including improvements to the junction at the northern end of the road with the A8.
- **Wright Street Crossing**, a new bridge across the White Cart Water linking Wright Street, the Westway Business Park and adjacent development areas, to provide improved connectivity between the Business Park, Glasgow Airport complex and the strategic road network. This crossing would also provide new and improved active travel opportunities.
- **Gateway,** a new 'gateway' route, incorporating a new bridge crossing of the White Cart Water at Paisley Harbour, to provide improved connectivity between Paisley town centre, the Airport and potential adjacent development sites.

An indicative plan showing the overall layout of the proposals and the indicative boundary of land which may be required to construct the scheme (and to allow for sufficient land for mitigation etc.) is presented in **Figure 1.2**. Further details on the scheme design at this stage are presented in the sub-sections below[3].

There are also two further project elements that may be applied for as part of the proposed development but as yet, these have not received confirmed funding under the GAIA City Deal. These elements are:

- a new/upgraded cycle route between Arran Avenue and Sanderling Road, linking the other new/upgraded road sections described above; and
- the potential for a new pedestrian/cycle bridge across the Black Cart Water to link into the new Inchinnan cycleway.

Prior to the submission of the planning application, it will be determined whether these elements are to be included and to be 'applied' for. To ensure that there are no gaps in our assessment or baseline data, we are considering these elements whilst gathering data and undertaking surveys.

2.4.1.1 Roads and NMU Facilities

Improved active travel links between population centres such as Renfrew, Erskine, Inchinnan and Paisley and key employment locations such as the Airport and Inchinnan Business Park, forms a key part of Council policy to promote modal shift, as set out in the Council's Local Transport Strategy, the Local Development Plan, it's Outdoor Access Strategy and it's soon to be published Cycling Strategy.

Existing river crossings suitable for active travel are located approximately 4km apart and suffer from significant traffic congestion at peak periods. The new bridge crossings linked to high quality, segregated active travel infrastructure that runs parallel to the key transport routes will provide a significant improvement in safety and connectivity and overcome the existing severance issues presented by the White Cart River.

[3] The preferred scheme is currently in the design development stage and a Specimen Design will be prepared by the end of 2016. The design will be 'frozen' at this stage to allow the EIA to be undertaken.

GAIA will provide a total of 5.78km of new/upgraded single carriageway road/cycleways to provide improved transport connections to and from the GAIA development area.

The key road connections are:

- A new 2.2km cycle link from the Bascule Bridge, following the alignment of Greenock Road and linking with Inchinnan Business Park.
- A new 1.7km section of single carriageway road extending south west from the junction of Abbotsinch Road, Inchinnan Road and Greenock Road (west of the Bascule Bridge) to the Abbotsinch Playing Fields. This road broadly follows the line of the White Cart Water, through an area of arable farmland at Netherton. The road would be elevated in the north to sit above the 200yr tidal flood level and would slope down to existing ground level as it meets with the existing Abbotsinch Road at the Abbotsinch Playing Fields. The existing Abbotsinch Road would no longer be in use, allowing the growth of Glasgow Airport and opening up land around the airport for future airport related development.
- A new 0.55km section of single carriageway road connecting onto the east part of Arran Avenue adjacent to the airport car-parking area, turning north on the west side of the White Cart Water and then turning east across the White Cart via a new bridge to connect into the existing 'dead-end' of Wright Street.
- An upgrade of 0.64km section of Inchinnan Road from the junction with Abbotsinch Road/Sanderling Road southwards towards its junction with New Inchinnan Road.
- A new 0.42km section of single carriageway road extending from Inchinnan Road through an area of disused hardstanding, to the south of Nethercommon Industrial Estate, and crossing the White Cart Water via a new 'Gateway' bridge. At the eastern landing of the Water, the new carriageway would pass across an area of disused car parking on the riverbank (west of Abercorn Industrial Estate) to meet the existing Harbour Road, which follows the eastern bank of the White Cart Water.
- Upgrade and widening of the 0.27m of the existing Harbour Road and 0.23km of the existing Abercorn Street to provide a road connection with Niddry Street (the A726).

2.4.2 Project Construction

It is anticipated that GAIA construction would take approximately 24 months, assuming that all elements of the project are built at the same time. The sequence of construction would be determined by the future contractor(s) but for the purposes of the EIA it has been assumed that construction work on all key parts of the scheme (roads and bridges) would commence at a similar time and be undertaken concurrently. The sequence of construction activity would indicatively be:

- site clearance and tree felling;
- establishment of construction compounds, site access tracks and temporary drainage;
- diversion of services and utilities where required and protection of existing services to be maintained (particularly a high voltage cable);
- ground works including earthworks and piling for bridge foundations;
- installation of permanent drainage;
- formation of new roads, NMU facilities and junctions (including traffic management at junctions with existing roads);

- construction of the new bridges; and
- planting and landscaping works.

The design of the Wright Street Bridge would require a clear span in the region of between 60 and 80 metres. The Paisley Harbour (Gateway) Bridge would measure approximately 43m in length. Given the length of span, conventional bridge forms such as precast concrete beam and steel beam/concrete deck composite structures may require in-river piers to support the bridge deck although these would be located close to the river banks. The most likely method to install the piers in the watercourse would be to install sheet piled cofferdams around the location of the piers, de-water, install a pile platform within the cofferdam and then build up the structures in these contained environments.

Further details on the potential outline construction methods for the scheme will be developed as the detailed design progresses and used to inform the EIA. It is assumed (and a mitigation commitment will be provided in the ES) that the principal contractor will undertake all works in accordance with an Environmental Management System (EMS) accredited to a relevant recognised standard and environmental issues overseen on site by an Environmental Clerk of Works (ECoW).

It has been assumed that construction would be undertaken on a working week based on working hours from 07.00 to 19.00 Monday to Saturday and that night time and Sunday working would not be permitted other than with prior approval of the relevant local authority environmental health departments.

The exact location of construction compounds will be determined by the eventual contractors for the scheme. At this stage and for the purposes of the EIA, it has been assumed that up to 3 construction compounds may be required. These include one compound on either side of the proposed road corridor at Netherton Farm (two in total), and one at Paisley Harbour to facilitate the bridge crossing and road construction near Abercorn Industrial Estate. Compounds would be located on land without significant environmental constraints and with ready access to the road network for heavy goods vehicles (HGVs). Further details of the location and size of the indicative construction compounds will be provided in the Environmental Statement (ES) for the proposals.

2.5 Sustainability of the Proposals

This project offers a rare opportunity to facilitate large-scale sustainable development and to further the aims of the 2015 United Nation's Sustainable Development Goals (SDGs), one of which is to 'take urgent action to combat climate change and its impacts'. The early stages of the infrastructure development offer the greatest opportunity for reducing whole-life project carbon (which is one of the guiding principles for the project), as well as measures to provide demonstrable economic, social and environmental benefits.

Opportunities for sustainable development, in line with the SDGs, have been considered against their applicability to the project to minimise the likelihood of being designed out at subsequent stages. Four key sustainability objectives were defined at the outset of the project to allow comparison between route options and ensure their inclusion throughout all stages of development. These are:

- To facilitate opportunities for **learning** through the project;

- To connect opportunities for environmental improvements with **community benefit**;
- Adopt and record sustainable **resource management** in design and construction;
- **Minimise whole life carbon** associated with the project.

A number of recent Institute of Environmental Management and Assessment (IEMA) guidance documents on climate change and EIA have been followed during this assessment and are detailed further in **Chapter 12.**

The EIA process provides an appropriate mechanism to assess the impact of the project on the receiving environment (climate change mitigation through whole life carbon reduction) as well as assessing the resilience of the project and receiving environment and communities to future changes in the environment (adapting to increased temperatures and sea level rise).

2.6 City Deal Masterplan

A masterplan is being prepared to establish a framework for future land uses and developments, which would result from the implementation of the both the CWRR and GAIA proposals to ensure that development resulting from these two projects is cohesive. The masterplan seeks to ensure that the road alignment, and associated planned infrastructure interventions, are suitably defined and that potential land uses in the future are identified and maximised, while demonstrating the physical and commercial regeneration of the area. The Masterplan is currently being developed and will be submitted as a supporting document to the Environmental Statement.

2.7 Development Planning Context

A summary of the key relevant development plan policy is outlined in this section. Further details on policies and plans (national, regional and local) will be reported as part of the ES which will provide a planning context for the assessment work.

2.7.1 Glasgow and Clyde Valley Strategic Development Plan 2012

The Glasgow & Clyde Valley Strategic Development Plan 2012 (SDP) sets out the spatial development strategy for the region. This project is being developed to reflect the SDP's spatial development strategy and support its spatial vision and strategy. The project will support the five key components of the SDP's spatial vision. Glasgow Airport Investment Area is identified as a Strategic Economic Investment Location (SEIL) in the SDP.

2.7.2 Renfrewshire Local Development Plan

The Renfrewshire Local Development Plan 2014 (LDP) sets out the spatial strategy that will facilitate investment and guide the future use of land in Renfrewshire. The LDP lists Glasgow Airport Investment Zone and Westway Business Park as important economic investment locations and the project, together with the complementary CWRR City Deal project, will improve connectivity to these locations.

A review of the LDP has been undertaken to identify strategically important development planning designations, constraints and other land use allocations within the study area. The study area for GAIA includes two Strategic Economic Investment Locations (SEILs) at Wright Street and Inchinnan. There is an area of Green Belt designated in the LDP to the north (and west) of the Glasgow Airport Operational Land Site. Three Renfrewshire LDP Transitional Zones

(areas where land use change is anticipated and encouraged) are located within the GAIA study area: Wright Street and Paisley North. These areas are located adjacent to a number of Local Industrial Areas. Abbotsinch Commercial Centre, comprised of a number of 'big box' retail stores is located centrally to the study area, along the southern edge of the M8. Key environmental constraints are shown on **Figure 1.3**.

Table 2.1 below presents an overview summary of the policies from the LDP which will be addressed as part of the EIA. The full text of each relevant policy has been summarised.

Table 2.1 Summary of Relevant Renfrewshire LDP Planning Policies

Policy	Brief Description
Policy E1: Renfrewshire's Economic Investment Locations	Support development in Strategic Economic Investment Locations and local business / industrial areas
Policy E2: Glasgow Airport Investment Zones	Promotes area around Glasgow Airport as key locations to support economic growth and the regeneration and renewal of the Cart Corridor
Policy E3: Transition Areas	Locations which can support a mix of uses provided development proposals can co-exist with existing uses
Policy E5: Glasgow Airport Operational Land	Promotes the area around Glasgow Airport as a key location to support economic growth and the requirements of the airport, including sustainable transport and travel and enhanced connectivity to and from the airport
Policy C1: Renfrewshire Network of Centres	Supports development that strengthens the network of places in Renfrewshire, and enhances its centres, ensuring these are vibrant, inclusive, accessible and complementary places, as well as compatible with surrounding land uses
Policy C2: Development out with the Network of Centres	Considers development which is proposed out with the network of centres in Renfrewshire
Policy I1: Connecting Places	Supports development proposals which give priority to sustainable modes of travel
Policy I5: Flooding and Drainage	Development should avoid areas susceptible to flooding, incorporate sustainable drainage infrastructure (SUDS), avoid increasing flood risk and compensate for loss of flood storage capacity
Policy P1: Renfrewshire's Places	Supports development proposals which give priority to sustainable modes of travel and have no significant impact on the safe and efficient operation of the local or trunk road network
Policy P7: Green Network	Supports development which safeguards existing green networks and / or has potential to contribute to an integrated green network
Policy P8: Open Space	Supports the protection of open space, recreational provision and amenity space from development

Policy	Brief Description
Policy ENV1: Green Belt	Green Belt maintains identity of settlements and landscape setting. Appropriate development within the green belt will be considered acceptable where it can be demonstrated that it is compatible with the provisions of the New Development Supplementary Guidance
Policy ENV2: Natural Heritage	Developments must not have an adverse effect on the integrity of sites protected for their natural conservation interest or which have potential to protect and enhance designated sites and wider biodiversity
Policy ENV4: The Water Environment	Supports proposals which encourage protection of the existing water environment, improvement to the control and management of water and enhancement of biodiversity, flora and fauna surrounding blue corridors. Encourages green infrastructure to ensure that the water environment is central to the fabric of places and contributes to sustainable flood management
Policy ENV5: Air Quality	Development proposals shall not individually or cumulatively have an adverse effect on air quality

2.8 Socio Economic Context

2.8.1 Overview of Socio-Economic Profile

The Glasgow City Region benefits from numerous economic assets, successful universities and research institutes and a skilled workforce. However the city and wider region also faces numerous challenges that have acted as barriers to economic growth. These include: high rates of long term unemployment; poor survival rates for business start-ups (when compared to similar UK cities); stalled development sites in key locations; and weaknesses in the area's transport infrastructure.

An overview of the socio-economic profile of three local areas within Renfrewshire has been undertaken[4]. These are: Braehead; Inchinnan; Paisley North and Airport. In addition to looking at this more disaggregated level, data is also analysed at the local authority level for Renfrewshire compared with the equivalent figures for Glasgow City and the Scottish national statistics.

There are some important trends from the analysis that highlight problems in the area:

- Renfrewshire's population is growing at a much slower rate compared to both Glasgow City and to the Scottish average trends;
- the proportion of the population in working age (i.e. between 16 and 64) has been in decline since 2001 and is forecast to decline further in the period 2015 to 2030. This could be due to lack of local employment opportunities. Combined with a forecast decline in the number of people under the age of 15, this highlights potential shortages in future local labour supply;

[4] These are reported in more detail in a separate socio economic assessment for Renfrewshire City Deal prepared by Peter Brett Associates

- in recent years Renfrewshire has seen relatively low levels of workplace earnings. This can make it difficult to attract people looking for employment to the area; and
- Renfrewshire has a lower rate of business start-ups compared to Glasgow City and Scotland as a whole. It has also seen a higher than average rate of business closures in recent years. The areas to the north of Paisley and around Glasgow Airport are in particular need of further investment going forward due to the higher than average unemployment rate, lower qualification and car ownership rates and a significantly decreasing population rate.

The vast majority of all travel to work in the local area is under 10km, making journeys to work by active travel modes practical. Renfrewshire shows a very similar pattern to that for Scotland as a whole, with the majority of households having one or less cars available, with the majority of households having one or no cars. At a more localised level, Inchinnan has the highest car ownership levels, with 40.4% of households having two or more cars. Paisley North and the airport has the lowest car ownership rates with 51.3% of households having no cars. An above average proportion of public transport users reflects the low car ownership in the area as well as the potential for promotion of travel by active travel modes.

2.8.2 Socio Economic Impact of the GAIA Proposals

The City Deal projects seek to maximise economic benefits for Glasgow, the wider City Region and Scotland through the delivery of a programme of high impact investment. In order to ensure happens, Member Authorities[5] have engaged in an exercise to identify projects which not only maximise the economic outputs at a project level, but which also deliver positive economic benefits to the region and Scotland collectively as a programme.

The GAIA project aims to open up and improve access to economic development locations adjacent to Glasgow Airport, in particular along the White Cart Corridor which is blighted by significant areas of underused land, the development of which has been hampered by poor accessibility. The infrastructure investments proposed for this location will assist in opening up this corridor as a key business location by providing significantly improved accessibility and connectivity to key development sites in the project area as well as facilitating the expansion and development of Glasgow Airport and enhanced productivity / GVA growth in existing sites.

An initial high level socio-economic assessment has been undertaken[6] to establish the potential gross impacts of the following elements of the future developments that would be anticipated to be facilitated by the GAIA proposed development.

- approximately 21.1 ha advanced manufacturing / light industrial / commercial office; and
- approximately 2.9 ha residential / mixed use split across two sites either side of White Cart Water: 0.9ha and 2.0ha

[5] East Dunbartonshire Council, East Renfrewshire Council, Glasgow City Council, Inverclyde Council, North Lanarkshire Council, Renfrewshire Council, South Lanarkshire Council, West Dunbartonshire Council

[6] GAIA Part B – Options Generation and Assessment, Report Prepared for Renfrewshire Council, Sweco, August 2016 (currently in draft)

An Economic Impact Model has been built to establish the following indicators for the proposed GAIA development:

- Developable floorspace;
- Residential units;
- Construction costs;
- Construction jobs (person years);
- Construction Gross Value Added (GVA);[7]
- Permanent Full-time Equivalent (FTE[8]) jobs
- GVA from permanent employees;
- Estimated value of supply chain linkages; and
- Council Tax contributions.

From the work undertaken to date it has been estimated that development of the elements of the proposed development to the north of the M8 would create around 147,700m^2 of developable floor space. Assuming an 85%/15% split between advanced manufacturing, light industrial and office related uses, this would generate approximately 1,551 FTE office jobs and £79.0 million GVA. A further £32.7 million would be spent on supply chain linkages per annum. The advanced manufacturing /light industrial element would provide 2,270 FTE jobs, £214.6 million GVA and £81.4 million in annual supply chain linkages.

The development proposed to the south of the M8 would provide a mix of residential units and mixed use floor space. An estimated 32 family homes would provide £0.04 million council tax per annum. The ongoing permanent impacts from the employment floor space would be 147 FTE jobs and £7.5 million GVA for the office related element and 215 FTE jobs and £20.3 million GVA for the light industrial element. A more detailed assessment of the socio-economic implications of the future developments which are anticipated[9] as a result of the GAIA infrastructure proposals will be set out in the Environmental Statement (ES).

In summary, significant economic benefits are predicted from the future development of residential and commercial sites which will be stimulated through the infrastructure measures that are proposed to be delivered by the GAIA proposed development.

[7] Gross value added (GVA) is the measure of the value of goods and services produced in an area, industry or sector of an economy

[8] One Full Time Equivalent worker is equivalent to one worker working full-time or two workers working part-time

[9] These developments are described further in the City Deal Masterplan which is being prepared for the proposals (see **Section 2.7**)

3. Land use and communities

3.1 Introduction

This section describes the proposed approach to the assessment of potential effects of the proposed development on land use, and on key community journeys by pedestrians, cyclists and equestrians.

Key land uses in the GAIA study area include business parks/industrial estates, residential and other properties, transport routes, woodlands, open space, agricultural land and waterways. Community journeys have been defined as key journeys representative of a range of journey types made by the local communities.

The assessment focuses on a wide study area representative of local land uses and the area used by the local communities (centred over the route option) hereafter referred to as the 'study area' (see **Figure 3.1**).

The objectives of this section of the report are to:

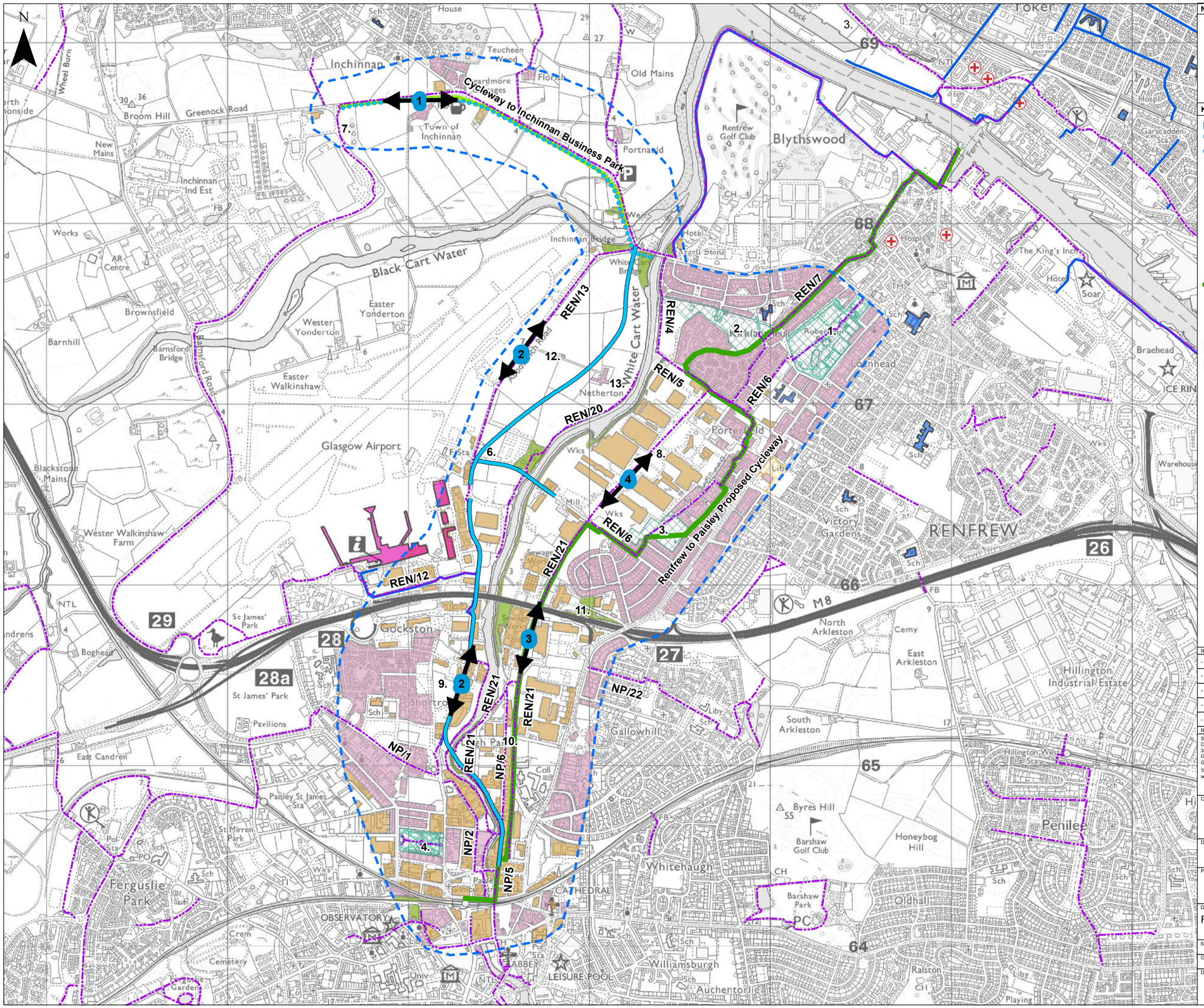
- outline consultation undertaken regarding the predicted effects of the proposed development in relation to land use and community use;
- describe baseline conditions relevant to the proposed development;
- present an initial assessment of the potential effects on the baseline associated with construction and operation of the proposed development; and
- outline the proposed approach to the impact assessment, if further surveys are required and what will be scoped out of the assessment.

3.2 Consultation

The following consultees have been contacted to date and the information or feedback provided is summarised in **Table 3.1.**

Table 3.1 Summary of Consultation

Consultee	Summary of Response
British Horse Society	(Email from 01.03.16) noted that the areas for development are not considered to have extensive equestrian activity.
Cycling Scotland	(Email from 01.04.16) noted that: • there are threats including severance of communities from the infrastructure; • there should be enhanced routes for a coherent cycling network encouraged. Where cycling linkages have already been identified in new bridges across the Clyde and White Cart, facilities for cyclists should be incorporated into the initial designs and take cycling by Design standards into consideration; • any projects in Renfrewshire should be implemented mindful that 30.6% of households in the council area have no access to a car and that cycling can provide an accessible form of transport for work, study and leisure; • any developments should incorporate a clear, evidence based focus on improving cycling infrastructure for journeys of up to 5 kilometres, the journey distance that most people would choose to cycle; and • the focus should be where demand is greatest, for example to schools, major employers, retail centres, rail stations and leisure attractions.



Notes

1. Robertson Park
2. Kirklandneuk Park
3. Knockhill Park
4. Fountain Gardens
5. Moorcroft Park
6. Abbotsinch Playing Fields
7. Inchinnan Business Park
8. Westway Business Park
9. Westpoint Business Park
10. Abercorn Indutrial Estate
11. Abbotsinch Retail Park
12. Netherton Cottage
13. Netherton Farm

Key

- Study Area
- Indicative Line of New Cycle Link
- Indicative Line of New / Upgraded Road
- Key Community Journeys:
  1. Inchinnan Business Park
  2. Glasgow Airport
  3. Paisley Town Centre
  4. Westway Business Park
- GAIA Core Paths
- Renfrew To Paisley Proposed Cycleway
- Local Cycle Route
- Cycleway to Inchinnan Business Park
- Glasgow Airport
- School
- Health Centre
- Playing fields
- Public park and garden
- Woodlands
- Commercial
- Residential

0 125 250 500 750 Metres

Reference Drawings

-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D

Sweco
City Park Suite 3/5
368 Alexandra Parade
Glasgow
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Tel: +44 (0)141 414 1700
web: www.sweco.co.uk

SWECO

Client: RENFREWSHIRE COUNCIL (Renfrewshire Council)

Drawing Status	Suitability
FINAL	S0

Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure 3.1 Land Use and Key Community Journeys

Scale	Designed	Drawn	Checked	Approved
1:20,000	TB	TB		
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/09/2016	01/09/2016		

Drawing Number: Project / Originator / Volume / Location / Type / Role / Number
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Project Ref. No.: 117084 (R06)

Revision: 0A

Consultee	Summary of Response
Forestry Commission Scotland	(Letter from 15.02.16 and meeting on 5.07.16) will require direct engagement regarding any design plans that may impact on Ancient Woodlands, Native and Semi-Native woodlands, SSSI (Black Cart), Local Nature Conservation Sites and Tree Preservation Orders.
GCV Green Network Partnership	(Email from 10.03.16) has identified that the Green Network delivery should focus on improvement of walkable access to greenspace, the greening of vacant and derelict land, intergrate Green Infrastructure and improve underperforming existing greenspace.
Living Streets	(Email from 11.03.16) recommends using the Scottish Government's Place Standard and noted that cycling and walking improvements are welcomed. If the overall scheme does not achieve the best outcomes for NMUs, the difficult crossing at major roads are a concern that must be addressed in the design. Attractive new bridges consist of good levels of pedestrian priority and cycle infrastructure.
Paths for All (PfA)	(Letter from 24.03.16) referred to the National Walking Strategy.
Scottish Rights of Way & Access Society	(Letter from 26.04.16) indicates that rights of way SR52-54 and SR56 will be affected by the GAIA project and informs that none of the proposed routes or bridges directly affects the routes.

3.3 Baseline Description

The main settlements in the area are Renfrew in the north-east and Paisley in the south. The study area contains land used for built development such as residential areas, roads, commercial and industrial, as well as semi-natural habitats, agricultural land (10% of the study area) and woodland (10%)[10] of the study area as shown on **Figure 3.1**.

3.3.1 Key Land Uses

3.3.1.1 Community Land

Within the study area, the Greenspace data and field work show that there are very few areas identified as open space (i.e. woodlands or amenity greenspaces). The principal areas of open space within the study area are located at:

- **Robertson Park** in Renfrew which includes a duck pond, floral gardens, BMX course, skateboard park, tennis courts, putting area, bowling green, sensory garden, cycle tracks, swing parks and a small animal enclosure;
- **Kirklandneuk Park** located in Renfrew, west of Robertson Park next to the Kirklandneuk Primary School;
- **Knockhill Park**, in Renfrew to the south-east of Westway Business Park; and
- **Fountain Gardens** in Paisley between Love Street and the A726 is one of only three category A listed fountains in Scotland.

The main woodland areas identified within the study area are riverine woodlands located on the bank of the White and Black Cart Water. An area of woodland is also located along the northern boundary of the study area, south of Greenock Road (A8).

[10]Information presented are estimates and are based upon the EUNIS Land Cover Scotland raster data https://gateway.snh.gov.uk/natural-spaces/dataset.jsp?dsid=EUNIS

There are a number of footpaths (including core paths) within the study area which provide access for the public for recreational purposes. A review of the relevant core paths has been undertaken to identify designated paths used by Non-Motorised Users (NMUs) in the area. **Table 3.2** below presents a summary of key paths in the study area.

Table 3.2: Key designated paths used in the study area

Path Name	Brief Description	Connectivity	Quality
Inchinnan Cycleway Corridor			
REN19 Core Path	Footway on Inchinnan Road from Inchinnan Business Park to Bascule Bridge (length is c2.1km)	Links to E1/25, Inchinnan Business Park and Ren/1 Ren/2 and Ren/4	- Tarmac surface - quality deteriorates throughout - Route is unlit - Limited signage upon approach at Bascule Bridge to Renfrew Ferry Busy road with fast-moving traffic - Standing water
Netherton Farm Corridor			
REN13 Core Path	Cycle Route on Abbotsinch Road, running the length of Abbotsinch Road (length is c3.6km)	The existing cycle facilities are signposted along the route that connects to the airport and five existing core paths: REN19, REN2 and REN4 at the beginning of the cycle route and NP1 and NP2 at the end of the cycle route.	- Route lit, Pavement is generally in good condition. Road in generally good condition - Signage provided; airport cycle route signs throughout - Large sections of route on-road - No mandatory cycle lane - Exit to airport not signposted Fairly well used, although not for airport connection
REN20 Core Path	Path along west bank of White Cart Water (length is c1.4km).	Currently isolated from existing core path network	- Path consists of grass/earth, with a small tarmac section No signage or lighting
Wright Street Corridor			
REN6 Core Path	Route from Inchinnan Road to Wright Street via Robertson Park (length is c2.4km)	Route adjacent to Ren/7 and Ren/15 Potential link to aspirational Ren/21 along former railway line.	- Tarmac surface on path; good quality but problems with drainage - Cycling signage painted on pavement but in poor condition.
REN20 Core Path	See description above	-	-
Gateway Corridor			
REN13 Core Path	See description above	-	-
NP6 Core Path	Abercorn Street to Chivas Brothers Access	Aspirational Ren/21, SP/2 and NP/2	- Surfacing is okay condition, but then deteriorates - No signage is provided

Path Name	Brief Description	Connectivity	Quality
REN 21 (Aspirational Core Path)	- West bank of White Cart Water (Niddry Street to Marchfield Avenue) - Harbour Road & east bank of White Cart Water - Hamilton Street to Wright Street (length is c3.1km)	- REN 13, NP2, Paisley to Glasgow Airport off road link - Possible connection to aspirational route across river if footbridge restored - NP5 - Possible connection to aspirational route across river if footbridge restored - Link to REN 6, NP5. - Would connect Renfrew and Paisley town centres	- Tarmac of variable quality - mainly falling into disrepair (sections for housing developments etc, have been abandoned) - Poor tarmac surface quality along surveyed section (Harbour Road) - Former railway line - derelict. Very poor surface

There is a proposal for a Renfrew to Paisley Cycleway being planned by Renfrewshire Council. The proposed bridge crossings associated with the GAIA and CWRR proposals will tie in with this cycleway and will significantly reduce severance and improve cross river connectivity from Paisley through to communities in Glasgow that are located to the north of the River Clyde. The proposed alignment of this cycleway principally follows the route of a former railway line between the two towns (see **Figure 3.1**).

3.3.1.2 Community Facilities

The majority of the key community facilities in the study area are located in the town centres of Paisley and Renfrew. These include:

- **Football pitches at Abbotsinch,** which are owned by Airport and leased to Glennifer Thistle FC;
- **West College Scotland's** Paisley Campus located on Renfrew Road in the south of the study area. The campus includes a Category C Listed Building and serves the populations of Inverclyde, Renfrewshire and West Dunbartonshire and surrounding areas;
- **Kirklandneuk and St James Primary Schools** which are located west and south-west of the Robertson Park in Renfrew;
- **Mossvale and St James Primary Schools** In Paisley to the west of the White Cart Water and south of Glasgow Airport;
- **Inchinnan Post Office** located in Inchinnan off Greenock Road (A8); and
- **Moorpark Post Office** located in Renfrew south west of the Robertson Park at the intersection between Paisley Road (A741) and Porterfield Road.

3.3.1.3 Private Assets

Various key residential and private properties have been identified within the study area. Residential land uses in the study area are concentrated in and around the north of Paisley town centre and Renfrew town centre, to the south of Glasgow Airport and east of Renfrew Road (A741) in the Gallowhill area.

Local transport and other private assets include:

Netherton Farm (inhabited) and **Netherton Cottage** (uninhabited) residential properties are single detached houses located between Abbotsinch Road and the White Cart Water within an area of agricultural land east of the airport runway and taxiway.

Town of Inchinnan Farm House, residential property and farm buildings located south of Greenock Road. The buildings are accessible via a road off Greenock Road.

Inchinnan Cruising Club, a small sailing club located south of Inchinnan Road and White Cart Bridge along the western bank of the White Car Water**.**

Glasgow Airport is an International airport located west of Abbotsinch Road.

The **Westway Business Park** area is located in Renfrew to the immediate east of the White Cart Water to the west of Paisley Road (A741). The park provides industrial, warehousing, distribution and office facilities including its own dock located on the tidal reaches of the White Cart Water.

Glasgow Airport Long Stay Car Park is a long stay car park located off the east of Abbotsinch Road.

The **Abercorn Industrial Estate** is accessible via Abercorn Street in Paisley and a large number of industrial units, some of which are vacant. Abercorn Street ends at a Waste Water Treatment Plant located to the immediate east of the White Cart Water. The facility serves about 74,000 people in the Paisley area.

The **Westpoint Business Park** located west of the White Cart Water and south of the M8 accessible via M8 junction 28. The park includes five modern buildings.

The **Inchinnan Business Park** is located north of Glasgow Airport and the Black Cart Water. It is linked from Renfrew via Greenock Road (A8) or the M8/A726. The park is well established with a number of major nationally owned occupiers including Rolls Royce, Vascutek, M&Co, Graham Technology, Bray Flow Technologies, Peak Scientific and Life Technologies.

A local business, Chalk Autos is located to the south of Greenock Road. Access to this local business is located to the east of the fork in the road.

3.3.1.4 Waterways

The **White Cart Water** and the **Black Cart Water** rivers are tributaries of the River Clyde and their courses meet within the study area to the south-west of Renfrew Golf Course approximately 1km south of their confluence with the River Clyde. The water features run under the A8 west of Renfrew through a number of 'A' Listed Bridges. The White Cart Water is navigable to a point slightly upstream of the Westway Industrial Park, which is located in the middle of the study area (further information on the rivers including flooding and water quality is presented in **Chapter 5**: Water Quality, Drainage and Flood Defence).

3.3.1.5 Agriculture

There are pockets of agricultural land identified in the north-west of the study area. The farmland surrounding Netherton Farm is classified as Class 3.2: Mixed Agricultural Land[11] which is described as 'land capable of being used to grow a moderate range of crops including cereals'. The land further north, west of the Black Cart Water is classified as a mix of Class 3.2 and 4.2, which is also classified as "Mixed Agricultural Land".

3.3.2 Key Community Journeys

A review of representative journeys (by destination) has been undertaken to identify a set of typical journeys within the study area by NMUs. Five key journeys have been identified (see Figure 3.1):

Key Destination 1. Inchinnan Business Park: The business park is located north of Glasgow Airport and south of Greenock Road (A8). The park is accessible to NMUs via core path REN19 which links to the Bascule Bridge along Inchinnan Road;

Key Destination 2. Glasgow Airport: Glasgow Airport is accessible to NMUs via core paths REN/2 and REN/13 along Abbotsinch Road and provide links to a local off-road cycle road which also provide access from Paisley town centre;

Key Destination 3. Paisley Town Centre: The town centre is accessible to NMUs via core paths REN/6, NP6 and aspirational core path REN21 and provide links to Renfrew Town Centre from Paisley; and

Key Destination 4. Westway Business Park: The business park is accessible via the REN/6 and REN/20 core paths. Aspirational core path REN/21 (the Renfrew/Paisley cycle route) is a potential link along the former railway line. Various local cycle paths run though the study area mainly via the core path network.

[11]The Macaulay Land Capability for Agriculture (LCA) classification. The Macaulay Land Use Research Institute http://www.macaulay.ac.uk/explorescotland/lca.html

3.4 Potential Effects

3.4.1 Construction

- temporary change in land use for construction compounds, and laydown areas (which would be restored after construction);
- direct and indirect impacts to current land uses and management including loss of agricultural land;
- conflicts between construction activities and users of the existing area including tracks and the road network;
- disruption effects on users of the White Cart Water during bridge construction activity;
- change in agricultural drainage patterns from development of new site infrastructure;
- increased hazards to users of the area from construction activities; and
- interruption to services through interference with utilities.

3.4.2 Operation

- permanent change of landuse;
- direct and indirect impacts on properties including disruption of access;
- permanent loss of woodland;
- permanent loss of agricultural land;
- impact on utilities in the area;
- improved access routes for local residents and recreational users; and
- increased hazards from operational traffic and new infrastructure into the area.

3.4.3 Inchinnan Cycleway Corridor

3.4.3.1 Land Use

Extending from the junction of Inchinnan, Abbotsinch and Greenock Roads, the proposed cycleway would reach the Black Cart Water. The cycleway would pass through an area of woodland on the northern bank of the Black Cart Water, which is designated as both a Site of Importance of Nature Conservation and Semi-Natural Ancient Woodland. This would require the removal of a number of trees to facilitate the path of the cycleway. It is not known at this stage whether these woodlands are used for recreational purposes however this would be investigated during work for the ES, and any effects reported.

Once the cycleway exits the woodland, effects would be limited to a corridor of non-prime agricultural land, currently in arable and grazing use. The development would slightly reduce the size of the fields and would require the removal of a hedgerow to facilitate construction.

Construction of the cycleway may permanently alter the accesses to Town of Inchinnan Farm House and Chalk Autos, the exact nature of these changes is currently unknown but will be assessed as part of the ES.

3.4.3.2 Community Journeys

The proposed cycleway would not require the relocation or re-routing of any core paths. Core path REN19 runs to the north of Greenock Road as indicated on Map 3 of Renfrewshire Council's Core Paths Plan.

The development will also form part of a significantly improved network, reducing severance and improving cross river connectivity between residential centres and key employment locations. Access to Inchinnan Business Park and to sites of greenspace in the wider Renfrew and Inchinnan area would be improved. The cycleway would provide members of the community with a new path and option for non-motorised travel.

3.4.4 Netherton Farm Corridor

3.4.4.1 Land Use

The development of the Netherton Farm Corridor would result in the permanent loss of an area of non-prime agricultural land as it routes from the junction at Greenock, Inchinnan and Abbotsinch Roads and passes south through Netherton Farm to meet with the existing alignment of Abbotsinch Road. At this point, the route would pass through the Abbotsinch playing fields, potentially resulting in the permanent loss of this community recreational facility, however through the detailed design process, this impact maybe reduced. .

Construction of the proposed development would also create a new configured access to the occupied property at Netherton Farm.

3.4.4.2 Community Journeys

Core path REN13 would be relocated and significantly improved to follow the new alignment of Abbotsinch Road. There would be no overall change in access to public space and community facilities in Renfrew and Paisley as the realigned Abbotsinch Road would continue to provide motorised and non-motorised access to facilities and open spaces in the wider area.

3.4.5 Wright Street Corridor

3.4.5.1 Land Use

The proposed Wright Street Corridor would result in the permanent loss of an area of Semi-Natural Ancient Woodland as the water crossing lands on the western bank of the White Cart Water. With regards to recreation and public use it is unlikely that these woodlands are used for recreation due to their location however further investigation will be undertaken as part of the EIA to understand what the implications of removal of this woodland would be on recreation.

The proposed development would result in the loss of a small area of the Glasgow Airport's long stay car park, located to the west of the White Cart Water. Only a small area of the car park would be lost as a result of the works and its use would be maintained following construction.

At the eastern landing of the river crossing, the Wright Street corridor would connect with the end of Wright Street, resulting in the permanent loss of an area of Semi-Natural Ancient Woodland and storage land at the south of the Westway Business Park.

The White Cart Water is used by small boats and for recreational purposes (i.e. kayaking) at the location of the proposed development. The proposed bridge crossing is not considered to restrict these uses and it is likely that the proposed corridor would enhance the amenity value of the waterway. This will be explored further in the land use chapter of the ES.

3.4.5.2 Community Journeys

The proposed development would intersect three core paths (REN6, REN13 and REN20), resulting in temporary impacts for users of these paths, as access would be diverted to construct the road. Following construction, these core paths would remain in use.

The Wright Street Corridor is predicted to reduce the length of some journeys for communities, resulting in improved access and connections in the Renfrew and Paisley area. The new bridge would provide a new cycling/footpath for the local area and improve connections on the NMU path network.

3.4.6 Gateway Corridor

3.4.6.1 Land Use

The proposed development would result in the permanent loss of a small area of native woodland along the western bank of the White Cart Water.

The Gateway Corridor predominantly follows existing roads (i.e. Inchinnan and Harbour Roads) therefore land-take will be kept to a minimum. However there will be land-take required for the bridge landing areas and the road approaches to the bridge between Harbour Road and Inchinnan Road.

The White Cart Water is used for small boats and recreational water sports (i.e. kayaking). This development of the river crossing is not predicted to impact on these uses.

3.4.6.2 Community Journeys

The proposed development would intersect three core paths (REN13, REN21 and NP6), resulting in temporary impacts on these paths during construction. Once operational, impacts on core paths would cease.

It is anticipated that the proposed development would reduce the length of local journeys due to the creation of a new bridge crossing. The new bridge would also create a new cycling/footpath lane in the local area and an improved path network connection.

Access to Glasgow Airport and greenspace in Paisley would be improved for local road users and would also be increased for non-motorised users due to the inclusion of foot- and cycle-ways along the road corridor. The development will also form part of a significantly improved network, reducing severance and improving cross river connectivity between residential centres and key employment locations.

3.5 Proposed Scope of the Assessment

3.5.1 Land Use

In the absence of specific published guidance for the determination of impacts on land use and their significance (e.g. moderate significance), each potential impact associated with land use will be informed by professional judgement and the magnitude of impact criteria in **Table 3.3.** Professional judgement will also be used to distinguish between significant and non-significant effects and may be beneficial or negative in nature.

At this stage of the project, all receptors are considered to be high sensitivity as it is difficult to confirm impact significance without incorporating detailed assessment of the impacts of the proposed development.

Table 3.3 Magnitude of Impact for Assessment of Land Use

Impact (Adverse or beneficial)	Criteria
Major	Land interests that would experience **high** levels of disruption to: • demolition of property or property becomes uninhabitable; • large scale permanent decreases in land area (greater than 7.5% of total study area); • permanent changes to access properties (private or community) and other key land uses; • substantial business operational impacts; • permanent change on waterways; and • Permanent change or restriction to agricultural land management, soils or production requiring major management adjustments to a farm unit.
Medium	Land interests that would experience **medium** levels of disruption to: • noticeable permanent decreases in land area (greater than 2.5% but less than 7.5% of total study area); • temporary changes to access properties (private or community) and other key land uses; • business operational impacts; • change on waterways; and • Permanent change or restriction to agricultural land management, soils or production requiring some management adjustments to a farm unit.
Low	Land interests that would experience only **low** levels of disruption to: • no demolition of property; • small scale permanent decreases in land area (less than or equal to 2.5% of total study area); • none or slight change to access properties (private or community) and other key land uses; • small scale business operational impacts; and • small scale change on waterways; and • Permanent change or restriction to agricultural land management, soils or production requiring some management adjustments to a farm unit.

The estimated land-take will be based on the finalised red line boundary for the proposed development, which has taken into account the footprint of the development and a suitable buffer to take into account any land required for maintenance (as described in Section 2.5). It also includes land required for construction of infrastructure (e.g. construction compounds) and land-take required for aspects such as landscape planting or other essential mitigation.

3.5.2 Community Journeys

All paths and community facilities are considered to be of equal importance regardless of user type or level of usage. The assessment of impact significance will be informed using the indicative criteria in **Table 3.4**.

Table 3.4 Magnitude of Impact for Community Journeys

Impact (Adverse or beneficial)	Criteria
Major	NMUs that would experience **high** levels of disruption to: • permanent change in key journey pattern and will be increased/decreased by over 500m; • permanent change of width of path and/or no barrier between NMU from traffic; • clear signing for routes for NMUs; • permanent change in safety for NMUs; • permanent change in the quality of the landscape or townscape experience by NMUs; • loss of community facilities resulting in fewer (or longer) journeys.
Medium	NMUs that would experience **medium** levels of disruption to: • change in journey pattern with an increase /decrease by 250-500m with possibility to use an alternative route; • temporary but noticeable change width of path and/or barrier between NMU from traffic; • signing for routes for NMUs; • temporary but noticeable change in the quality of the landscape or townscape experience by NMUs; • change of location of community facilities may result in some residents being dissuaded from making these trips (i.e reduction of journeys).
Low	NMUs that would experience only **low** levels of disruption to: • no change or temporary change in journey pattern with an increase/decrease by up to 250m; • slight change of width of path and/or barrier between NMU from traffic • no or unclear signing for NMU routes; • small scale change in the quality of the landscape or townscape experience by NMUs; • journey pattern to community facilities will be maintained but new bridge will be need to be crossed or a subway traversed.

3.5.3 Remaining surveys

No additional surveys are expected to be required to inform the land use and community journeys baseline during the EIA process.

3.5.4 Impacts to be scoped out

Based upon the baseline and initial assessment, it is proposed that the following are scoped out of the assessment.

- The proposed development will not require the demolition of any residential properties and community facilities therefore this impact has been scoped out and will not be assessed further.
- With limited use of the existing infrastructure by equestrian riders, it has been predicted that there will be no direct impact on equestrians and this effect has been scoped out of the assessment.

3.6 Summary of proposed EIA scope

- Further work to define the detailed Land Use and Community journeys baseline through desk-based research and GIS.
- Consultation with statutory agencies and key consultees on key issues such as NMUs, Greenspaces, Access, etc.
- Assessment of predicted direct and indirect impacts (permanent, construction and operational) of the specimen design on properties and other land uses including greenspaces, recreational interests and any designated paths.
- Development of appropriate mitigation including measures to ensure continuation of existing land uses and community journeys once the proposals are completed.
- Assessment of the residual effects predicted from the proposals taking into account the developed mitigation.
- Consideration of cumulative land use and community journeys implications in combination with the CWRR proposals.

4. Geology, Hydrogeology, Soils and Contaminated Land

4.1 Introduction

This section describes the proposed approach to the assessment of potential construction and operational effects on geology, hydrogeology, soils and contaminated land. It has been undertaken in accordance with the DMRB Volume 11 Section 3 Part 11 Geology and Soils and guidance on EIA by Scottish Natural Heritage (EIA Handbook).

The objectives of this section of the report are to:

- outline consultation undertaken with statutory organisations regarding the predicted effects of the proposed project, especially in relation to potential contamination;
- describe baseline conditions relevant to the proposed development;
- present an initial assessment of the potential effects of the proposals; and
- outline the proposed approach to impact assessment, including the requirement for site investigation data, and engineering and geotechnical design information to inform the design of mitigation measures.

4.2 Consultation

The feedback from relevant consultation to date is summarised below (**Table 4.1**), with further description of the responses provided by consultees given in the subsequent subsections.

Table 4.1: Consultation Responses

Consultee	Response/Action	Data	Action Taken
Renfrewshire Council Contaminated Land Officer	Meetings confirmed that no formally designated contaminated land is located within the study area, although a number of historical potentially contaminative former uses are noted in the Councils' Contaminated Land Inspection Strategy. Some site investigation data was provided for the area around the former oil refinery in the east of the study area.	Partial	Further consultation will be undertaken as part of the Site Investigation.
Scottish Environment Protection Agency (SEPA)	A meeting identified no potential contamination issues relevant to this stage of the process. An information request provided data on the location of WML and PPC licences.	Yes	Further consultation will be undertaken as part of the Site Investigation.

4.2.1 Summary of Consultation Undertaken to Date

As part of the assessment undertaken to date, the Renfrewshire Council Contaminated Land Officer (CLO) was consulted to request available information on potential significant contamination issues at or within the vicinity of the study area. The consultation process confirmed that no formally designated contaminated land is located within the study area. However, a number of areas of land with historical potentially contaminative former uses are noted to have been included within the Council's Contaminated Land Inspection Strategy, though these were noted to have been identified as part of the historical map review and there are no plans to commence any investigation in relation to Part IIA (contaminated land legislation).

Additionally, SEPA have been approached to request any licensed activities relating to Pollution Prevention and Control (PPC), Waste Management Licences (WML) and Controlled Activities Regulations (CAR). This identified six records, including two PPC permits (for a tannery and a waste transfer station) and four Waste Management Licences (relating to a civic amenity site, a car breakers and a waste transfer station). None of the records are for processes in locations likely to have a significant impact on (or from) the proposed development.

4.2.2 Proposed Future Consultation

During development of the specimen design, additional consultation with Renfrewshire Council Contaminated Land Officer and SEPA will be required to request detailed information relating to the proposed route. This will be undertaken primarily as part of a site investigation, and the interpretative report will include consideration of any available information on historical site investigation data or remediation works. Consultation will also be undertaken with the Local Authority Petroleum officer, to assess the potential presence of former or current above or underground fuel storage tanks, predominantly to assess the associated potential contamination risks.

4.3 Baseline Description

Existing baseline conditions are presented in this section. Only information relevant to the proposed development and post option assessment have been included.

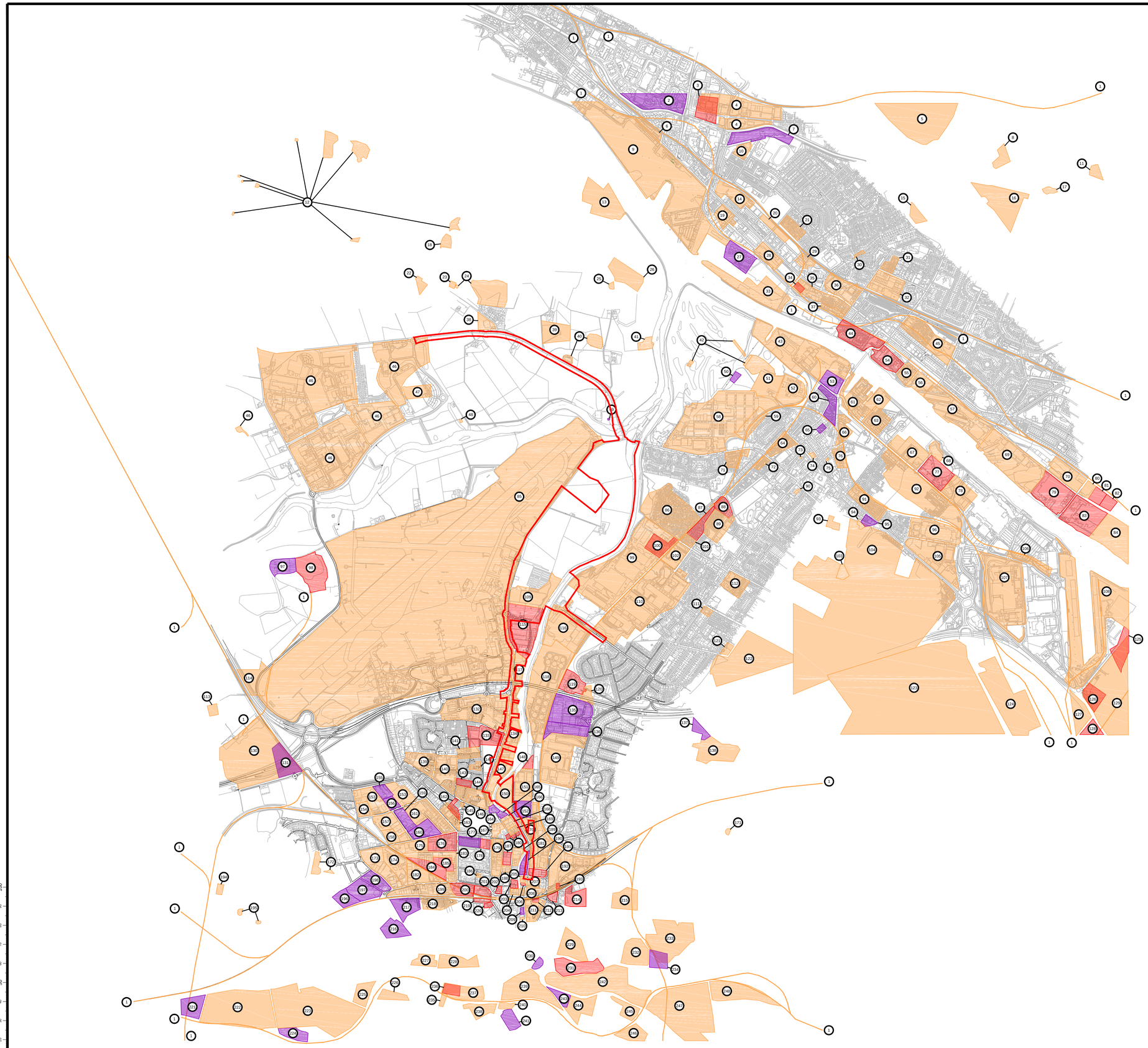
4.3.1 Historical Review

A review of the available historical map records, detailing the development of the entire study area from 1858 to the present day was undertaken, with only key developments pertinent to the GAIA study area (as shown in **Figure 4.1**) highlighted.

The earliest available historical maps (1858) show the land alongside the White Cart Water to be occupied by industry, including steel works, engineering and shipbuilding works, saw mills and dye works. The majority of these industries are noted to have been either demolished or redeveloped for different uses over the period examined. Railway land is also noted east of the White Cart Water, which has been dismantled by the present day.

In more recent years, additional industries appear along the White Cart Water, including a sewage works, located on the eastern bank of the White Cart, south of the M8 motorway bridge, works on the eastern bank of the White Cart Water. Glasgow Airport is noted to have been constructed during the 1960s, located west of Abbotsinch Road. The majority of the land to the west of the White Cart in this area remains as agricultural land over the period examined.

The surroundings of the study area are noted to have undergone significant residential and commercial development over the historical period examined.



Notes

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2. Accuracy of Map Image Not Guaranteed Due to Reproduction Methods.

Key to symbols

- Indicative Boundary of Proposed Development
- Historical Potential Contamination Source Reference - refer to associated table for further details.
- Low/Moderate risk of potentially significant contamination constraints which may require some remediation depending on the sensitivity of proposed use.
- Moderate risk of potentially significant contamination constraints which may require some remediation.
- High risk of potentially significant contamination constraints which is likely to require some remediation.

Reference drawings

0	01.06.16	FOR REVIEW	RH	RH	LB
REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D

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SWECO

Client
RENFREWSHIRE COUNCIL
Renfrewshire Council

Drawing Status	Suitability
FINAL	S0

Project Title
GLASGOW AIRPORT
INVESTMENT AREA PROJECT

Drawing Title
Figure 4.1
Potential Contamination Constraints
-
-

Scale	Designed	Drawn	Checked	Approved
1:15000	RH	JS	RH	LB
Original Size	**Date**	**Date**	**Date**	**Date**
A1	01.06.16	01.06.16	01.06.16	01.06.16

Drawing Number

Project	Originator	Volume	Location	Type	Role	Number
117084	SWECO	EAC	00	SP	EN	00003

Project Ref. No. 117084

Revision 0

0 10 20 30 40 50 60 70 80 90 100

4.3.2 Potential Contamination Risks

A summary of the identified potential contamination risks associated with the historical development of the study area is provided in **Appendix 4.1** which provides a figure and schedule of historical contamination sources. A more detailed review of the historical development of the study area is included within the Preliminary Sources Study Report, which will form a technical appendix to the ES.

4.3.3 Topography & Geomorphology

The study area is generally a large, low relief area at approximately 10m above ordnance datum (AOD). Towards the north west and south east of the area, topography gradually increases with distance from the White Cart Water.

The floodplains of White Cart Water, Black Cart Water and the River Clyde dominate the geomorphology of the study area, and associated alluvial deposits and river terrace deposits characterise the majority of the study area.

4.3.4 Topsoil

Topsoil is generally expected to be present in scarce, segregated areas across the study area, although agricultural topsoil is likely to be present across much of the area in the vicinity of Netherton Farm to the west of the White Cart.

4.3.5 Made Ground

BGS online mapping records made ground (undivided) of man-made and natural materials to be present across the southern and eastern sections of the study area, extending approximately 2.3km south along the western bank of the White Cart Water, and along the approximate eastern extent of the study area along the eastern bank of White Cart Water.

Within the extents of the previously mentioned undivided made ground, an approximate $10m^2$ area of infilled made ground is located on the western bank of White Cart Water.

The majority of the study area comprises undeveloped land between Abbotsinch Road and the western bank of White Cart Water in the vicinity of Netherton Farm. Although no made ground deposits are recorded within this area, it is anticipated that localised made ground may be encountered associated with development of infrastructure within the surrounding area and residential properties in the vicinity of Netherton Farm. Made ground is therefore likely to comprise a variable mixture of road make up and structural soils, with potential for remnant buried structures and/ or obstructions to be encountered.

Analysis of historical ground investigation data confirms that made ground is known to be present across the southern and eastern sections of the study area, to a maximum recorded depth of 4.5mbgl, noted to comprise sandy concrete and brick fill, sandy clay with gravel, sandstone, bricks and ash, sand and mud with ash, gravel and soft clay.

4.3.6 Drift Geology

Superficial deposits vary across the study area and include tidal flat deposits, sediment and undifferentiated river terrace deposits. Raised tidal flat deposits of Flandrian Age comprise silt and clay and are located across Netherton Farm area. Locally undifferentiated river terrace deposits of silt, sand and gravel are present immediately north west of these tidal flat deposits.

Superficial deposits of 'sediment' extend over the approximate area of the previously mentioned undivided made ground, covering the eastern and south western sections of the study area. Raised tidal flat deposits of Late Devensian silt, sand and gravel, are located immediately west of the river terrace deposits, on the western bank of the White Cart Water, and immediately east of the made ground/ sediment on the eastern bank of the White Cart Water.

Borehole records obtained from the BGS note superficial deposits across the study area to be present to depths of between 4.78mbgl and 39.78mbgl.

4.3.7 Solid Geology

The solid geology underlying the majority of the study area is the Limestone Coal Formation, of the parent unit Clackmannan Group, noted to comprise cyclic sequences of sandstones, siltstones, mudstones, coals, blackband and clayband ironstones and seatrocks. The Top Hosie Limestone marks the youngest, uppermost strata of the Dinantian Lower Limestone Formation, which is conformable with the Limestone Coal Formation. The beds are oriented approximately north east to south west, and encountered approximately 600m north of the Westway Industrial Estate.

The Lower Limestone Formation, of the parent unit Clackmannan Group, is located immediately south and east of the Top Hosie Limestone beds and is noted to comprise cyclic sequences of mainly mudstones with sandstones, siltstones, marine limestones, thin coals and clayband ironstones. Early Permian microgabbro sills of the Western Midland Valley Westphalian to Early Permian Sill Suite intrude the Lower Limestone Formation, and other strata locally.

The Upper Limestone Formation, of the parent unit Clackmannan Group, is located within one fault-bounded area approximately 2km south west of the Westway Industrial Estate, and comprises cyclic sequences of sandstones, siltstones, mudstones, marine limestones, coals and seatrocks. The north east-south west trending beds of the conformable Index Limestone, indicate a marker bed representing the youngest, uppermost strata of the Limestone Coal Formation.

The historical ground investigation data indicates that bedrock is present to depths between 8.2mbgl and greater than 86.6mbgl. Due to lack of deep exploratory holes in the existing ground investigation data, depth to rockhead cannot be accurately determined across the study area and results are limited to specific borehole locations. Historical boreholes and the relevant mapping indicate rockhead depth to be between 25mbgl and 30mbgl.

4.3.8 Hydrology

The closest water body to the study area is the White Cart Water, which flows south to north through the study area, issuing north towards the River Clyde, which it meets at a confluence approximately 750m north of its confluence with the Black Cart Water. The SEPA RBMP indicates that the Inner Clyde Estuary (which covers both the Clyde and the White Cart at these locations) has been given a classification of Moderate ecological potential (see **Section 5.3**).

The majority of the GAIA study area comprises predominantly either undeveloped agricultural land or developed, brownfield land. It is therefore anticipated that the majority of surface water will either be infiltrated by pervious surfaces, runoff to local surface water drainage systems or else drain topographically overland (predominantly from west to east, towards the White Cart).

4.3.9 Hydrogeology

The Groundwater Vulnerability Map of Scotland (1:625,000 scale) indicates that the study area is underlain by a moderately permeable aquifer that is noted to seldom produce large quantities of water for abstraction but are important for local supplies and in supplying base flow to rivers.

The Hydrogeological Map of Scotland (1:625,000 scale) indicates that the quaternary sands, silts and clays underlying the study area form a concealed aquifer of limited or local potential, with borehole yields recorded to be typically 1 and 2l/s.

The online SEPA River Basin Management Plan interactive map records that the study area is underlain by the Paisley and Rutherglen bedrock and localised sand and gravel aquifers which is classified as having an overall status of Poor with High confidence, predominantly due to chemicals production and mining and quarrying of coal. It is noted that there is no trend for pollutants for this water body. The area is also noted to be within a SEPA Drinking Water Protection Zone.

Groundwater strikes and seepages were encountered in a number of available historical borehole records. Across the proposed project, groundwater strikes occurred between 2mbgl and 8mbgl. Most groundwater strikes were encountered within the superficial deposits, with none recorded at rockhead. Regional groundwater flow is likely to be dominated by the flow of the White Cart Water and the River Clyde and be towards the north or north west.

4.3.10 Unexploded Ordnance (UXO)

Regional unexploded bomb risk information was obtained through Zetica Ltd., which provided an indicative UXO risk map of the Glasgow region, and through BACTEC International Ltd. who provided a detailed UXO Risk Report covering the GAIA study area.

The Zetica Ltd. map details a moderate bomb risk for the Renfrew area, including the GAIA study area. Renfrew is noted have been subjected to >100 tons of bombs, which included 76high explosive bombs, four anti-personnel and two incendiary recorded. BACTEC International Limited confirm that the most significant UXO risks are associated with Renfrew and Abbotsinch Military Airfields (part of Glasgow Airport) which are located south west of Westway Industrial Estate. A large National Filling Factory (WWI) managed by Nobel Explosives Co. Ltd. is located in Cardonald, approximately 5.2km south east of Westway Industrial Estate.

The BACTEC International Ltd. report states that the UXO risk associated with these sites is highly dependent upon site history and should be fully investigated in order determine the UXO risk.

In conclusion, there are significant potential sources of UXO recorded within the study area. The overall risk from UXO is considered to be moderate, although further investigation is required to confirm this.

4.3.11 Mining & Mineral Resources

The Coal Authority interactive mapping indicates that the corridors are all located within a Coal Mining Reporting area and in many cases a Surface Coal Resource Area. There is only one development of high risk just to the south of Westway Industrial Estate.

The north of the study area, surrounding the Netherton Farm and Westway Industrial Estate areas, is indicated to be within Surface Coal Resource Areas.

4.4 Potential Effects

A construction impact is short term and will only occur during the construction of the proposed project (e.g. contamination risks to construction workers, dust). Operational impacts are those that could potentially occur during construction but will have a longer lasting impact (e.g. groundwater contamination, loss of geological resource). The majority of potential impacts on geology, soils, hydrogeology and contaminated land are generally considered to be long term in nature.

The main operational impacts are predicted to be the potential **dewatering and alteration of the groundwater regime** (both drift and bedrock aquifers), and **contamination of the water environment** (predominantly associated with the mobilisation of existing soil or groundwater contamination). However, a number of other potential impacts have been identified that require further consideration, which are detailed in the following subsections. It should also be noted that the EIA process may identify additional impacts once additional baseline data and design information are obtained.

Refer to **Chapter 5 (Water quality, drainage and flood defence)** for information on hydrology and flood risk, and for construction effects on surface water quality such as accidental construction impacts.

4.4.1 Construction

There are a number of construction effects that predominantly relate to the exposure of human or wider environment receptors to contamination. The consideration of potential construction effects takes into account the site conditions, baseline sensitivities and construction activities anticipated. The following potential construction effects have been identified:

- Accidental release, leakage or spillages of hydrocarbons, chemicals, fuel or oils from storage tanks or construction plant during construction causing contamination of groundwater.

- Localised increase in alkalinity from spillages of concrete or unset cement causing pollution of groundwater, the severity of which may be increased during times of heavy or prolonged rainfall.
- Human exposure to contamination (including ground gas) during construction.

4.4.2 Operation

Potential operational impacts on geology, soils, hydrogeology and contaminated land are impacts that will occur (or continue to occur) once the proposed project is in operation. The following subsections detail the currently identified potential effects that require consideration as part of the impact assessment.

Geology

The following potential effects on geological resources have been identified:

- Potential adverse effects on the superficial deposit geological resource from excavations or foundation construction.
- Potential adverse effects on the solid geological resource due to excavations or foundation construction.
- Effects on the use of existing or potential geological resources (including topsoil and mineral reserves).

Soils

The following potential effects associated with soil resources have been identified:

- Stripping of topsoil from construction areas on site has an adverse effect on the topsoil resource, and even if intended for reuse the storage and handling methodology should be considered with respect to the potential to cause deterioration of the topsoil.
- Soil compaction associated with construction traffic may reduce soil permeability and increase surface runoff.
- Potential for increased erosion effects on topsoil (and consequently the water environment) associated with tree and vegetation removal.
- Potential for cross-contamination across ownership boundaries during investigation or construction.

Hydrogeology

The following potential effects on hydrogeology (including private water supplies) have been identified (note that risks to surface water associated with similar effects are considered further in **Chapter 5**):

- Dewatering and alteration of the groundwater regime (both drift and bedrock aquifers) caused by the development, including from excavations and the construction of foundations.
- Potential contamination of water environment by leachable contamination from imported fill materials or SUDS drainage.
- Surface runoff from the new road causing contamination of groundwater.
- Disposal of effluent and sludges during the construction phase causing an impact on groundwater quality.

- Reduction in infiltration caused by increased hardstanding cover or compaction of soils, resulting in impacts on groundwater.

Contaminated Land

The following potential effects associated with existing contamination within the site have been identified:

- Constraints on the proposed project due to contamination by previous land uses.
- Potential contamination of water environment by increased mobilisation of existing contamination, for example associated with excavations or SUDS.
- Potential contamination of the water environment due to the disturbance or disposal of contaminated sediment associated with dredging works.
- Potential introduction of contaminative pathways along drainage routes, for example leading to connectivity between historical contamination sources and sensitive receptors (e.g. water environment, humans, or buildings).
- Mobilisation of contaminants into surface water or groundwater bodies, for example due to excavation or groundwater pumping within areas of contamination or due to the excavation and stockpiling of contaminated soils.
- Human exposure to contamination (including ground gas) by users of the development, and by maintenance workers on the proposed infrastructure.
- Potential for human exposure to contamination in adjacent areas (including the redirection of ground gas caused by increased hardstanding cover).
- Potential harm to concrete due to corrosive soil conditions, or permeation of hydrocarbons into water supply pipes.
- Potential plant exposure to phytotoxic contamination in areas of soft landscaping.

4.5 Proposed Scope of Assessment

The impact assessment will be carried out in accordance with DMRB Volume 11, Section 3, Part 11: Geology and Soils, and in consideration of the most up-to-date guidance on EIA including from Scottish Natural Heritage, which is presented in their EIA Handbook.

In order to inform the understanding of baseline conditions and the risk assessment process, intrusive site investigation data are required, which will be undertaken in accordance with the guidance in BS 5930:2015 Code of practice for ground investigations and BS 10175:2011+A1:2013 Investigation of potentially contaminated sites: code of practice. An interpretative report will be completed based on the findings of the site investigation, which along with the Preliminary Sources Study Report will form the technical appendix to this chapter of the ES.

4.5.1 Assumptions and Limitations

The main limitation to the risk assessment process and subsequent application of mitigation measures is an understanding of the baseline condition and the geotechnical and engineering design, so consequently to complete the EIA the following data is required:

- The **Interpretative Site Investigation Report**, which is required to inform the baseline understanding and risk assessment.

- The **proposed engineering and geotechnical designs**, which are required in order to fully consider the potential risks, identify those which require mitigation, and provide mitigation recommendations.

4.5.2 Impact Assessment

Effects are identified by predicting the changes that would be caused by the construction and operation of the development in relation to the baseline situation. The level of **effect** and significance of the proposed development will be defined by taking into account the **sensitivity** of the receiving environment and the potential probability and **magnitude** of the change.

The sensitivity of a receptor to change includes its capacity to accommodate the kinds of changes the project may bring about; **Table 4.2** provides examples of the characteristics that define receptor sensitivity. The magnitude of change includes the timing, scale, size and duration of the potential effect, which for the purposes of this assessment are defined in **Table 4.3**. The sensitivity of the receiving environment together with the magnitude of the effect defines the significance of the effect prior to application of mitigation measures as outlined in **Table 4.4**.

Table 4.2 Evaluating the sensitivity (value/importance) of receptors

Sensitivity	Definition
Very High	High quality and rarity, regional or national scale and limited potential for substitution/replacement. This includes the following: • Human health; • Site of Special Scientific Interest (SSSI) or Special Area of Conservation (SAC); • SEPA Water Quality defined as High; • Surface Water – large scale industrial abstractions >1000m³/day within 2km downstream; • Abstractions for public drinking water supply; • Private Water Supplies – Surface water abstractions within 0 – 200m and groundwater spring abstractions from 0-100m from construction activities; • Designated salmonid fishery and/or salmonid spawning grounds present; • Watercourse widely used for recreation, directly related to watercourse quality (e.g., salmon fishery) within 2km downstream; • Conveyance of flow and material, main river >10m wide; • Active floodplain area (important in relation to flood defence); • Groundwater abstractions >1000m³/day (within zone of influence from development); • Groundwater – public drinking water supply; • Groundwater aquifer vulnerability classed between 4d, 4c, 4b, 4a and 5 in the SEPA vulnerability classification scheme; and • Geology rare or of national importance as defined by SSSI or Regional Important Geological Site (RIGS).

Sensitivity	Definition
High	Receptor with a high quality and rarity, local scale and limited potential for substitution/replacement or receptor with a medium quality and rarity, regional or national scale and limited potential for substitution/replacement. This includes the following: • SEPA Water Quality defined as Good; • Large scale industrial agricultural abstractions 500-1000m3/day within 2km downstream; • Surface water abstractions for private water supply for more than 15 people; • Private Water Supplies – Surface water abstractions within 200m – 600m, groundwater spring abstractions from 100 – 400m, and groundwater borehole abstractions from 0 – 200m from construction activities; • Designated salmonid fishery and/or cyprinid fishery (Coarse Fish, including roach, carp, chubb, bream etc.); • Watercourse used for recreation, directly related to watercourse quality (e.g. swimming, salmon fishery etc.); • Conveyance of flow and material, main river >10m wide; • Active floodplain area (important in relation to flood defence); • Groundwater abstractions 500-1000m3/day (within zone of influence from development); • Groundwater abstraction for private water supply >10m3/day or serves >50 people; and • Groundwater aquifer vulnerability classed as 3 in the SEPA vulnerability classification scheme.
Medium	Receptor with a medium quality and rarity, local scale and limited potential for substitution/replacement or receptor with a low quality and rarity, regional or national scale and limited potential for substitution/replacement. This includes the following: • SEPA Water Quality defined as Moderate; • Industrial/agricultural abstractions 50-499m3/day within 2km downstream; • Occasional or local recreation (e.g. local angling clubs); • Conveyance of flow and material, main river <10m wide or ordinary watercourse >5m wide; • Existing flood defences; • Groundwater abstractions 50-499m3/day; • Private Water Supplies – Surface water abstractions from 600 – >800m, groundwater spring abstractions from 400m – 800m and groundwater borehole abstractions from 200m – 600m from construction; • May be subject to improvement plans by SEPA; • Designated cyprinid fishery, salmonid species may be present and catchment locally important for fisheries; • Watercourse not widely used for recreation, or recreation use not directly related to watercourse quality; and • Groundwater aquifer vulnerability classed as 2 in the SEPA vulnerability classification scheme.

Sensitivity	Definition
Low	Receptor with a low quality and rarity, local scale and limited potential for substitution/replacement. Environmental equilibrium is stable and is resilient to changes that are greater than natural fluctuations, without detriment to its present character. This includes the following: • SEPA water quality defined as Poor or Bad; • Industrial/agricultural abstractions <50m3/day within 2km downstream; • Fish sporadically present or restricted, no designated features; • Receptors not used for recreation e.g. no clubs or access route associated with watercourse; • Watercourse <5m wide – flow conveyance capacity of watercourse low – very limited floodplain as defined by topography, historical information and SEPA flood map; • Groundwater abstractions <50m3/day; • Private Water Supplies – groundwater spring abstraction >800m and groundwater borehole abstractions from 600 - >800m from construction activities; • No public drinking water supplies; • Groundwater aquifer vulnerability classed as 1 in the SEPA vulnerability classification scheme; • Receptor heavily engineered or artificially modified and may dry up during summer months; and • Geology not designated under a SSSI or RIGS or protected by specific guidance.

Table 4.3 Estimating the magnitude of impact on receptors

Magnitude	Criteria	Description and Example
Major	Results in loss of attribute	• Fundamental (long term or permanent) changes to geology, hydrology, water quality and hydrogeology; • Loss of designated Salmonid Fishery; • Loss of national level designated species/habitats; • Changes in Water Framework Directive (WFD) water quality status of river reach; and • Pollution of potable source of abstraction compared to pre-development conditions.
Moderate	Results in effect on integrity of attribute or loss of part of attribute	• Material but non-fundamental and short to medium term changes to the geology, hydrology, water quality and hydrogeology; • Loss in productivity of a fishery; and • Contribution of a significant proportion of the discharges in the receiving water, but insignificant enough to change its water quality status.
Minor	Results in minor effect on attribute	• Detectable but non-material and transitory changes to the geology, hydrology, water quality and hydrogeology. •
Negligible	Results in an effect on attribute but of insufficient magnitude to affect the use/integrity	• No perceptible changes to the geology, hydrology, water quality and hydrogeology; • Discharges to watercourse but no loss in quality, fishery productivity or biodiversity; and • No significant effect on the economic value of the receptor. •

Table 4.4 Level of effect related to sensitivity and magnitude of change

Magnitude	Very High	High	Medium	Low
Major	Major	Major	Moderate	Minor
Moderate	Moderate	Moderate	Moderate	Minor
Minor	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

5. Water quality, drainage and flood defence

5.1 Introduction

This chapter provides an assessment of the potential effects of the proposed development on hydrology and flood risk, drainage and water quality. Previous and future consultation with the consultation authorities and key stakeholders has been summarised, followed by a baseline description of the water environment and existing land drainage. The scope of assessment for the EIA is then described, including sources of information and the proposed approach and methods. The likely licensing requirements for works in the water environment is also outlined.

5.2 Consultation

The following consultees have been contacted during the previous stages of the project and the information or feedback that they have provided is summarised in Table 5.1 below. Future consultation to be undertaken during the EIA is also summarised.

Table 5.1: Previous and Proposed Consultation

Consultee	Response/Action	Data Provided	Action Taken
SEPA and Renfrewshire Council	Stage 2 response noted planning restrictions and flood mitigation requirements for development on the functional (1 in 200 year) floodplain with respect to Scottish Planning Policy (SPP) (2014). Particular focus on realignment of Abbotsinch Road into the functional tidal floodplain of the White Cart Water; clarified that development critical for the operation of transport infrastructure (e.g. Glasgow Airport) can be placed within undeveloped functional floodplain provided that the design requirements specified in SPP are satisfied. Meeting with SEPA and Renfrewshire Council 21.04.16 to discuss: • design proposals with respect to flood risk and development constraints on land allocated as developed/undeveloped; and • potential requirements for sustainable drainage systems (SuDS) and further water quality assessment to be included in EIA. Further consultation will be undertaken during the EIA to: • obtain information on any licensed abstractions and discharges to the River Clyde and White Cart/Black Cart Waters; • agree any further requirements for the flood risk assessment (FRA) and obtain feedback on the detailed FRA and mitigation included in the design; • inform the number, type and sizing of SuDS features required for the proposed development; and • inform the requirements for any engineering activities requiring authorisation under CAR and	No	Requirements with respect to SPP have been considered within the evolving design and flood risk assessment. Update the existing baseline dataset, inform the detailed FRA and drainage design and requirements for CAR.

Consultee	Response/Action	Data Provided	Action Taken
	relevant information to be included in the Environmental Statement (ES) and CAR applications.		
Marine Scotland	Meeting (02.06.16) noted presence of Atlantic salmon, sea trout, river lamprey and European eel in the River Clyde and Black Cart/White Cart Waters. EIA screening opinion (e-mail 20.07.16) noted that Marine EIA will be required – the proposed bridge works fall under developments included in Annex II of the Marine EIA Regs, and the size and nature of the proposed development is considered likely to have significant environmental effects.	Yes	Assessment and mitigation of crossing structures to take account of species present. Further consultation will be undertaken to inform the requirements of the Marine EIA.
Peel Ports and Renfrewshire Council	Bathymetric surveying data and flood modelling data used for the North Renfrew Flood Prevention Scheme (FPS) to be supplied. Further consultation will be undertaken with the Council to advise if flow attenuation prior to discharge to the White Cart Water or River Clyde is required. Any requirements for restricting flow rate could have an impact on the sizing of attenuation features, and subsequently flood compensatory storage provision, if constructed within the functional floodplain of these rivers.	Expected soon	Data will inform Stage 3 flood modelling. To inform the sizing of attenuation features, if required, and subsequently the flood mitigation design.

5.3 Baseline Description

The proposed development will cross the White Cart and Black Cart transitional waters, which are associated with the Inner Clyde Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI) (downstream) and Black Cart SPA and SSSI (upstream). Two Sites of Importance for Nature Conservation (SINCs) are present within the vicinity of the proposals; one of these SINCs is associated with semi-natural habitats along the banks of the White Cart Water. Refer to **Chapter 7 (Ecology and Nature Conservation)** for further information on these ecological designations.

5.3.1 Hydrology and Flood Risk

The proposed development is within SEPA's Potentially Vulnerable Area (PVA) 11/13 (White Cart Water catchment), as well as PVA Area 11/12 (Black Cart Water catchment) and PVA 11/09 (Clyde south – Port Glasgow to Inchinnan).

SEPA's Flood Maps[12] indicate fairly extensive river (fluvial) flooding of the Black Cart Water, and to a lesser degree the White Cart Water, and coastal flooding, attributed to tidal influence on the River Clyde, extending into the downstream reaches of the River Cart. The 200-year flood envelope extends into the northern and western sections of Glasgow Airport and inundates sections of the Paisley to Bishopton Railway line. Numerous localised areas of surface water (pluvial) flooding are identified in the Renfrew, Clydebank and Paisley areas to the south of the River Clyde.

The White Cart Water has historically been a significant source of flood risk, with more than 20 significant flooding events recorded since 1908 and a flood event in 1984 affecting over 500 properties. Further flooding events between 1984 and 1999 gave impetus to the development of the White Cart FPS. The FPS became operational in 2011 and was designed to protect properties up to the 1 in 200 year flood event.

Revised modelling undertaken for the Stage 2 (options) assessment indicated that Netherton Farm is not at risk from fluvial flooding in response to the 200-year (+20% uplift for climate change) flood event, in contrast to the SEPA Flood Maps. Peak water level predictions for this flood event (approximately 3.0mAOD) were below the minimum bank spill point onto the adjacent land (approximately 3.6mAOD).

Improvements to the representation of extreme tidal forcing in the revised modelling, based on guidance for tidal representation in SEPA's flood risk guidance[13], have also reduced the predicted peak tidal water level relative to Glasgow City Council's River Clyde Flood Management Strategy (RCFMS) (2005) study. Peak water level predictions in the 200-year plus climate change event at Netherton Farm have reduced from 5.13mAOD to 4.99mAOD.

The modelling demonstrated that fluvial flooding at each of the proposed bridge crossings was contained within the river banks, with patches of tidal inundation particularly at the disused carpark at Laigh Park to the east of the White Cart Water, in the vicinity of the Gateway Crossing.

5.3.2 Drainage

The study area of the proposed development is predominantly pervious which lends itself to drainage via infiltration. Surface waters which exceed the infiltration rate/capacity, typically drain overland from west to east following the natural topography towards the White Cart Water. Any development with a north-south orientation, such as the proposed Abbotsinch Road Realignment, has the potential to impede this natural drainage route.

5.3.3 Water Quality

The reach of the Black Cart and White Cart Waters in the study area (water body name: Clyde Estuary – Inner (Inc. Cart; ID: 200510)) is classified by SEPA as transitional waters and is tidally influenced. The reach is classified as heavily modified with an overall status of "Moderate ecological potential" in 2013[14]. Existing pressures include pollution from sewage disposal and

[12] SEPA Flood Maps: http://map.sepa.org.uk/floodmap/map.htm

[13] Technical Flood Risk Guidance for Stakeholders (SS-NFR-P-002) v9.1 (SEPA, 2015)

[14] SEPA River Basin Management Plan (RBMP) Interactive Map: http://gis.sepa.org.uk/rbmp

air transport, and morphological alterations through dredging, channelisation and impoundment. These pressures have resulted in low dissolved oxygen levels and poor morphological status, leading to an overall ecological status of "Poor". However, the water body achieves an overall chemical status of "Pass" as there is no known heavy metal contamination. With improvement measures identified to reduce these pressures, the reach of the Black Cart and White Cart Waters has been set the target to obtain overall "Good" status by 2027 and thereby achieving the aims of the 2000/60/EC Water Framework Directive (WFD).

Refer to **Chapter 4** (Geology, hydrogeology, soils and contaminated land) for information on existing groundwater quality and areas of identified contaminated land.

5.4 Potential Effects

5.4.1 Construction

5.4.1.1 Hydrology and Flood Risk

Potential temporary impacts on hydrology and flood risk could include:

- Reduced soil permeability and increased runoff from soil compaction due to works traffic, which could increase the peak runoff and intensity of runoff during a rainfall event. This is likely to be more of an issue for the Abbotsinch Road Realignment onto existing farmland, rather than other sections of the proposed project which are located within urbanised areas.
- Increased flood risk from any temporary works and structures within the functional floodplain and temporary loss of fluvial/tidal floodplain area within the construction footprint.
- Temporary bunding in the Black Cart and White Cart Waters or on the functional floodplain to create dry working areas could restrict flows and locally increase flood risk to nearby receptors.
- Re-routing of runoff into the existing drainage network could locally increase pluvial and sewer flooding in areas local to the proposed development if the existing drainage network is under capacity.

5.4.1.2 Water Quality

Potential temporary impacts on water quality could include:

- Construction of the Wright Street Crossing, Inchinnan Cycleway and Gateway Crossing and approach roads, soil-stripping, compound preparation and other earthworks could result in sediment release and silt-laden runoff entering the Black Cart and White Cart Waters, and the downstream River Clyde, adversely impacting water quality and aquatic ecology.
- A decline in water quality from accidental release/spillages of oil, fuels and chemicals from mobile or stationary plant and a localised increase in alkalinity from spillages of concrete or unset cement. Due to the size of the rivers and high dilution/dispersal effect, any impacts are considered to be minor. Refer to Chapter 4 for further impacts on groundwater quality.

- Mobilisation of contaminants into the Black Cart and White Cart Waters, and the River Clyde downstream, due to excavation works or dewatering within areas of contaminated land or stockpiling of contaminated soil/spoils. The potential impacts of disturbance of contaminated land is considered in **Chapter 4.**
- Morphological changes to the channel banks and bed to accommodate construction of abutments and piers for new river crossings on the Black Cart and White Cart Waters.
- Sewage inputs from accidental/uncontrolled release from sewers through damage to pipelines or unsatisfactory disposal of sewage from site welfare facilities.

5.4.2 Operation

5.4.2.1 Hydrology and Flood Risk

Potential permanent impacts on hydrology and flood risk could include:

- Development on the functional floodplain could displace floodwaters and therefore increase flood risk to the proposed project and elsewhere. SuDS should be located outwith the functional floodplain where possible and lined if located within an area of known contamination or to protect underlying groundwater, if required.
- New impermeable areas (e.g. road embankment and SuDS features) could increase the volume and peak flow of surface runoff reaching the Black Cart and White Cart Waters due to a reduction in infiltration capacity.
- The new road and its drainage system may act as a barrier to water movement within existing catchments, altering drainage patterns and increasing flood risk to the proposed project and upstream of the barrier. This is a particular focus of the Abbotsinch Road Realignment, which could potentially sever the natural west-east flow path to the White Cart Water.
- Abutments and piers of the river crossings could restrict flow conveyance of the Black Cart and White Cart Waters and thereby increase fluvial/tidal flood risk during high/extreme flows.
- Any permanent alterations to the drainage system as a result of the proposed development could increase pluvial and culvert flooding.

5.4.2.2 Water Quality

Potential permanent impacts on water quality could include:

- An increase in road traffic leading to an increase in volume and/or frequency of contaminated road runoff to the White Cart Water and/or River Clyde. Road runoff can contain suspended solids and contaminants bound to them (e.g. heavy metals), oil and hydrocarbons, biodegradable organic materials (e.g. debris and grass cuttings) and de-icing salt in winter.
- Scour around the river crossing structures could result in transfer of suspended sediment downstream and erosion of the river banks.
- Potential contamination of the water environment by increased mobilisation of existing soil or groundwater contamination, or by leachable contamination from imported fill materials or SUDS. This is considered further in **Chapter 4.**

5.5 Proposed Scope of Assessment

The assessment will be carried out in accordance with the 'Simple Assessment' methods prescribed within the DMRB HD 45/09[15], unless otherwise stated. The following legislation, policy and guidance documents will also be taken into account (any updates to guidance made between finalisation of this Report and completion of the EIA will be taken into account in the assessment):

- 2000/60/EC Water Framework Directive;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended);
- The Climate Change (Scotland) Act 2009;
- The Flood Risk Management (Scotland) Act 2009;
- Scottish Planning Policy (SPP) (Scottish Government, 2014);
- Technical Flood Risk Guidance for Stakeholders (SS-NFR-P-002) v9.1 (SEPA, 2015);
- The Fluvial Design Guide (Environment Agency, 2010);
- Guidebook of Applied Fluvial Geomorphology (Sear et al., 2010);
- SEPA Flood Maps (SEPA, 2015);
- SEPA River Basin Management Plan (RBMP) Interactive Map (SEPA, 2011) and Water Body Information Sheets (SEPA, 2014);
- SEPA Regulatory Method (WAT-RM-08): Sustainable Urban Drainage Systems (SUDS or SUD Systems), v6.0 March 2016;
- SEPA Supporting Guidance (WAT-SG-12): General Binding Rules for Surface Water Drainage Systems, v4.1 March 2016;
- CAR: A Practical Guide (v7.3) (SEPA, 2016);
- SUDS for Roads (SCOTS and SUDS Working Party, 2015); and
- The SUDS Manual, C753 (CIRIA, 2015).

During the EIA, baseline data collected during earlier stages of the options assessments will be reviewed and updated as required with further desk-based and survey information, and additional consultation responses obtained for the proposed development (Table 5.1: Consultation). The proposed methodologies for the hydrology/flood risk and water quality assessments are presented below, including a consideration of potential licensing requirements.

5.5.1 Hydrology and Flood Risk

A detailed FRA is required as the proposals are located on or immediately adjacent to the functional floodplain of the White Cart and Black Cart Waters and is at 'medium to high risk' of flooding, in line with SPP. The 'functional' floodplain is defined as land which is prone to flooding up to and including the 0.5% Annual Exceedance Probability (AEP) (1 in 200 year return period) flood event.

[15] DMRB Volume 11, Section 3, Part 10 (HD 45/09): Road Drainage and the Water Environment (The Highways Agency et al., 2009)

The FRA will be undertaken in accordance with Methods E and F (Assessing Flood Impacts) of the DMRB HD 45/09 and will adhere to the requirements of SEPA's Technical Flood Risk Guidance for Stakeholders and SPP, whereby development is prevented:

- which would have a significant probability of being affected by flooding; and/or
- would increase the probability of flooding elsewhere.

Site-specific flood modelling has already been undertaken for existing (baseline) conditions via one-dimensional hydrodynamic modelling of the River Clyde, White Cart and Black Cart watercourses and adjoining floodplains based on the RCFMS (2005) ISIS model. The model will be further refined to predict changes in peak runoff and water levels in the pre and post-development scenarios for the proposed development. Design flows up to the 0.5% AEP (1 in 200 year return period) event will be modelled, including a climate change allowance of +20% on the estimated 200-year peak flow. The detailed FRA will include assessment of:

- the effect of the Wright Street Crossing, Inchinnan Cycleway and Gateway Crossing designs on water levels;
- the impact on water levels of road embankments and SuDS features constructed in the functional floodplain; and
- mitigation measures, such as provision of compensatory floodplain storage or flood relief culverts in order to achieve a neutral effect on flood risk up to the 200-year design level. This is a particular focus of the Abbotsinch Road Realignment.

Topographic and bathymetric surveys will be undertaken upstream and downstream of the proposed bridge crossing locations on the White Cart and Black Cart Waters to inform the flood modelling. Bathymetric surveying of the White Cart and Black Cart are also being undertaken to provide updated channel cross-sections within the river model to reflect alterations to bathymetry relative to the 2002-2003 data used to construct the RCFMS (2005) model (i.e. to account for dredging, sediment deposition and scour in the intervening period).

The potential impacts will be determined with reference to detailed engineering drawings of the Wright Street Crossing, Inchinnan Cycleway and Gateway Crossing, and the footprint of the proposed project.

5.5.1.1 Assumptions and Limitations

The FRA is based on the RCFMS ISIS model, which was extensively developed and validated as part of the 2005 study. Updates to the model have been implemented to account for post-2005 alterations to river inflows and floodplain topography (including the White Cart FPS and various developments on the banks of the River Clyde). However, no further flow surveying or model validation will be conducted as part of the proposed modelling work to inform the specimen design and EIA.

5.5.2 Water Quality

No water quality surveys or water quality monitoring will be required during the EIA. Construction impacts of the proposed project on water quality will be assessed qualitatively based on valued, expert judgement and taking account of experience from similar projects in other comparable locations. Assessment of potential impacts will take into account the size and location of the construction footprint, type and nature of construction activities likely to occur

in-channel or within the catchment, the potential risk from pollutant spillages and silt-laden runoff entering the White Cart/Black Cart Waters and River Clyde, and the pollutant dilution/ dispersal capacity of these rivers. Methods to assess impacts on groundwater quality and disturbance of contaminated land is considered in Chapter 4.

To assess potential operational impacts on water quality, calculations will be undertaken to estimate the probability of an accidental spillage from a heavy good vehicle (HGV) leading to a serious pollution incident in line with DMRB HD 45/09 (Method D – Pollution Impacts from Accidental Spillages). To undertake these calculations, traffic and drainage information will be required, including:

- two-way annual average daily traffic (AADT) flow;
- %HGV;
- lengths of road draining to the White Cart Water and/or River Clyde outfall(s); and
- SuDS components included in the drainage design.

Impacts of scour around the bridge structures on the White Cart and Black Cart Waters will also be assessed.

In line with SEPA's guidance[16], only 'minimal' SuDS treatment is required for discharges to transitional/tidal waters. This is likely to take the form of basic source control measures (e.g. filter drains, swales, filtration trenches, permeable paving). The type and density of SuDS included in the drainage design will be agreed with SEPA as design work progresses.

5.5.2.1 Assumptions and Limitations

For road schemes that propose to discharge routine runoff to non-tidal watercourses, an assessment following DMRB HD 45/09 Methods A and B (Effects of Routine Runoff on Surface Waters) would normally be undertaken. However, this assessment is based on discharges to watercourses with hydrological catchments and which exhibit one flow direction in order to calculate the low flow value, and therefore the potential dilution/dispersal capacity, of the watercourse. For the proposed GAIA development, discharge is proposed to the White Cart Water and/or River Clyde which are tidal and saline in this location; a low flow value cannot be accurately determined for waters which are tidally-influenced and the estimated pollutant loadings/concentrations cannot be compared against the freshwater pollutant thresholds within the assessment tool. As a result, the assessment method is not applicable and therefore has been scoped out of the EIA. Due to the large size of the rivers, and implementation of SuDS, it is considered that routine runoff would have a negligible impact on water quality.

Detailed pollutant transport modelling in line with SEPA's WAT-SG-11 Guidance[17] is not required as there are no designated shellfish or bathing waters in the vicinity of the proposed project, as agreed with SEPA.

[16] SEPA Regulatory Method (WAT-RM-08): Sustainable Urban Drainage Systems (SUDS or SUD Systems), v6.0 March 2016; SEPA Supporting Guidance (WAT-SG-12): General Binding Rules for Surface Water Drainage Systems, v4.1 March 2016
[17] SEPA Supporting Guidance (WAT-SG-11): Modelling Coastal and Transitional Discharges, v3.0 April 2013

5.5.3 Controlled Activities Regulations (CAR)

CAR licence applications may be required for engineering activities which have the potential to impact on the water environment, e.g. abutments/piers of the river crossings and any associated bed/bank scour protection. It has already been agreed with SEPA that road drainage will fall under CAR General Binding Rules (GBRs)[18], and as long as the conditions of the GBR are met, no further consultation with SEPA is necessary on this issue. In addition, in-river works below Mean High Water Springs (MHWS) will fall under the marine licensing process and further consultation will be undertaken with Marine Scotland to confirm potential consent requirements.

Although CAR is a separate consenting regime to EIA, much of the information collated as part of the Stage 3 assessment and EIA will be used in the CAR applications and any marine licence applications. In the event that engineering activities are licensable under CAR, the approach and programme of delivery will be agreed with SEPA and Renfrewshire Council, and opportunities to combine efforts, e.g. baseline data collection for EIA and CAR, will be investigated.

5.5.4 Impact Assessment

Impact significance is a function of the sensitivity (value/importance) of an attribute and the magnitude of impact. **Tables 5.2** to **5.4** are based on DMRB HD 45/09 criteria and will be used to inform the assessment.

The significance of impacts on flood risk and water quality will be reported for residual impacts only (i.e. the remaining impacts following implementation of mitigation) for the construction and operation phases of the proposed project. As per DMRB HD 45/09 guidance, where there are two alternatives provided in **Table 5.4**, a single significance rating will be chosen based on professional judgement. Criteria to inform assessment of the impacts on groundwater are provided in **Chapter 4.**

Table 5.2: Evaluating the Sensitivity (value/importance) of Water Environment Attributes

Importance	Criteria	Typical Examples
Very High	Attribute has a high quality and rarity on regional or national scale	Surface Water: EC Designated Salmonid/Cyprinid fishery WFD Class 'High' Site protected/designated under EC or UK habitat legislation (SAC, SPA, SSSI, WPZ, Ramsar site, salmonid water)/species protected by EC legislation
		Flood Risk: Floodplain or defence protecting more than 100 residential properties from flooding
High	Attribute has a high quality and rarity on local scale	Surface Water: WFD Class 'Good' Major Cyprinid Fishery Species protected under EC or UK habitat legislation
		Flood Risk: Floodplain or defence protecting between 1 and 100 residential properties or commercial/industrial premises from flooding

[18] SEPA (2016) CAR: A Practical Guide, v7.3 June 2016

Importance	Criteria	Typical Examples
Medium	Attribute has a medium quality and rarity on local scale	Surface Water: WFD Class 'Moderate'
		Flood Risk: Floodplain or defence protecting 10 or fewer commercial/industrial properties from flooding
Low	Attribute has a low quality and rarity on local scale	Surface Water: WFD Class 'Poor' or 'Bad'
		Flood Risk: Floodplain with limited constraints and a low probability of flooding of residential and commercial/industrial properties

Table 5.3: Estimating the Magnitude of Impact on Water Environment Attributes

Magnitude	Criteria	Typical Examples
Major Adverse	Results in loss of attribute and/or quality and integrity of the attribute	Surface Water: Calculated risk of pollution from a spillage >2% annually Loss or extensive change to a fishery Loss or extensive change to a designated Nature Conservation Site
		Flood Risk: Increase in peak flood level (0.5% annual probability) >100mm
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute	Surface Water: Calculated risk of pollution from spillages >1% annually and <2% annually Partial loss in productivity of a fishery
		Flood Risk: Increase in peak flood level (0.5% annual probability) >50mm
Minor Adverse	Results in some measurable change in attributes quality or vulnerability	Surface Water: Calculated risk of pollution from spillages >0.5% annually and <1% annually
		Flood Risk: Increase in peak flood level (0.5% annual probability) >10mm
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the integrity of the water environment	Surface Water: Risk of pollution from spillages <0.5%
		Flood Risk: Negligible change in peak flood level (0.5% annual probability) <+/- 10mm
Minor Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Surface Water: Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually)
		Flood Risk: Reduction in peak flood level (0.5% annual probability) >10mm
Moderate Beneficial	Results in moderate improvement of attribute quality	Surface Water: Calculated reduction in existing spillage by 50% or more (when existing spillage risk >1% annually)
		Flood Risk: Reduction in peak flood level (0.5% annual probability) >50mm
Major Beneficial	Results in major improvement of attribute quality	Surface Water: Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse
		Flood Risk: Reduction in peak flood level (0.5% annual probability) >100mm

Table 5.4: Estimating the Significance of Potential Effects

Magnitude / Sensitivity	Negligible	Minor	Moderate	Major
Very High	Neutral	Moderate/Large	Large/Very Large	Very Large
High	Neutral	Slight/Moderate	Moderate/Large	Large/Very Large
Medium	Neutral	Slight	Moderate	Large
Low	Neutral	Neutral	Slight	Slight/Moderate

6. Landscape and visual effects

6.1 Introduction

A detailed landscape, townscape and visual impact assessment (LVIA), including a cumulative assessment, will be carried out to identify and assess any significant landscape, townscape or visual effects anticipated to be associated with the proposed development and to inform further refinement of the proposed layout and design. The acronym 'LVIA' will be used in this report and in the subsequent assessment to refer to the assessment of effects including those on townscape character. The landscape, townscape and visual assessments will be undertaken by chartered Landscape Architects at Sweco (a practice registered by the Landscape Institute) with relevant assessment experience.

The following will form the main focus of the LVIA:

- the general effect of the proposed development on local landscape and townscape character and the ability of the landscape/townscape to accommodate the change;
- visual effects on key receptors such as people in settled areas, at recognised viewpoints, tourist and visitor attractions and using key transport routes; and
- the potential cumulative effects with other consented and proposed developments in the area which are of a similar scale and type to the proposed development

An LVIA consists of two separate but interlinked components: a landscape assessment; and a visual assessment. Given the nature of the site and study area, in this instance the landscape assessment includes a townscape assessment. When presenting the methodology, this chapter refers to 'landscape assessment' and this can generally be taken to also refer to 'townscape assessment'. Where applicable specific detail on the approach to townscape assessment will be set out.

The landscape assessment considers the effects of the proposed development on the landscape as an environmental resource. The visual assessment considers the change to people's views (identified as residents, visitors to the area, people working in the area etc.). Landscape and visual effects will be considered for both the construction and operational phases of the proposed development.

The LVIA is underway and will be informed by a combination of desk and site-based assessment techniques. At this stage the initial findings of the LVIA are being used to inform the design of the proposed development. The LVIA chapter of the ES will present the findings of the iterative assessment process including identification of any mitigation that has been incorporated into the design.

The LVIA will build on landscape and visual assessment work already carried out in relation to the proposed development. A number of route options were considered at a previous stage and a preliminary landscape and visual assessment of each of the options has informed a wider decision on the most suitable routes.

6.2 Consultation

No consultation has been carried out at this stage specifically in relation to the LVIA. Consultation responses received with relevance to the landscape and visual assessment are summarised in **Table 6.1.**

Table 6.1: Pre-Scoping Consultation Responses

Consultee	Response/Action	Data Provided	Action Taken
A&DS	Has no comment to make at this stage of the development	No	No action required
Forestry Commission Scotland	FCS encouraged the promotion of the Policy on Control of Woodland Removal. Any of the following: Ancient Woodland Inventory, Native and Semi-Native Woodlands, or Tree Preservation Orders (amongst others), if impacted by the development, should require a direct engagement with the relevant authority.	No	No action required at this stage however further consultation will take place once areas of woodland loss are known
GCV Green Network Partnership	Noted that the City Deal projects present significant opportunities to deliver important elements of the Green Network in Renfrew. Green Network elements need to be properly designed and any environmental improvements should follow the Integrated Green Infrastructure approach.	No	Noted. No action required at this stage
Living Streets	Living Streets recommends using the Scottish Government's Place Standard at areas of significant potential change to help establish community perception	No	Noted. No action required at this stage

Going forward, as part of the EIA, the following key stages of consultation will be undertaken:

- Review of consultation responses received in relation to this scoping report;
- Discussion with SNH/Renfrewshire Council on the assessment methodology, including the interpretation of the 'worst case assessment scenario' from a landscape and visual perspective. This stage will require the completion of a 'design-fix' for the proposed development; and
- Agreement on the location of representative viewpoints with Renfrewshire Council.

6.3 Baseline Description

6.3.1 Study Area

Following the preliminary landscape and visual desk and site based assessments, the extent of the study area has been defined as a 1km radius around the site boundary. It is considered that the nature and form of the proposed development and the surrounding urban context are such that no significant landscape or visual effects would be experienced outside of this study area.

The 1km LVIA study area provides a boundary to the assessment, identification of receptors and the selection of representative viewpoints is shown on Figure 6.1. However, the preliminary assessment has identified that potentially significant effects, particularly on people's views, would be located within a more immediate radius to the site and the focus of the assessment, including the majority of viewpoint locations, will be within approximately 0.5 km of the site boundary.

6.3.2 Desk Based Research

Preliminary LVIA work has made reference to the following information sources:

- survey data related to the site, e.g. topographical and tree surveys;
- drawings relating to the development proposals and their construction;
- Ordnance Survey mapping and aerial photography;
- development plans and guidance containing information relating to landscape designations and landscape related policies at the local, regional and national level; and
- the published SNH landscape character assessment for the study area

Relevant details of information from these sources are provided in **Section 6.3.**

6.3.3 Field Surveys

Preliminary field surveys have been undertaken from public roads, public rights of way and publically accessible areas, including areas of public open space. The site and study area has been visited in relation to landscape and visual studies in: April; May; and July 2016.

Site work has involved:

- a corroboration of the findings of the desktop review;
- gathering of additional information on landscape elements, character, views and localised screening;
- confirming a list of preliminary viewpoints and taking reference photographs;
- preliminary identification of landscape and visual effects; and
- consideration of opportunities for landscape and visual mitigation

6.3.4 Landscape and Townscape Character

The site and 1 km study area is located within Renfrewshire and is covered by 'Glasgow and the Clyde Valley Landscape Character Assessment', completed for Scottish Natural Heritage (SNH) by Land Use Consultants in 1999 (Report No. 116). The proposed development site is located in areas identified as 'Urban' and the following character types:

- Alluvial Plain
- Green Corridors

In addition, the wider 1km study area also includes the 'Rugged Upland Farmland' character type.

The areas identified as 'Urban' are not attributed a landscape character description. Therefore the LVIA will set out the descriptions for the character areas that are available, i.e.: Alluvial Plain; Green Corridors; and Rugged Upland Farmland, and townscape character assessment will be carried out for the 'Urban' areas.

N

Notes

Key

- Indicative Boundary of Proposed Development
- Study Area

Glasgow and the Clyde Valley Character Areas (SNH, 1999)

- Alluvial Plain
- Drumlin Foothills
- Green Corridors
- Rugged Upland Farmland
- Urbanised Area

Alluvial Plain LCA
- Distinctive and low-lying landform
- Open landscape with woodland blocks
- Pasture and arable fields
- Influenced by urban expansion and transport infrastructure

Drumlin Foothills LCA
- Distinctive undulating landform
- Transitional landscape between lowland areas and the rugged moorland hills in the north
- Pastoral farming dominates in the lower areas, before extending into areas of moorland
- Woodland is a mix of semi-natural and farm woodland and conifer plantations

Green Corridors LCA
- Undeveloped land along rivers and canals
- Mix of landscape, industrial and transport features

Rugged Upland Farmland LCA
- A rugged landform including rocky bluffs and shallow troughs
- Pastoral farming dominates
- Tree cover often emphasisies landform

(The 'Urban Area' LCA does not pick up on any geographically specific sensitivities or characteristics of the urban area, and the classification is considered too broad. Therefore, Townscape Character Areas have been developed to provide more detailed characteristic of the urban environment. These are shown and described on Figure D7.3 Townscape Character Areas)

0 125 250 500 750 Metres

Reference Drawings

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Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure 6.1: Landscape Character Areas

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Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/09/2016	01/09/2016		

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Project Ref. No.: 117084 (R06)

Revision: 0A

Figure 6.1 presents the landscape character areas and Figure 6.2 shows the townscape areas which were identified during LVIA work undertaken to date. The potential effects on these landscape and townscape areas will be identified within the LVIA chapter.

6.3.5 Landscape Designations

There are no national landscape designations (e.g. National Scenic Areas) on the site or within the study area. There are also no local landscape designations (e.g. Special Landscape Areas) on the site or within the study area.

There are protected areas which are of relevance to the LVIA (shown on Figure 6.3), including:

- Greenbelt, defined by Renfrewshire Council. The nearest area of Greenbelt to the proposed development is located within the north-western extent of the site. This is primarily a planning designation, however it is relevant to the consideration of openness within the site and study area;
- Ancient Woodland, which is relevant to the consideration of value attributed to landscape features within the site and the potential for loss of such features due to the proposed development. The site passes through areas of Ancient Woodland, close to Glasgow Airport, the impact of which will be considered within the LVIA; and
- Conservation Areas, which are primarily designated for their heritage value, however they are of particular relevance to the consideration of townscape character and value and also visual receptors, therefore they will be considered within the LVIA. The nearest Conservation Areas to the site are:
  - Greenlaw Conservation Area, which is located 0.3 km south-east of the site; and
  - Paisley Town Centre, which is located 0.2 km south of the site.

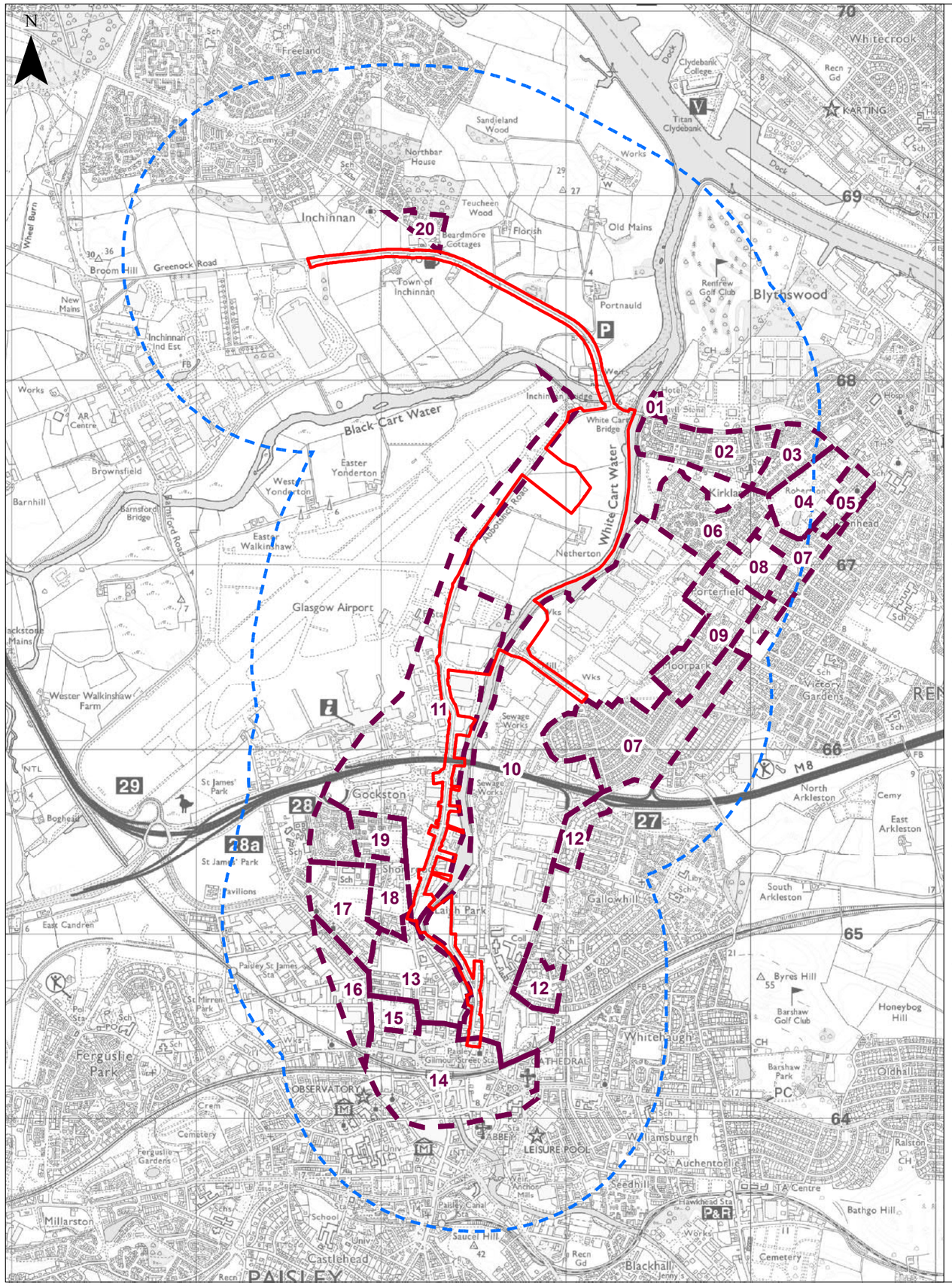
6.3.6 Visual Envelope and Potential Visual Receptors

The site is located on the western extent of the town of Renfrew and north of Paisley centre. The built nature of the site and study area limits visibility of the site due to the screening effect of residential and industrial buildings. A full visual analysis will be carried out of the site and proposed development, however at this stage the following can be stated with regards to potential visual receptors:

6.3.6.1 Residential Receptors

The site is located within or adjacent to industrial and agricultural areas and is largely set away from residential properties. However, there are some notable residential receptors including:

- Kirklandneuk at the northern extent of the site;
- the Shortroods area, near to Inchinnan Road and New Inchinnan Road;
- the New Sneddon Street area, facing into the White Cart Water;
- a tenement building on Abercorn Street; and
- residential villas and the new Keepmoat development on Inchinnan Road.



TCA 01 Argyll Diageo
- Defined by industrial and big box retail use
- Large, uniform buildings dominate
- Roads provide access, no throughfare
- Little relationship with surrounding area
- Flat topography, area bounded by woodland

TCA 02 Kirklandneuk
- Residential area to south of Inchinnan Road
- Variety of housing types
- Narrow street pattern
- Poor vehicle/ pedestrian connectivity
- Planting limited to hedges defining front boundary with limited garden shrubs
- Area has no relationship to White Cart Water in west

TCA 03 Craigielea
- Residential area characterised by 2-4 storey terraced flats
- Dense, geometric layout
- Properties overlook communal open green spaces
- Pedestrian access to Robertson Park (TCA04)
- Poor vehicle throughfare

TCA 04 Robertson Park
- Open public park adjacent to Renfrew old town
- Mature avenue trees, ornamental planting
- Formal and informal recreation opportunities

TCA 05 Renfrew Town Core
- 12th century Old Town includes the remains of Royal Stewart Castle
- Dense, small scale, with a fine grain reflecting the historic pattern
- Mixture of commercial and residential uses: 4-5 storey concrete terraced tenements, terraced semi-detached homes, historic church and central square
- Pedestrian friendly; limited circular vehicular access
- Little/ no street vegetation

TCA 06 Nethergreen
- Recent residential development
- Detached and semi-detached 2-storey brick homes
- Lack of front boundary fences, open outlook
- On-street vegetation limited to garden shrubs
- Network of curved streets in cul-de-sac arrangement,
- Poor circulation or throughfare (both pedestrian and vehicular)

TCA 07 Renfrew Residential
- Residential areas, characterised by semi-detached 2-storey concrete houses, terraces and detached bungalows
- Good vehicular circulation and throughfare
- Wider streets, on street parking
- Limited vegetation - hedges define some boundaries
- Internalised outlook

TCA 08 Moorpark
- Moorpark Pre-Five Centre and site of old Renfrew Primary School
- Bound by tenement flats to east and west

TCA 09 Porterfield
- Mix of modern residential brick flats and older 20th Century concrete terraced houses and flats
- Poor vehicular connections
- Some mature planting associated with older properties. More recent development is sparse
- Central communal green space
- Internal outlook

TCA 10 French Street Industrial Estate
- Dominant land use chacterising large extent of riverside
- Large, extensive industrial area, including offices, storage units, sewage works and loading docks
- No relationship with river setting
- No pedestrian access or throughfare
- Woodland edge screens views in and out of site

TCA 11 Glasgow Airport
- Extensive areas of carparking/ storage
- Large scale prefabricated metal buildings characterise the area
- Flat topograpy with very little variation
- Lack of vegetation due to airport requirements. Some woodland associated with the riverside and forming avenues to roads in the wider area
- Extensive green open spaces and fields surround airport

TCA 12 Gallowhill
- Residential neighbourhood comprised of 2 storey terraces/ semi detached - little variety in type
- Neat and regular layout
- No on-street vegetation. Some hedges define front yard boundaries
- Good pedestrian and vehicle circulation

TCA 13 Sneddon
- A junction of a combination of land use types
- Mixed use area comprised of both modern terraced residential flats, semi-detached concrete houses and tenement blocks, commercial and retail development and areas of industry
- Lack of on-street vegetation
- Large areas of derelict and brownfield sites

TCA 14 Paisley Town Centre
- Mixture of range of architectural types, including neoclassical, art deco and georgian tenements and more recent development
- Shopping venture
- Strong public transportation
- Green open and designed spaces open to public
- Dense and complex layout with varied scale of buildings

TCA 15 Fountain Gardens
- Open green space within a densely built up area
- Geometrically designed public park
- Ornate fountain in centre
- Bordered to south by regular spaced residential flats

TCA 16 St. James Industrial
- Industrial area surrounded by residential zones
- Characterised by large prefabricated buildings and large areas of hardstanding, carparking and storage
- No green space

TCA 17 Mossvale
- Residential area characterised by four storey concrete flats laid out in rigid geometric pattern
- Communcal green space surrounds
- Large fields associated with Mossvale Primary School creates large open spaces and loosens grain of built development

TCA 18 Osprey
- Modern residential estates
- 2 storey detached and semi-detached villas with private front and back gardens
- Limited on-street planting but some recreational green open spaces
- Dense and repetitive layout
- Good access and circulation

TCA 19 Mosslands
- Residential area comprised of 2 storey terraced and semi-detached concrete properties
- Grid-like geometric pattern
- No on-street planting however access to public green open space (low maintenance)
- Poor connections (both vehicular and pedestrian)

Notes

Key

- Indicative Boundary of Proposed Development
- Study Area
- GAIA Townscape Character Areas

0 125 250 500 750 1,000 Metres

Reference Drawings

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FINAL	S0

Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure 6.2: Townscape Character Areas

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Notes

Key

- Indicative Boundary of Proposed Development
- Study Area
- Council Boundary
- Ancient Woodland Inventory (AWI)
- Semi-Natural Ancient Woodland
- Conservation Areas
- Renfrewshire Council Greenbelt

0 125 250 500 750 1,000 Metres

Reference Drawings					
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Project Title
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Drawing Title
Figure 6.3: Landscape Designations

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Project Originator Volume Location Type Role Number
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Revision: 0A

6.3.6.2 Transport / Recreation Routes

Transport and recreational route receptors are likely to comprise the following:

- Users of the Greenock Road / Inchinnan Cycle Link;
- Users of the riverside footpath from Inchinnan Road South;
- Inchinnan Cruising Club;
- Abbotsinch Road North;
- Abbotsinch Road South; and
- Abbotsinch Playing Fields

Users of transport and/or recreational routes are likely to be identified may range between low and medium sensitivity within the LVIA, dependent on their individual characteristics and context.

6.3.6.3 Receptors at employment sites

Receptors at employment sites are likely to comprise the following:

- Arran Avenue Industrial Area, located directly to the east of Glasgow Airport;
- Inchinnan Road Industrial Area;
- Abercorn Street Industrial Estate;
- Inchinnan Business Park, located north of Glasgow Airport and the Black Cart Water;
- the Westway Business Park area, located in Renfrew to the immediate east of the White Cart Water to the west of Paisley Road (A741);
- the Westpoint Business Park, located west of the White Cart Water and south of the M8 accessible via M8 junction 28. The park includes five buildings;
- the Chivas Brothers Headquarters located between Renfrew Road and Abercorn Street in Paisley; and
- premises north of Paisley Gilmour Street

Receptors at employment sites are likely to be identified as being of low sensitivity to change within the LVIA.

6.3.6.4 Receptors at educational facilities

The Paisley campus of West College Scotland is located on Renfrew Road (A741) in the southern extent of the study area and is identified as a potential visual receptor.

Receptors at educational facilities are likely to be identified as being of low sensitivity to change within the LVIA.

6.3.7 Representative Viewpoints

A list of viewpoints will be agreed with Renfrewshire Council, however the following preliminary list of viewpoints have been identified.

Table 6.2 – Preliminary Viewpoints

No.	Name	OS Location	Location and position in relation to site	Reason for selection
1	White Cart Bridge Approach	NS 49280 67859	Adjacent to the northern boundary of the site	Representative of road users and pedestrians
2	Abbotsinch Road	NS 48362 66691	Adjacent to the western boundary of the site	Representative of road users and pedestrians
3	Wright Street	NS 49154 66240	0.3 km east of the site	Representative of residential receptors
4	Inchinnan Road	NS 48155 65082	Located adjacent to the western boundary of the site	Representative of residential receptors
5	Harbour Road	NS 48377 64936	Located at southern extent of the site	Representative of road users

Viewpoint locations are illustrated on **Figure 6.4**.

6.4 Potential Effects

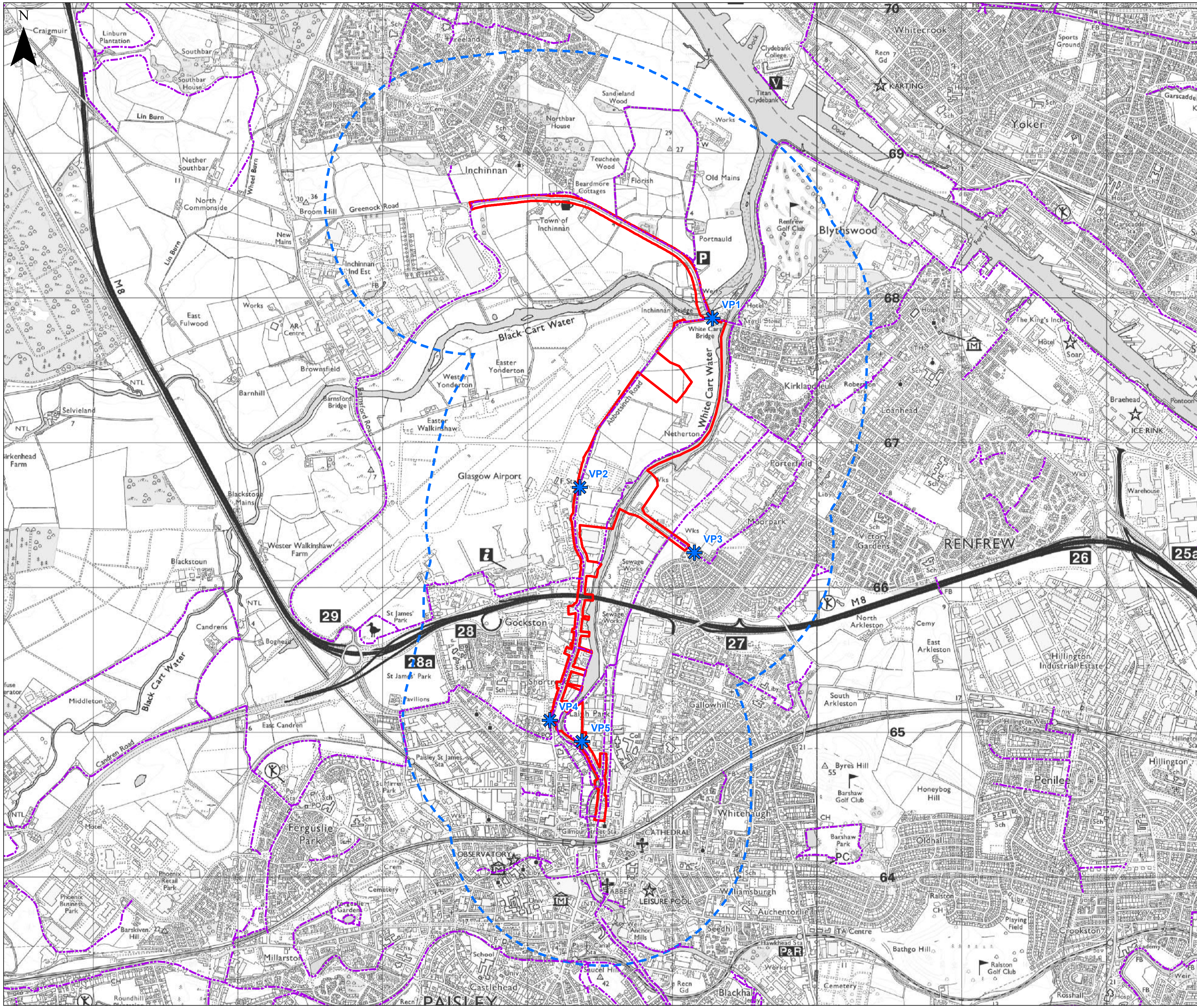
The LVIA will consider the effects arising from the proposed development during the construction and operation phases. The operation phase is taken as being the point at which all construction is complete and the scheme appears as it was designed in the final proposals. It is not proposed to split the operational phase assessment into separate Year 1 and Year 15 assessments. This approach is generally taken in areas in which extensive mitigation planting is proposed and the Year 15 assessment would take into account the mitigating effect of mature/semi-mature vegetation. However as the study area is urban and potential for significant landscape or visual effects relatively limited, it is expected that the necessity for extensive mitigation planting will be limited and there is no requirement for a Year 15 assessment.

6.4.1 Landscape

Anticipated operational phase landscape effects relate to:

- **change to the landscape and townscape character of the site**. A particular focus will be on the introduction of new bridge crossings over the White Cart Water and the realignment of the Abbotsinch Road through arable fields;
- **change to adjacent landscape character areas**. The full landscape and townscape character assessment will consider the impact of the introduction of a new road scheme, including bridge crossings, into a predominantly urban area and how well the scheme assimilates into that existing context; and
- **the loss of some landscape features within the site,** including agricultural fields, hedgerow and trees

In addition to the operational phase landscape effects, the proposed development is anticipated to give rise to landscape effects during construction. Effects on the site and study area during the construction phase will be temporary. The landscape assessment will therefore focus on the changes to the local landscape/townscape which would be unique to construction, e.g. the introduction of: site compounds; and heavy machinery.



Notes

Reference Drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
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Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure 6.4: Visual Context

Scale	Designed	Drawn	Checked	Approved
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6.4.2 Visual

Anticipated operational phase visual effects relate to change in the visual amenity of receptors such as those listed in **Section 6.3.4.** The assessment of change in visual amenity will focus on the following aspects of the development:

- the loss of arable fields to the east of Glasgow Airport and the introduction of a realigned road;
- the introduction of new bridge crossings over the White Cart Water; and
- changes to existing roads within the scheme corridor.

In addition to the operational phase visual effects, the proposed development is anticipated to give rise to visual effects during construction. Effects on the site and study area during the construction phase will be temporary but may last up to two years. The construction phase visual assessment will focus on the changes to the visual amenity experienced by receptors which are unique to the construction phase, e.g. the introduction of: site compounds; heavy machinery; and lighting into people's views.

6.5 Proposed Scope of Assessment

The assessment will be carried out in accordance with the Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA) as well as other current and relevant advisory guidelines. The proposed draft methodology has been included within Appendix 1 which will form the basis of the LVIA.

7. Ecology and nature conservation

7.1 Introduction

This section sets out the proposed approach to the assessment of potential ecological effects of the proposed development, which has been undertaken in accordance with the Guidelines for Baseline Ecological Assessment[19] and the Guidelines for Ecological Impact Assessment in the UK[20].

Specifically, this section seeks to:

- describe key consultation undertaken with statutory and non-statutory organisations regarding the predicted ecological effects of the proposal;
- describe initial baseline conditions relevant to the proposed project and wider study area;
- present an initial assessment of the ecological effects associated with construction and operation of the proposed project;
- describe outline mitigation proposed to ameliorate predicted ecological effects;
- outline the proposed approach to the Ecological Impact Assessment (EcIA) (as part of the wider EIA);
- present the proposed survey methods that will be used to generate ecological and baseline information for the EcIA; and
- present a justification for predicted significant effects to be scoped out of the EcIA.

7.2 Consultation

A range of organisations have been consulted to date. The results of the consultation process, are summarised below (**Table 7.1**).

Table 7.1: Consultation Responses

Consultee	Response/Action	Data Provided	Action Taken
Clyde Amphibian and Reptile Group	Advised the group does not hold up-to-date records and that contact should be made with Glasgow Museums Biological Records Centre regarding relevant amphibian and reptile data for the search area.	No	No action required.
Clyde Bat Group	No response received to date.	No	No action required.
Glasgow Museums Biological Records Centre	Advised the organisation holds records and that a search could be undertaken subject to an additional fee.	Yes	Additional costs were approvad; data is described below will be presented in the EIA.

[19] IEMA (1995) Guidelines for Baseline Ecological Assessment. Institute of Environmental Management & Assessment

[20] CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland

Consultee	Response/Action	Data Provided	Action Taken
Marine Scotland	Marine Scotland confirmed use of the River Clyde and Black and White Cart Waters by diadromous fish including: Atlantic salmon, sea trout, river lamprey and European eel. As part of their response, use of the rivers as spawning staging areas was noted, in addition to a requirement to account for effects to these species. In addition, Marine Scotland noted a requirement for screening of Likely Significant Effects (LSE) associated with the Endrick Water Special Area of Conservation (SAC) and proximity of the Inner Clyde and Black Cart Water SPA.	n/a	Following meeting MS confirmed fish surveys in the Clyde would not be needed and that the proposed approach to HRA Screening (for Endrick Water SAC) was acceptable. An HRA Screening appraisal will be undertaken and reported to MS and SNH
Renfrew Biological Records	Advised the organisation holds records but could not access them due to on-going IT issues. The group stated that Glasgow Museums Biological Records centre hold all of their data and to contact this organisation regarding the request.	No	No action required.
River Clyde Foundation	Advised the group does not hold up-to-date records and that contact should be made with Glasgow Museums Biological Records Centre regarding relevant amphibian and reptile data.	No	See above under 'Glasgow Museums Biological Records Centre'
RSPB	Advised the charity holds records and that a search could be undertaken subject to an additional fee.	Yes	Additional costs were approvad; data is described below will be presented in the EIA
Scottish Badgers	The group confirmed the existence of one recorded within 1km of the search area and recommended a survey is carried out.	n/a	Surveys for badger will be undertaken to inform an assessment of the construction and operational effects as part of the EIA.
Scottish Natural Heritage	SNH initially provided a response confirming a potential requirement to take into account impacts to designated sites, protected species and birds. Subsequent consultation has confirmed a Habitats Regulation Appraisal is not required in respect to the Black Cart Water Special Protection Area (SPA) but that protected Species and development licences may be required at a later stage in the project.	n/a	Information will be taken into consideration as part of EIA.
Scottish Ornithologist Club	Initial information request is still being processing within the organisation as of 18/03/16.	Pending	No action required.
Scottish Wildlife Trust	The group confirmed they only hold/issue data relevant to their nature reserves and as there are no reserve within the search area, no further exchange is anticipated.	n/a	No action required.

Consultation undertaken for the project to date has provided clear advice and direction, in addition to sufficient background information for the purpose of the assessment of ecological effects. Therefore, no additional consultation is proposed as part of the EIA process other than for agreement of HRA screening for the Endrick Water SAC.

7.2.1 Glasgow Museums Biological Records Centre

Consultation with Glasgow Museums Biological Records Centre provided biological records for a 5km search area extending from the centre of the DMRB Stage 2 Study Area.

Records of common toad (*Bufo bufo*), common frog (*Rana temporaria*) and palmate newt (*Lissotriton helveticus*) were common throughout the search area, in addition to eight records of great crested newt (*Triturus cristatus*), which were specifically noted by Glasgow Museums Biological Records Centre as being questionable in terms of the reliability and veracity of the source information. Regardless, the nearest great crested newt record (centred in Barshaw Park) is located approximately 3.5 km to the proposed project, in-between an area of densely populated urban settlement.

Historical records of marine mammal were recorded within the vicinity of the proposed option crossings, these comprised: common seal (*Phoca vitulinax*), grey seal (*Halichoerus grypus*) and common porpoise (*Phocoena phocoena*). However, it should be noted that the records were noted to be in excess of 20 years old.

In addition, records of seven terrestrial mammal species were provided for the search area, as outlined in **Table 7.2** below.

Table 7.2: Records of Terrestrial Mammals

Species	No of Records	Date	Location
Badger (Meles meles)	7	2003-2010	Confidential
Brown long-eared bat (Plecotus auritus)	4	1904 - 1989	-
Common pipistrelle (Pipistrellus pipistrellus)	13	1986 - 2010	-
Daubenton's bat (Myotis daubentonii)	1	1992	Glasgow airport
Otter (Lutra lutra)	10	1935 - 2015	-
Soprano pipistrelle (Pipistrellus pygmaeus)	1	2008	-
Water vole (Arvicola amphibius)	27	1977 - 2009	-

Records of 3,936 bird species were provided for the search area, which included 33 bird species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).

7.2.2 RSPB

Consultation with the RSPB provided 2,762 biological records for a 5 km search area extending from the proposed project. Of the records provided, 17 were provided in respect to bird species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), in addition to records of the following mammal species:

- brown hare (Lepus europaeus);
- soprano pipistrelle; and
- European hedgehog (Erinaceus europaeus).

Consultation undertaken in line with DMRB Stage 2 Assessment methodology, provided clear advice and direction, in addition to sufficient background information for the purpose of the assessment of ecological effects and therefore no additional consultation is proposed as part of the EIA process.

7.3 Baseline Description

7.3.1 Site Description

The proposed development lies within an area comprising a mosaic of mixed residential housing and industrial businesses, interspersed by amenity areas, parkland, areas of semi-natural habitat, running water (the Black Cart Water and the White Cart Water – tributaries to the River Clyde) and hard-standing.

7.3.2 Desk Study

A search of publically available data[21] has been undertaken to inform earlier stages of the project. This has been used to inform the scope of the ecological assessment. The search established a number of European and nationally important sites designated for ecological considerations within proximity of the proposals, which are described below.

7.3.2.1 Nature Conservation Sites

There are no statutory designated sites within the red line boundary. However within 2km, two statutory designated sites of international importance (the Inner Clyde SPA and Inner Clyde Ramsar Site) were identified within 10 km of the proposed project, in additional to two nationally important sites (the Inner Clyde and Black Cart Water SSSI) recorded within 2 km of the proposed project (see **Figure 7.1**; **Table 7.3**).

Table 7.3: Statutory Designated Sites

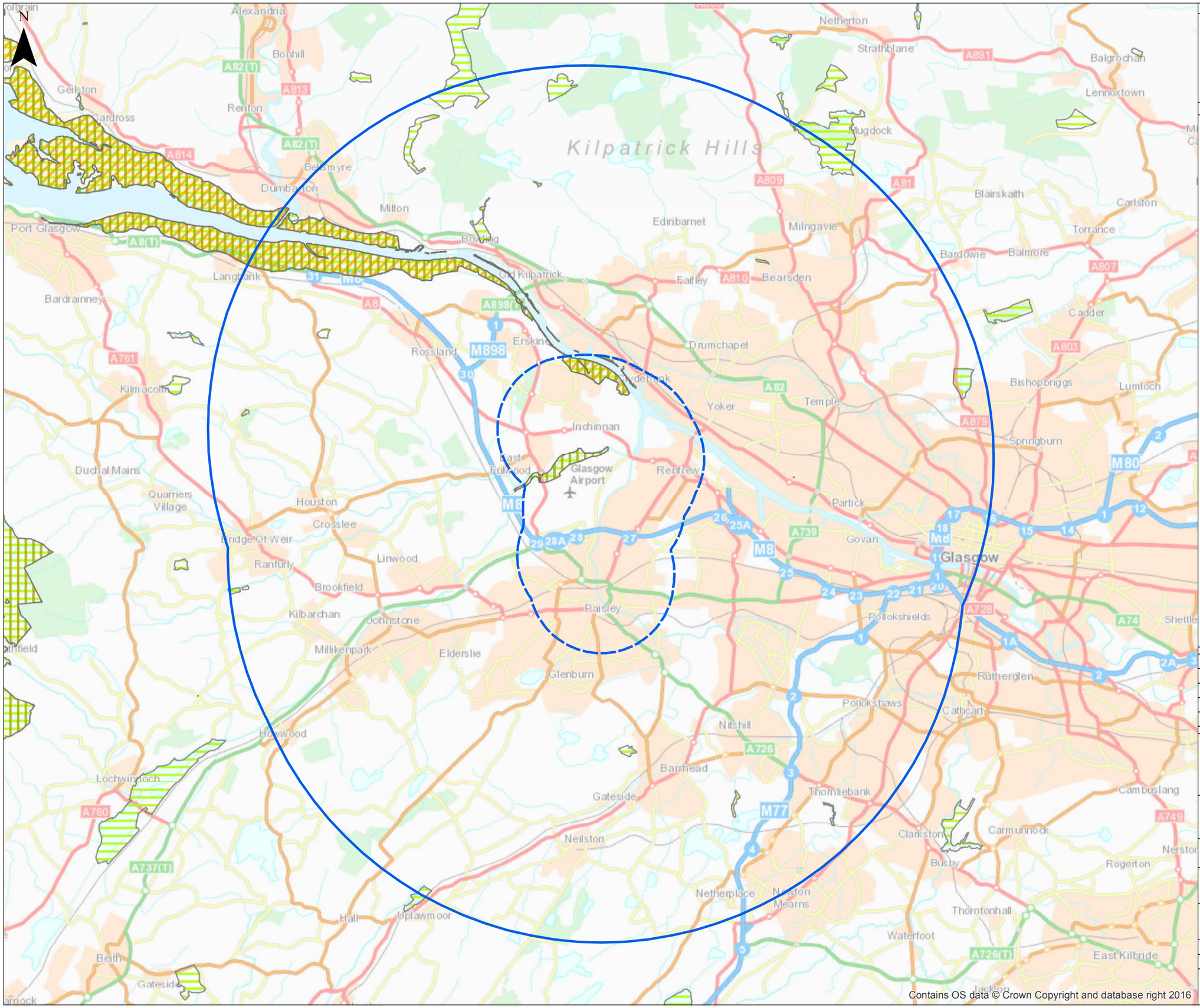
Site Name	Designation	Grid Reference	Size	Distance from Site
Inner Clyde	SPA, SSSI	NS 482 702	1825.29 ha	1.34 km (west)
Inner Clyde	Ramsar site	NS 482 702	1824.29 ha	1.48 km (west)
Black Cart Water	SPA/SSSI	NS 468 670	56 ha	0.31 km (west)

Two of the sites (the Inner Clyde SPA and Black Cart SPA) receive statutory protection under the European Union (EU) Directive on the Conservation of Wild Birds (79/409/EEC). In comparison, SSSIs receive statutory protection under the Wildlife and Countryside Act 1981 (as amended), while Ramsar Sites receive protection under the Convention on Wetlands of International Importance, which came in to force in December 1975.

The Inner Clyde SSSI/SPA is designated under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive (redshank (*Tringa tetanus*), 1,918 individuals representing at least 1.3% of the wintering Eastern Atlantic - wintering population (winter peak mean)).

The Black Cart SSSI/SPA is designated under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive (whooper Swan (*Cygnus Cygnus*), 220 individuals representing at least 4.0% of the wintering population in Great Britain (early 90s winter peak mean)).

[21] Including SNH (2016) Information Database at http://www.snh.gov.uk/publications-data-and-research/snhi-information-service



Notes

Key

- Buffer (10km)
- Buffer (2km)
- Special Protection Area (SPA)
- RAMSAR Site
- Site of Special Scientific Interest (SSSI)

0 0.5 1 2 3 4 Km

Reference Drawings

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Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure 7.1: Ecology Designated Sites

Scale	Designed	Drawn	Checked	Approved
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7.3.2.2 Non-statutory Sites

Ancient Woodlands and Sites of Importance for Nature Conservation (SINC)

No areas of ancient woodland were recorded within the proposed project; however, ten areas of ancient woodland were recorded within 2 km of the proposed project (**Figure 7.2 Table 7.4**).

Table 7.4: Ancient Woodland Sites

Site ID/Name	OS Grid Reference	Category	Distance from Site	Size
Teucheen Wood	NS 482 690	2b	0.20 km (south)	5.09
Blythswood	NS 498 682	2b	0.52 km (north-east)	4.36
Woodland #3	NS 501 683	2b	0.72 km (north-east)	4.64
Woodland #4	NS 473 702	1a	1.58 km (north-west)	2.52
Woodland #5	NS 470 695	2b	0.91 km (north-west)	2.76
Woodland #6	NS 464 698	2b	1.62 km (north-west)	6.12
Woodland #7	NS 462 696	2b	1.45 km (north-west)	8.92
Woodland #8	NS 459 695	2b	1.80 km (north-west)	0.79
Woodland #9	NS 458 695	1b	1.90 km (north-west)	0.61
Woodland #10	NS 457 695	Other (Roy Map)	1.96 km (north-west)	2.71

In addition to the above areas of long-established woodland, ten SINCs were identified within 2km of the proposed development. The first eight SINCs were associated with the White Cart and Black Cart Waters and comprised a series of riverine woodlands (along the White Cart Water) and open arable fields (along the Black Cart Water). In comparison, the ninth SINC mirrored that of Teucheen Wood (an area of long-established woodland described above).

Thirteen additional SINCs were identified within 2km of the proposed project. Two of the SINCs were concurrent with the boundary of two Local Nature Reserves (LNRs) (Jenny's Well and Paisley Moss), while three SINCs were either wholly or partially concurrent with the boundaries of three areas of ancient woodland (of long-established origin). In addition, three of the SINCs overlapped the CWRR project.

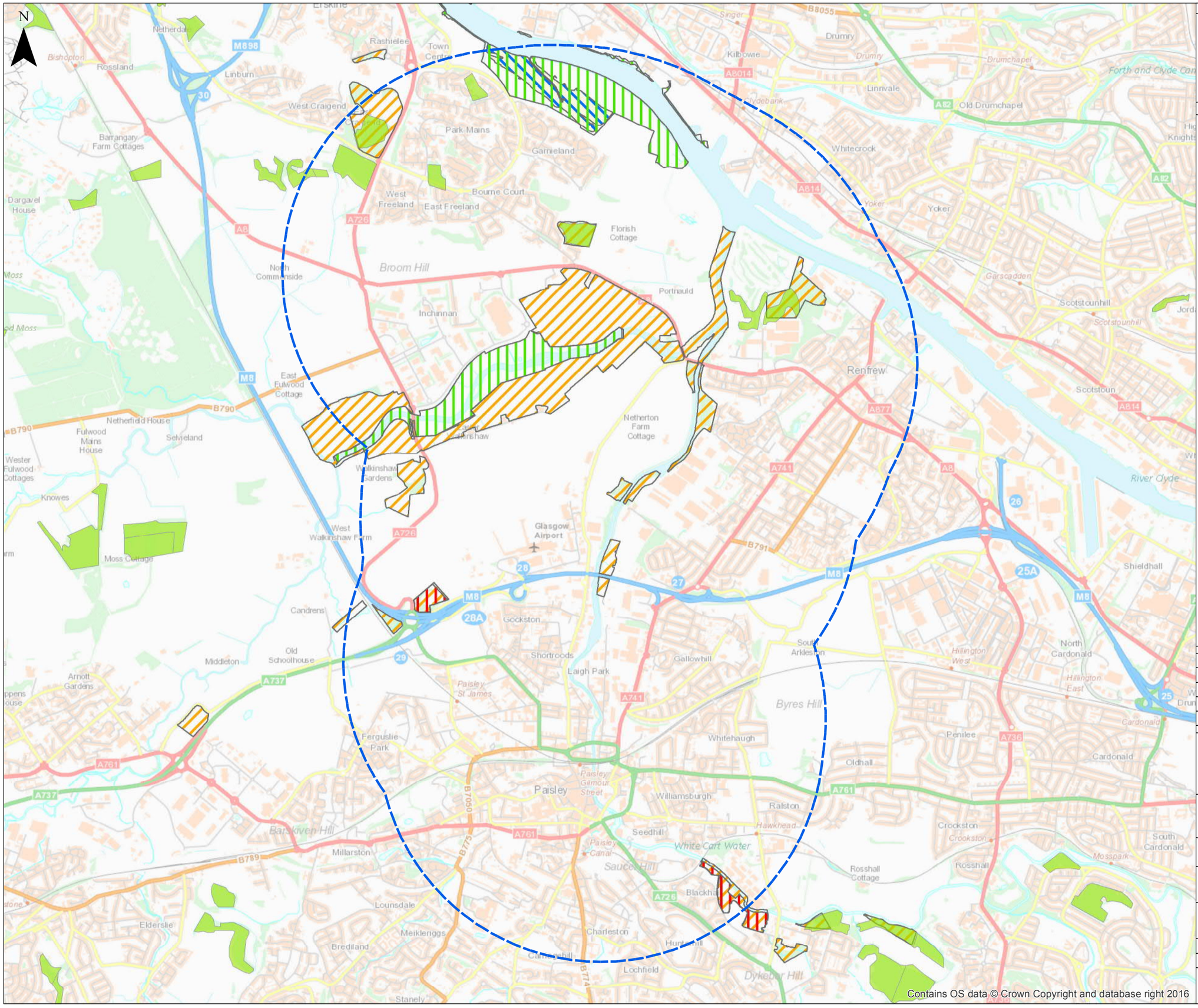
RSPB Nature Reserves and Important Bird Areas (IBA)

A Royal Society for the Protection of Birds (RSPB) Nature Reserve and IBA were recorded adjacent to the River Clyde, to the north of the proposed project. The boundary of these two sites were contiguous with the boundary of the Inner Clyde SPA/SSSI.

A second IBA, comprising a section of the Black Cart Water and an area of adjacent land, was recorded to the west of the proposed project. The boundary of this site was noted to be contiguous with the boundary of the Black Cart Water SPA/SSSI.

Local Nature Reserves

Two LNRs were identified within 2km of the proposed project and are designated for their locally important habitats that support a range of flora and fauna (**Table 7.5**).



Notes

Key

- Buffer (2km)
- Ancient Woodland Inventory (AWI)
- Local Nature Reserve (LNR)
- Site of Importance for Nature Conservation (SINC)
- Important Bird Area (IBA)
- RSPB Reserve

0 250 500 750 1,000 Metres

Reference Drawings

-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D

Sweco
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SWECO

Client: RENFREWSHIRE COUNCIL

Renfrewshire Council

Drawing Status: DRAFT

Suitability: S0

Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure 7.2: Ecology Non Statutory Sites

Scale	Designed	Drawn	Checked	Approved
1:32,500	TB	GAR		
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/09/2016	01/09/2016		

Drawing Number: 117084 - SWEC0 - EAC - 00 - SP - EN - 00003
(Project - Originator - Volume - Location - Type - Role - Number)

Project Ref. No.: 117084 (R06)

Revision: 0A

Table 7.5: Local Nature Reserves

Site ID/Name	OS Grid Reference	Distance from Site	Size (ha)	Site Information
Jenny's Well	NS 497 630	0.91 km (south-east)	8.17	The LNR was designated in 1986 and is notified for its flora (oaks) and fauna (song birds).
Paisley Moss	NS 469 657	0.52 km (west)	4.02	The LNR was designated in 1993 and supports ponds, mossy marshes, reeds and sedge beds. The site is known for its wintering jack snipe (Lymnocryptes minimus), common snipe (Gallinago gallinago) , 22 different types of grass and 11 types of sedge, marsh orchids (Dactylorhiza majalis) and the common blue butterfly (Polyommatus icarus)

7.3.2.3 Protected Species Records

Records for protected and notable species were identified by interrogating online data sources for the 10km Ordnance Survey (OS) Grid (NS46, NS47, NS56, NS57).

Sixty-four protected and/or notable bird species were identified, the desk study identified four species which are afforded protection under Annex 1 of the Birds Directive (barnacle goose (*Branta leucopsis*), kingfisher (*Alcedo atthis*), merlin (*Falco columbarius*) and white-tailed eagle (Haliaeetus albicilla)) and seven species offered protection under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) (barn owl (*Tyto alba*), common crossbill (*Loxia curvirostra*), fieldfare (*Turdus pilaris*), kingfisher, merlin, redwing and white-tailed eagle). Similarly, and with respect to bird species of conservation concern/priority, the desk study identified the following:

- twenty-three bird species listed as an action species within the historical UK BAP[22];
- twenty-six species listed as Red List Species of Conservation Concern[23]; and
- one species (lesser whitethroat) listed as an action species within the LBAP.

Ten protected/notable mammal species were recorded by the desk study. The first species (badger) is afforded specific legal protection under the Protection of Badger Act 1992 (as amended) and Wildlife and Countryside Act 1981 (as amended), while all species of bat, otter and pine marten (*Martes martes*) are fully protected under the Conservation (Natural Habitat &c) Regulations 1994 (as amended). Although red squirrel (*Sciurus vulgaris*) and water vole are not afforded protection at a European level, unlike bats and otters, they are afforded protection under the Wildlife and Countryside Act 1981 (as amended), in addition to brown hare, hedgehog and pine marten.

[22] The UK Government (1992) The UK Biodiversity Action Plan (http://jncc.defra.gov.uk)

[23] Eaton M A, Aebischer N J, Brown A F, Hearn R, Lock L, Musgrove A J, Noble D G, Stroud D and Gregory D (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man. British Birds 108, pp 708-746

Similarly, and with respect to mammal species of conservation concern/priority, the desk study identified the following:

- seven species (hedgehog, brown hare, otter, water vole, pine martin, red squirrel and soprano pipistrelle) listed as an action species within the historical UK BAP; and
- five species (brown hare, common pipistrelle, otter, soprano pipistrelle and water vole) listed as an action species within the LBAP.

One single protected amphibian species (great crested newt) was recorded by the desk study, which receives strict protection under the Conservation (Natural Habitat &c) Regulations 1994 (as amended) and Wildlife and Countryside Act 1981 (as amended). This species is additionally subject to a UK BAP.

7.3.2.4 Invasive non-native Species

Records of the following invasive/non-native species were identified by the desk study:

- Japanese knotweed (*Fallopia japonica*);
- giant hogweed (*Heracleum mantegazzianum*); and
- Himalayan balsam (*Impatiens glandulifera*).

7.4 Potential Effects

The key ecology and nature conservation impacts with respect to the proposed project are likely to include the following:

- **Construction:**
  - direct mortality of fauna during construction;
  - habitat loss (temporary and permanent) through land-take;
  - fragmentation of existing habitats;
  - disturbance and displacement during construction;
  - pollution to water courses from runoff during development phases;
  - point source and diffuse pollution;
  - increased sediment loading;
  - decreased habitat complexity; and
  - changes to discharge regime.
- **Operation:**
  - direct mortality of fauna during operation;
  - behavioural changes of fauna during operation;
  - fragmentation of existing habitats;
  - disturbance and displacement during operation;
  - pollution to water courses from road drainage;
  - point source and diffuse pollution;
  - increased sediment loading;

- decreased habitat complexity; and
- changes to discharge regime.

7.5 Proposed Scope of Assessment

In accordance with the CIEEM EcIA good practice guidance[24], the Ecology and Nature Conservation Chapter of the ES will present the results of consultation and a detailed desk-study, in addition to a description of the habitats and fauna baseline for the proposed project and wider ecological study area (the zone of influence). The findings of the survey work will be analysed and presented (where appropriate) in a technical report providing baseline conditions and summarised as part of the chapter.

Activities during the construction and operational phases and their predicted impact significance on important ecological features, such as protected species, will be identified and characterised at the geographical scale at which they are significant taking into account the following parameters:

- positive or negative;
- magnitude;
- extent;
- duration;
- reversibility; and
- timing and frequency.

Following the determination and assessment of predicted significant ecological effects, professional judgement will be used, coupled with an understanding of important ecological features and legal requirements, to determine the requirements for appropriate mitigation. Mitigation will be proposed (where practicable) at the relevant geographical scale of significance to avoid, reduce or offset identified potential effects.

Residual effects will be assessed using the same methodology for the assessment of predicted ecological effects but taking into consideration committed mitigation. In addition and where applicable, an assessment of predicted cumulative ecological effects will be undertaken as discussed in **Chapter 13**.

7.5.1 Study Area

Field surveys will be undertaken within all suitable areas of the proposed project and a wider study area (outside the proposed project), which varied in width relevant to the important ecological feature.

Further information regarding the width of the pertinent study area is presented below:

- Extended Phase 1 Habitat (the proposed project and adjacent area up to 100m from the outmost edge of development);
- badger survey (the proposed project and adjacent area up to 100m from the outmost edge of development);

[24] CIEEM. (2016). Guidelines for Ecological Impact Assessment in the UK and Ireland. Accessed: July 2016. Available at: http://www.cieem.net/ecia-guidelines-terrestrial-. Accessed: July 2016.

- otter survey (the proposed project and 250 m up and downstream of freshwater habitats);
- water vole survey (the proposed project and 100-200m up and downstream of freshwater habitats); and
- bat survey (the proposed project and adjacent area, between 20-100m from the outmost edge of development).

It should be noted that, where applicable, the relevant study area will be extended to provide a greater level of ecological understanding regarding the ecological effects on an important ecological feature. Further details of survey methodology is contained within **Appendix 7.1.**

7.5.2 Matters to be scoped out of the Ecological Assessment

7.5.2.1 Baseline Surveys

It is considered that there is sufficient evidence to show that there are unlikely to be significant effects on Great Crested Newts, breeding birds and fresh water fish species or habitats, and therefore no further surveys are proposed for these as part of the assessment of ecological effects. This approach has been agreed in consultation with SNH and Marine Scotland. Based on our current understanding of the site and informed by Phase 1 habitat survey work it is also considered that NVC surveys are not required and have therefore been scoped out of the EIA.

7.5.2.2 Habitat Regulations Appraisal (HRA)

Consultation with SNH in April 2016 (Dave Laing – Operations Officer, Pers. Com., 19 April 2016) confirmed an absence of Likely Significant Effects (LSE) between the proposed project and the Black Cart Water SPA and Inner Clyde SPA. Consequently, a Habitats Regulations Appraisal (HRA) will not be required in support of the proposed project for these sites.

An HRA Screening appraisal will be undertaken to assess the potential for LSE of the proposals on the Endrick Water SAC following consultation with Marine Scotland (see Section 7.2).

8. Archaeology and Cultural Heritage

8.1 Introduction

This section sets out the approach to assessing impacts of the proposals on the historic environment, including designated heritage assets (Scheduled Monuments, Listed Buildings, World Heritage Sites, Conservation Areas, Inventory Gardens and Designed Landscapes, Inventory Historic Battlefields) and other undesignated features of cultural significance. Specifically, this section aims to address the topic as follows:

- summarise consultation carried out to date during the options assessment, and identify further consultation which will take place as part of the EIA;
- provide a high-level summary of baseline conditions relating to the historic environment;
- identify potential effects based on the high-level baseline study previously undertaken;
- set out the scope of the desk-based assessment which will be undertaken to provide detailed cultural heritage baseline data and identify all potential effects arising from the proposed development;
- describe proposed mitigation measures; and
- describe the methodology which will be applied in assessing any residual effects.

8.2 Consultation

Historic Environment Scotland (HES) and West of Scotland Archaeology Service (WoSAS) were consulted for initial comments on the proposals (see **Table 8.1**).

Table 8.1 Consultation to Date

Consultee	Response/Action	Data Provided	Action Taken
Historic Environment Scotland	**Letters dated 29 January and 15 April 2016** noted presence of a number of Category A Listed Buildings and a Scheduled Monument within the study area. **Site meeting, 26 May 2016**: confirmed the importance of the Category A listed bridges over the White Cart Water and Black Cart Water and the potential for sensitive archaeology between the A8 Greenock Road and the Scheduled Monument at All Hallows Church, Inchinnan.	No	No action required
West of Scotland Archaeology Service	**Meeting in April 2016**: identified a number of areas of archaeological interest within the study area, where early investigation may be worthwhile; and suggested a number of historic locations/themes that could be enhanced by providing information to visitors, with the involvement of Renfrewshire Local History Forum. **Letter dated 24 May 2016**: identified a number of heritage assets in the vicinity of the route options where potential impacts may require mitigation through archaeological investigation and recording. **Site meeting, 26 May 2016**: confirmed the importance of the Category A listed bridges over the White Cart Water and Black Cart Water and the potential for sensitive archaeology between the A8 Greenock Road and the Scheduled Monument at All Hallows Church, Inchinnan.	No	No action required

The following organisations will be consulted during the preparation of the Environmental Statement:

- Historic Environment Scotland (HES), regarding Scheduled Monuments and Category A Listed Buildings;
- West of Scotland Archaeology Service (WoSAS), regarding archaeological remains, whether designated or not;
- Renfrewshire Council Buildings Conservation, regarding Listed Buildings and Conservation Areas; and
- Renfrewshire Local History Forum, regarding any aspect of cultural heritage, and particularly where there may be opportunities to enhance community involvement.

Consultees will be invited to comment on potential impacts identified through a desk-based assessment, and on mitigation proposals.

8.3 Baseline Description

8.3.1 Baseline data sources

A high-level baseline study has been carried out for the proposed development, the findings of which are described in this section. This study aims to support the identification of any potentially significant effects on cultural heritage assets under the three sub-topics identified in DMRB guidance (archaeological remains, historic buildings and historic landscapes), based on a review of the following data sources:

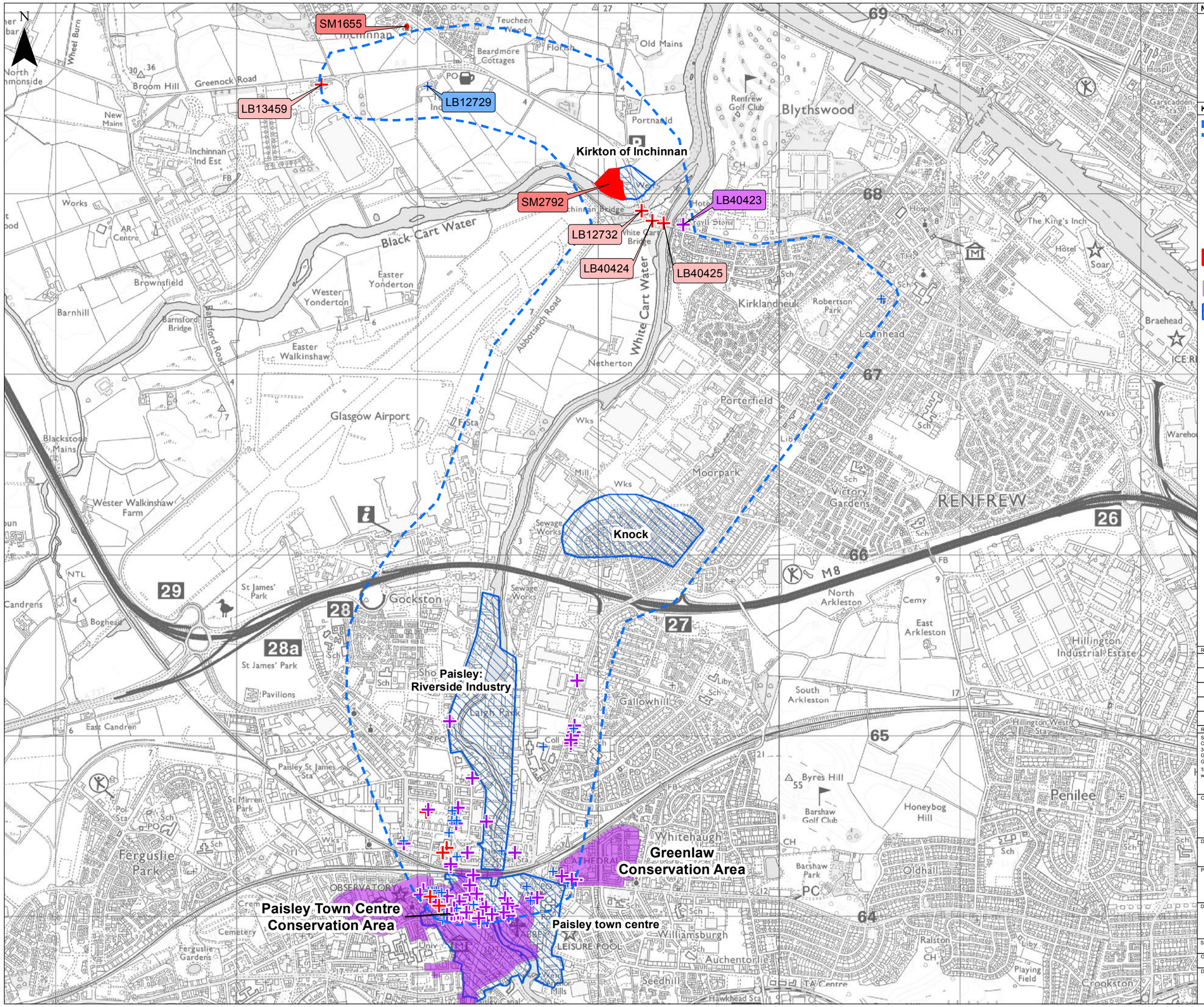
- heritage designations (Scheduled Monuments, Listed Buildings, Conservation Areas, Inventory Gardens and Designed Landscapes and Inventory Historic Battlefields);
- archaeological records in the West of Scotland Archaeology Service Historic Environment Record (WoSAS HER); and
- archaeological records in the National Monuments Record of Scotland (NMRS).

Figures 8.1 and **8.2** show the heritage designations and archaeologically sensitive areas identified within the study area defined for the proposed development. The archaeologically sensitive areas are defined through professional judgment as areas where it is considered that there is potential for significant impacts on archaeological remains.

8.3.2 Archaeological Remains

8.3.2.1 Designated heritage assets

There is one Scheduled Monument located within the study area defined for the proposed development: Inchinnan, site of All Hallows Church (SM2792). This is the location of an early Christian monastic site and of at least three successive churches built between the medieval period and the late 19th century. The late 19th century All Hallows Church was demolished in 1965 to accommodate the expansion of Glasgow Airport. Only parts of the church's foundations are visible above ground level, and its cultural significance relates mainly to the archaeological research potential of site, including remains of the medieval church, monastic structures and burials.



Notes

Key

- GAIA core study area
- Category A listed building (LBXX) (Historic Environment Scotland data 2016)
- Category B listed building (LBXX) (Historic Environment Scotland data 2016)
- Category C listed building (LBXX) (Historic Environment Scotland data 2016)
- Scheduled monument (SMXX) (Historic Environment Scotland data 2016)
- Conservation area (Historic Environment Scotland data 2016)
- Archaeological sensitivity

Reference Drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D

Sweco
City Park Suite 3/5
368 Alexandra Parade
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Tel: +44 (0)141 414 1700
web: www.sweco.co.uk

SWECO

Client: RENFREWSHIRE COUNCIL

Drawing Status: DRAFT

Suitability: S0

Project Title: GLASGOW AIRPORT INVESTMENT AREA

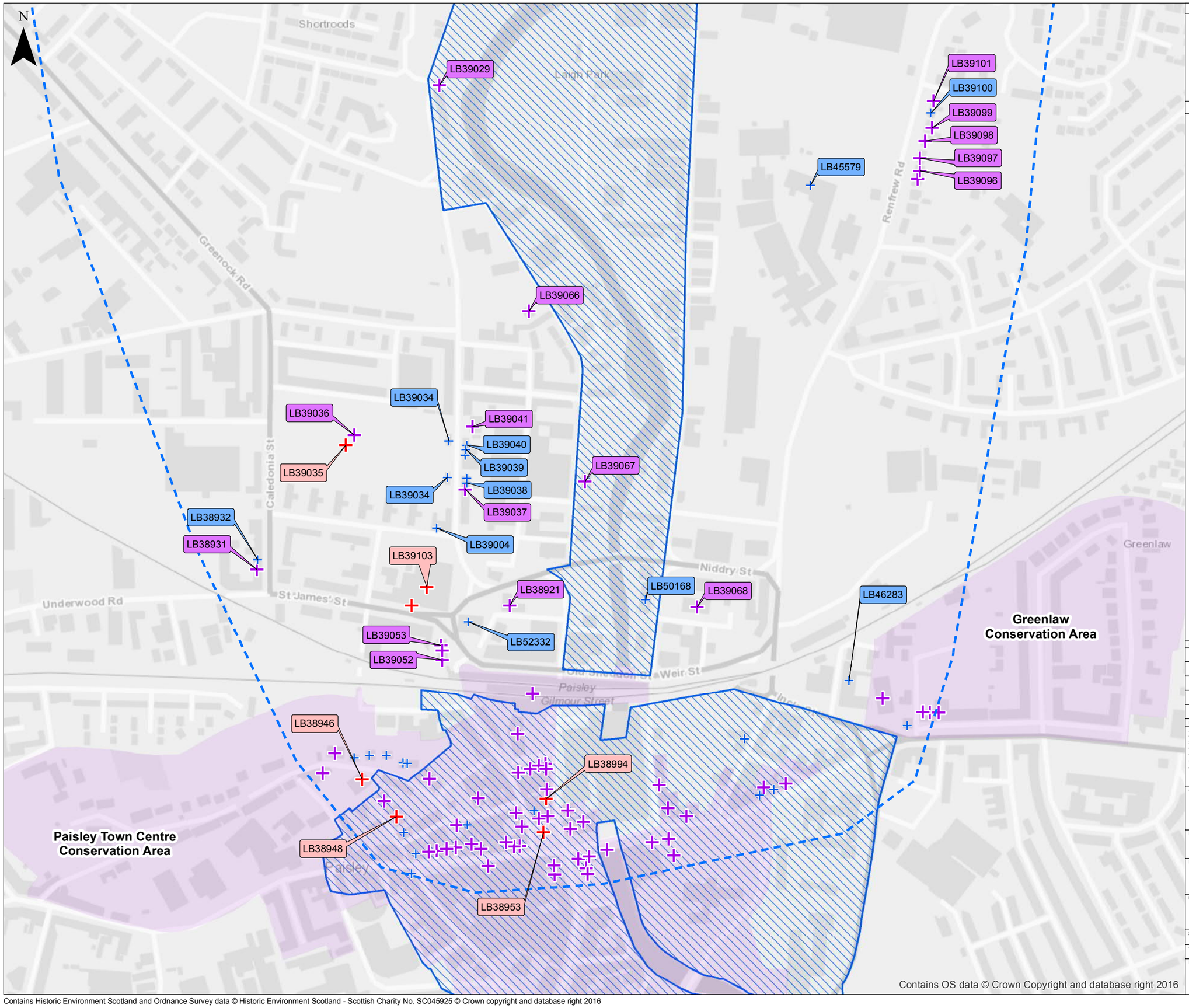
Drawing Title: Figure 8.1: Heritage Designations and Areas of Archaeological Sensitivity

Scale	Designed	Drawn	Checked	Approved
1:20,000	PM	LG		
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/09/2016	01/09/2016		

Drawing Number: 117084 - SWEC0 - EAC - 00 - SP - EN - 00003 (Project Originator Volume Location Type Role Number)

Project Ref. No.: 117084 (R06)

Revision: 0A



Notes

Key

- GAIA core study area
- Category A listed building (LBXX) (Historic Environment Scotland data 2016)
- Category B listed building (LBXX) (Historic Environment Scotland data 2016)
- Category C listed building (LBXX) (Historic Environment Scotland data 2016)
- Conservation area (Historic Environment Scotland data 2016)
- Archaeological sensitivity

Reference Drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D

Sweco
City Park Suite 3/5
368 Alexandra Parade
Glasgow
G31 3AU
Tel: +44 (0)141 414 1700
web: www.sweco.co.uk

SWECO

Client: RENFREWSHIRE COUNCIL

Drawing Status: FINAL

Suitability: S0

Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure 8.2: Heritage Designations and Areas of Archaeology Sensitivity within Paisley Town Centre

Scale	Designed	Drawn	Checked	Approved
1:5,000	PM	LG		
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/09/2016	01/09/2016		

Drawing Number: 117084 - SWEC0 - EAC - 00 - SP - EN - 00003 (Project – Originator – Volume – Location – Type – Role – Number)

Project Ref. No.: 117084 (R06)

Revision: 0A

Three sculptured stones, originally from All Hallows Church, were removed when it was demolished and are now in an enclosure adjacent to the modern parish church, where they are designated as a Scheduled Monument (SM1655).

8.3.2.2 Undesignated heritage assets

Paisley town centre: An area of archaeological sensitivity corresponds to the area mapped in WoSAS HER for Paisley (WoSASPIN 7730), and includes the pre-industrial town which developed from a medieval core around the east end of the High Street and the north end of Causeyside, as well as the abbey to the east of the river.

Paisley - riverside industry and harbour: The riverside north of Old Sneddon Street / Weir Street has a particularly high concentration of industrial sites recorded in the WoSAS HER, including quays, ironworks and textile mills. Paisley was a notable industrial centre in the 18th-19th century, and significant industrial archaeology dating from this period may exist in this area. Structures relating to the harbour may also have archaeological interest.

Knock: A number of antiquities are recorded on the 1st edition OS map in the vicinity of Knock, a farmstead situated on Knock Hill which may have replaced an earlier manor house (WoSASPIN 42630). Cinerary urns were found near the summit of Knock Hill in the late 18th century (WoSASPIN 7651) and further east are the sites of a possible motte 'Kemp Knowe' (WoSASPIN 7621) and a high cross known as 'Queen Blearie's Stone' (WoSASPIN 7620). No visible features relating to these heritage assets are likely to survive, and much of the area is now covered by housing developments; nevertheless the presence of these features suggests an area of importance in prehistoric and medieval times.

Kirkton of Inchinnan (WoSASPIN 62749): A small settlement is shown beside All Hallows' Church on Roy's Military Survey (1747-52). The area indicated on the constraints map corresponds to the record for this site in the WoSAS HER. There is potential for medieval or post-medieval settlement remains within this area, associated with the Scheduled monastery and church.

8.3.3 Historic Buildings

The study area for the proposed development includes parts of Paisley Town Centre and Greenlaw Conservation Areas. A Character Appraisal has been published for the Paisley Town Centre Conservation Area, though not for Greenlaw. Paisley's origins are linked to the medieval Abbey established on the east bank of the White Cart Water, at an important crossing point. A town developed on the west bank, which in the medieval period was small and subordinate to Renfrew, but expanded rapidly in the 19th century as a manufacturing centre. Its expansion was not formally planned, giving the town an irregular street plan and a varied appearance.

The Character Appraisal document identifies a number of distinctive areas within the Conservation Area. The riverside area around the Abbey and Town Hall is dominated by these two monumental buildings and contains much green space which contrasts with the adjacent city centre. The High Street, with Paisley Cross and County Square at the east end, was the principal street of the medieval town and retains its central function today. Oakshaw Street, occupying an east/west ridge above the High Street, has a quieter residential character with a number of landmark buildings which form a varied skyline particularly looking north over the town from viewpoints such as Saucel Hill. Moss Street, running north from County Square, is a street with late medieval origins which, unlike others, was not widened in the 19th century.

New Street and George Street, to the south of the High Street, retain much of their original Georgian character, while Causeyside Street, a principal approach to the town from the south, has an urban character created by four-storey tenements with eye-catching corner features.

Paisley town centre contains numerous Listed Buildings; within the Conservation Area, only Category A Listed Buildings within the study area are shown in Figure 8.2. These include the High Church on Oakshaw Street (LB38946), Middle Church on Church Hill, Clydesdale Bank at 7 Gilmour Street (LB38994), and The Cross war memorial (LB38953). Other Listed Buildings include churches and church halls, schools, commercial premises and shops, statues, the railway station and private houses.

Greenlaw Conservation Area includes an area which developed as a residential suburb of Paisley during the 19th century, including a Category B Listed Georgian terrace on Garthland Place.

Other Listed Buildings within the 19th century town, to the north of the Conservation Area, include the Category A Listed fountain in Fountain Gardens (LB39035) and the Classical-style Sheriff Court (LB39103). North of the town centre, on Renfrew Road (A741) are a row of 18th and 19th century houses which originally formed a separate settlement called Gateside.

There are three Category A Listed bridges on Inchinnan Road (A8) where it crosses the White Cart Water and the Black Cart Water west of Renfrew. Inchinnan Bridge (HB 12732) and White Cart Bridge (HB 40424) are stone bridges with multiple arches, both of which were built in 1812 in a similar style. The Rolling Lift Bridge over the White Cart Water (HB 40425), built in 1924, is the only lifting bridge of this type in Scotland and therefore represents an important element of industrial/engineering heritage. The setting of all three bridges is experienced principally in terms of short-range views along and across the rivers and the approaches along the road.

Close to the White Cart Water on the north side of Inchinnan Road, the 'Argyll Stone' and 'St Conval's Chariot' (HB 40423) are respectively the base of a medieval cross, and a granite boulder (on which St Conval was said to have floated across the Irish Sea). They are enclosed by ornate cast iron railings, within wooded gardens in the grounds of the Normandy Hotel. The setting of this Listed Building is limited to these gardens.

India Tyre Factory, Greenock Road, Inchinnan (HB 13459) is a Category A Listed Art Deco style office for a former tyre factory, located on the south side of the A8. Town of Inchinnan Farm (HB 12729) is a plain farmhouse built ca 1800, currently a working farm surrounded by farmland.

8.3.4 Historic Landscapes

The Scotland Historic Land Use Map (HLAMap[25]) identifies one area of historic landscape within the study area, corresponding to the medieval town of Paisley, and with the same extent as the area of archaeological sensitivity described above and shown on **Figure 8.2.**

[25] http://hlamap.org.uk

8.4 Potential Effects

8.4.1 Construction

Typical construction impacts which could occur as a result of the proposed development include:

- Removal of or disturbance to archaeological deposits, due to topsoil removal and excavation associated with site activities including road construction, site investigation, site clearance, landscaping, installation of structures and services.
- Damage to fabric of historic buildings due to demolition works, vibration from piling or other construction works.
- Change to historic landscape integrity from removal of trees and landscape features.

There is potential for an impact on the Category A Listed Inchinnan Bridge (LB12732) where there are proposals to realign the parapets at the south end of the bridge in order to improve traffic flow at the junction with the realigned Abbotsinch Road.

There is potential for an impact on the Kirkton of Inchinnan (WoSASPIN 62749), due to the proposed construction of a cycle path and new bridge to the west of Inchinnan Bridge.

There is potential for archaeological remains associated within the 'Paisley – Riverside industry and harbour' archaeologically sensitive area to be disturbed by the proposed development. However, in all cases the structures have been completely demolished and any subsurface remains which survive would be of low or negligible importance. Any residual effects following implementation of mitigation measures (i.e. excavation and recording) will be of negligible significance.

Currently unknown archaeological remains may be affected by construction impacts. All such impacts will be mitigated through archaeological investigation and recording, resulting in a negligible or at most minor negative residual impact.

8.4.2 Operation

Typical operational impacts which could occur as a result of the proposed development include:

- Impacts on the settings of archaeological sites and monuments, historic buildings or areas of historic landscape, resulting from visual or noise intrusion associated with roads/paths, fences, structures, lighting, landscaping or other elements.
- Traffic movement leading to vibration and compaction, causing damage to archaeological deposits and historic buildings.
- Changes to access, e.g. severance, leading to neglect, dereliction or other change in land-use with secondary effects on archaeological sites and monuments, historic buildings or historic landscapes.

There is potential for operational impacts on the site of All Hallows Church (Scheduled Monument 2792), and Inchinnan Bridge (Category A Listed Building no. 12732), resulting from the proposed cycleway bridge which may affect the settings of these heritage assets.

No other potentially significant operational impacts have been identified.

8.5 Proposed Scope of Assessment

8.5.1 Desk-based Assessment

A desk-based assessment will be carried out to inform assessment of the proposed development and cumulative and secondary effects identified in the emerging masterplan. The inner study area will include all areas where construction activities could have a physical impact on archaeological remains or historic buildings. The outer study area will extend up to 1km from the proposals, to allow for the identification of any potential impacts on the settings of heritage assets.

All readily available and relevant documentary sources for the inner study area will be examined, following the Chartered Institute for Archaeologists' (CIfA) Standard and Guidance for archaeological desk-based assessment. This will include:

- spatial data and descriptions of designated assets from Historic Environment Scotland;
- the National Record of the Historic Environment (NRHE), including the Canmore database and associated photographs, prints/drawings and manuscripts held by HES;
- Historic Landscape Assessment data, viewed through the HLAMap website;
- the West of Scotland Archaeology Service Historic Environment Record (WoSAS HER);
- the National Collection of Aerial Photography (NCAP);
- lidar data supplied by the Scottish Government;
- geological data available online from the British Geological Survey;
- historic maps held by National Library of Scotland;
- historic maps and plans held by the National Records of Scotland; and
- other readily available published sources and unpublished archaeological reports.

A walkover survey will be carried out to assess the condition of heritage assets identified from the desk-based study, identify any previously unrecorded assets, and gather information about current site conditions (e.g. land use and topography) relevant to the assessment.

The results of the desk-based assessment will be presented in a report which will serve as a basis for consultation and will be included as an appendix to the ES.

8.5.2 Impacts to be assessed

The cultural heritage chapter of the ES will include a summary of the results of the desk-based assessment, and will identify all potential impacts from the proposals. Any impact which may result in an effect of minor or greater significance on a heritage asset will be assessed in full; impacts which will clearly lead to no effect, or a negligible effect on heritage assets will be scoped out. The advice of consultees will be sought on which impacts should be assessed in full, or scoped out, based on the results of the desk-based assessment.

On the basis of the high-level baseline study carried out to date, potentially significant impacts on the following heritage assets have been identified, which will be assessed in the Environmental Statement:

- Kirkton of Inchinnan (WoSASPIN 62749)
- Site of All Hallows Church (Scheduled Monument 2792)
- Inchinnan Bridge (Category A Listed Building no. 12732)

8.5.3 Mitigation

Mitigation may comprise the following measures, where appropriate:

- Design to avoid or minimise the extent of physical disturbance to archaeological sites and monuments, historic buildings and historic landscape, allowing preservation in situ.
- Design modifications to avoid or reduce impacts on setting, through reducing or screening visual intrusion or enhancing the surroundings in which a historic site or monument, historic building or landscape is experienced.
- Measures to offset adverse effects and deliver added value to the project by enhancing understanding and appreciation of the historic environment, for instance through archaeological investigation, recording, analysis, interpretation and publication; or improving access and presentation of heritage assets to the public.

8.5.4 Impact Assessment Methodology

Residual effects on heritage assets will be assessed in line with relevant legislation, policy and guidance relating to cultural heritage, including:

- The Ancient Monuments and Archaeological Areas Act 1979;
- The Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997;
- Scottish Planning Policy (paragraphs 135-151);
- Historic Environment Scotland Policy Statement 2016;
- Planning Advice Note 2/2011: Planning and Archaeology;
- Design Manual for Roads and Bridges: Volume 11, Section 3 Part 2 (HA 208/07 Cultural Heritage, August 2007);
- Guidance published by Historic Environment Scotland in the series 'Managing Change in the Historic Environment', including 'Setting' and 'Engineering Structures';
- The 'Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment' (2014) and the 'Standard and guidance for historic environment desk-based assessment' (2014), both published by the Chartered Institute for Archaeologists (CIfA); and
- WoSAS Procedural Guidance for Archaeology and Development (West of Scotland Archaeology Service 2009).

Impact assessment will follow a step-by-step approach as set out below. The standard assessment criteria applied by Headland Archaeology are included in **Appendix 8.1**.

1. Characterisation of the heritage asset in terms of its type, date, extent, principal features and condition.

2. An objective description of the asset's setting (if a potential setting impact is identified), including topography, land use, key views and other attributes, e.g. paths of approach, sound, sense of place etc.

3. Assessment of the asset's cultural significance, with reference to Historic Environment Scotland Policy Statement Annexes 1-6. HES guidance 'Managing Change in the Historic Environment: Setting (Assessment Stage 2)' is referred to in determining how, and to what extent setting contributes to the asset's significance.

4. Objective description of the impact of the development on the heritage asset. Where appropriate, effects on setting will be informed by visualisations to show the extent of visibility. Historic Environment Scotland and WoSAS will be consulted to ensure the visualisations provided meet their requirements. Site visits will be undertaken where necessary to confirm the findings of the assessment.

5. Assessment of the magnitude of effect(s), with reference to 'MCHE: Setting' (Assessment Stage 3) where a potential setting impact is identified. Magnitude is defined as the extent to which the heritage asset's cultural significance (as defined in Step 3) is adversely or beneficially affected by the changes identified in Step 4.

6. Assessment of the significance of effect in EIA terms: this is broadly based on a matrix combining the magnitude of the effect with the importance of the asset, but also involves professional judgement, particularly where the matrix gives two possible results for a particular combination of magnitude and importance.

9. Traffic and transport

9.1 Introduction

This section presents an overview of baseline traffic and transport conditions in the area of the proposed development including for road traffic and for non-motorised users (NMUs). The traffic modelling work which is being undertaken for the project is explained and initial findings of traffic appraisal work are presented to set out a context for the anticipated effects of the proposed development on future traffic flows and for NMU users.

9.2 Consultation

Consultation has been undertaken with a number of key traffic and transport stakeholders. As part of the development of the traffic model, technical meetings were held with Transport Scotland and Renfrewshire Council. Details of the traffic modelling work are not presented in this Scoping Report but can be found in the project's transport modelling reports[26].

It was recognised at an early stage of the GAIA project that the input of NMU groups would help to achieve an important project objective of providing better quality, integrated walking and cycling routes to key employment, healthcare, and leisure locations. A number of relevant NMU organisations were consulted and an NMU workshop was held with key representatives in April 2016. The key feedback from a number of these groups is presented in **Chapter 3: Land Use and Communities** (see **Table 3.1**).

The NMU workshop allowed attendees to consider the emerging design proposals and gave them the opportunity to highlight issues and provide their views on design for pedestrians and cyclists. Feedback from the workshop is being used to input to the emerging design of cycleways and pedestrian facilities.

9.3 Baseline Description

This section describes the baseline traffic and transport environment within the proposed development area and the existing transport infrastructure.

9.3.1 NMUs

The existing provision for NMUs varies considerably throughout the GAIA study area. These largely consist of a network of cycle routes and footways, including various forms of pedestrian and/or cycle crossings within the local road network. The provision of existing NMU user facilities in and around Paisley are shown on **Figure 3.1**. A number of aspirational routes have also been outlined by Renfrewshire Council.

The existing Core Path and cycling network is currently largely leisure based in format, due to the variable quality of the infrastructure in place. In general, the on-road cycle facilities identified within the study area do not include provision of dedicated cycle lanes and segregation from motorised traffic or advance stop lines at junctions, both major and minor. There is also a lack of crossing opportunities for White Cart Water.

[26] SIAS (June 2016) Renfrewshire City Deal, Part B Option Testing Report

9.3.2 Model Development

In order to establish the existing traffic conditions in the GAIA area, a variety of surveys were commissioned and undertaken on the 26th and 27th August 2015.

Initial analysis of link flows has indicated that, when compared to the theoretical capacities set out in Tables 5.3.1 and 5.3.2 in the NESA Manual (DMRB Volume 15, Section 1, Part 5):

- Abbotsinch Road, Inchinnan Road, Paisley Road and Renfrew Road are currently operating within capacity;
- The M8 between Junctions 27 and 28 is operating close to capacity; and
- The gyratory system in Paisley Town Centre is currently operating above capacity.

Traffic flow levels in the GAIA area vary throughout the hours of the day. An operational model created in S-Paramics was developed covering the areas of Renfrew, Paisley and Yoker. The study area can be seen in **Figure 9.1.**

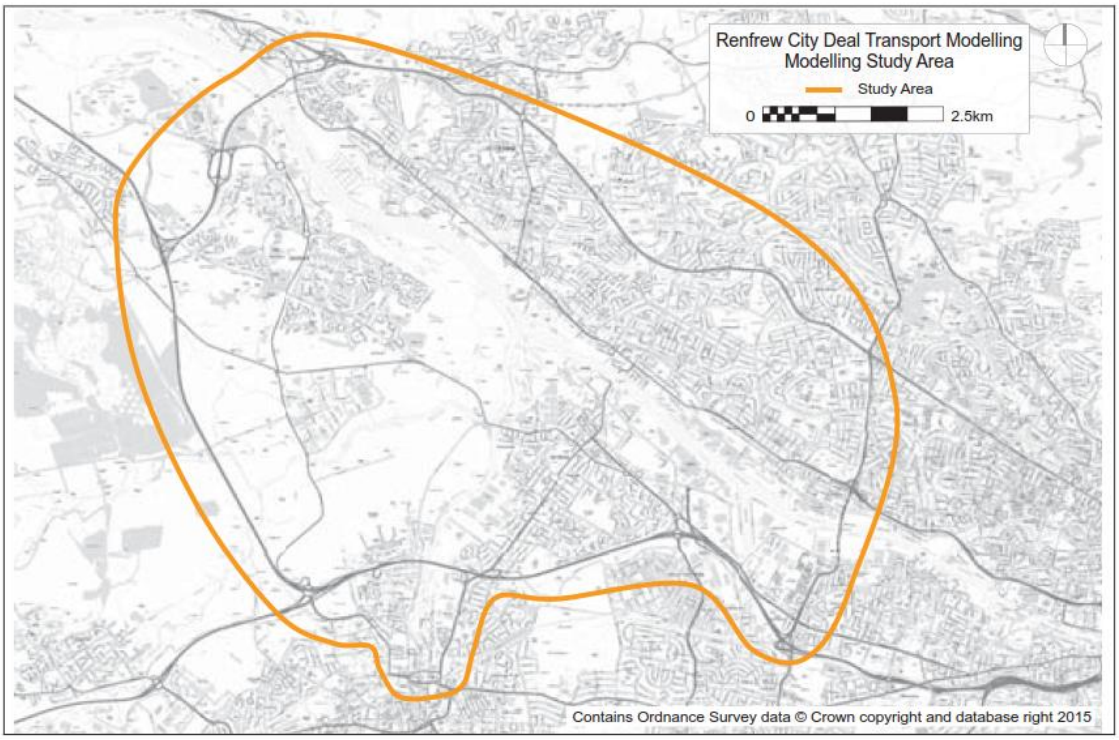


Figure 9.1: Traffic Model Study Area

The traffic model has been used to generate traffic flow information for a 'base year' (2015) and for future traffic levels predicted (in 2037) to take account of the anticipated growth in traffic. This future year scenario is based on anticipated development between now and 2037 in line with the Local Development Plans (LDPs) of the three local authorities in the model area[27]. The option tests include:

[27] The LDP model scenario includes a crossing of the White Cart Water at Wright Street as this is an assumed development within the LDP

- 2015 base scenario;
- 2037 LDP scenario (including developments and infrastructure from the local plans; Re-alignment of Abbotsinch Road, Wright Street link and Renfrew Road link); and
- 2037 option test including the proposed Gateway Crossing (and removal of the Renfrew Road link).

9.4 Potential Effects

9.4.1 Construction

During the construction process it is expected that traffic on the local road network will increase as a result of the presence of construction vehicles, in addition to the associated growth forecasts which accompany future traffic flows. With regard to the construction traffic, all traffic will be expected to follow pre-designated routes upon entering and exiting the site during specified operating hours. This will ensure that any disruption to local residents, businesses, and the local road network in general is kept to a minimum.

A construction management plan will be developed with facilities such as wheel-washing points located at site accesses, temporary pedestrian routes and temporary hoardings are, among other things, to be in place to help minimise the adverse effects of the construction process and to maximise safety.

9.4.2 Operation

9.4.2.1 NMU

Although the proposed alignments of walking and cycling routes for the GAIA project are to have little impact on the route taken by commuters due to the similarity in alignment to the existing roads, the cycling infrastructure in place will be of a much higher quality, with all routes designed, where possible and appropriate, to incorporate 3m wide shared use foot/cycle ways adjacent to the carriageways. These are aimed at all users, including commuters. The routes proposed as part of the GAIA project mean that journeys to destinations including the Westway Business Park, Glasgow Airport, and Inchinnan Business Park via active travel modes will be significantly improved.

9.4.2.2 Traffic flows

The traffic flows for the base (2015), LDP (2037) and option test (2037) for GAIA can be seen in **Figure 9.2** and **Table 9.1** displaying the respective locations of each of the test points.

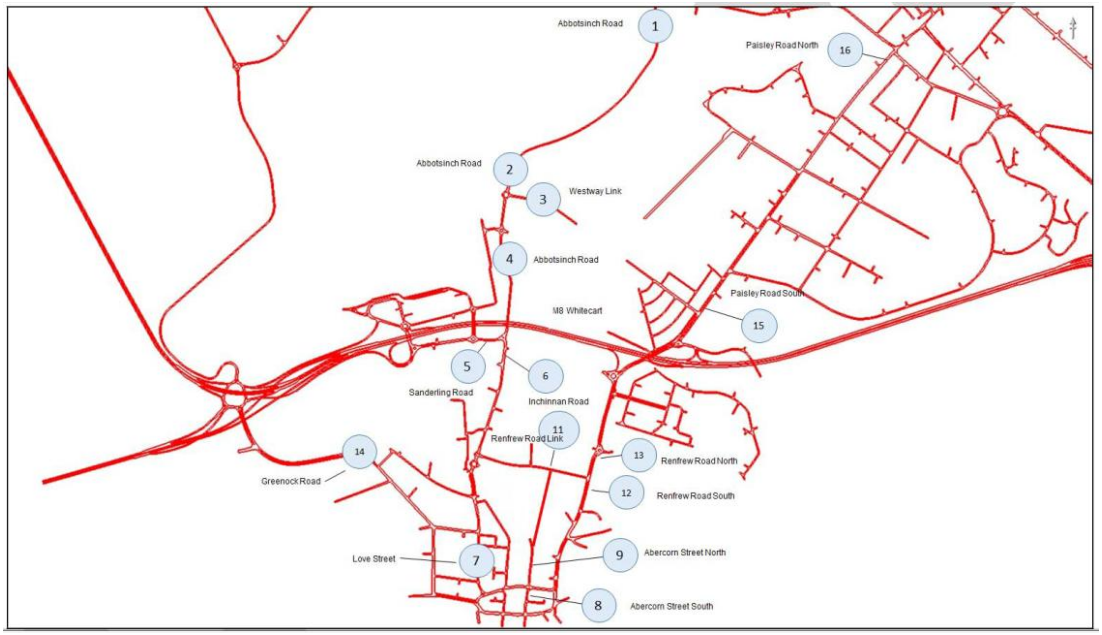


Figure 9.2: GAIA Traffic Model Focus Area

Table 9.1: AM Peak period GAIA two-way traffic flows on key links

Point	Road	Direction	2015 Base	2037 (LDP)	2037 Gateway Crossing
1	Abbotsinch Road (1)	Northbound	800	1,000	1,400
		Southbound	1,250	1,600	1,800
2	Abbotsinch Road (2)	Northbound	800	1,000	1,400
		Southbound	1,250	1,600	1,800
3	Wright Street Link	Eastbound	-	350	350
		Westbound	-	125	125
4	Abbotsinch Road (3)	Northbound	500	700	1,000
		Southbound	1,200	1,450	1,650
5	Sanderling Road	Eastbound	775	875	875
		Westbound	1,550	1,650	1,850
6	Inchinnan Road S	Northbound	1,500	1,700	2,150
		Southbound	1,400	1,650	1,800
7	Love St	Northbound	900	1,200	375
		Southbound	1,150	1,150	775
8	Abercorn St (South)	Northbound	2,250	2,450	2,950
9	Abercorn St (South)	Northbound	125	150	1,200
		Southbound	50	50	925
10	Gateway Crossing	Northbound	-	-	1,100
		Southbound	-	-	900
11	Renfrew Road Link	Eastbound	-	850	-
		Westbound	-	350	-
12	Renfrew Rd S	Northbound	3,300	3,300	3,150
		Southbound	2,650	3,100	2,750
13	Renfrew Rd N	Northbound	3,300	3,750	3,150
		Southbound	2,650	3,050	2,750
14	Greenock Road	Northbound	1,650	2,300	1,950
		Southbound	1,850	2,250	2,200
15	Paisley Rd S	Northbound	1,800	1,800	1,950
		Southbound	1,850	1,850	1,950

Point	Road	Direction	2015 Base	2037 (LDP)	2037 Gateway Crossing
16	Paisley Rd N	Northbound	525	550	575
		Southbound	675	700	725
17	M8 Whitecart	Eastbound	11,800	12,550	12,750
		Westbound	12,350	14,900	14,550

The main traffic findings in terms of predicted changes in future traffic flows between the Base model, LDP scenario and option test are:

- the introduction of the LDP traffic up to 2037 is predicted to result in increases in queued traffic during the AM and PM peak periods as a result of new developments;
- with the introduction of the Gateway Crossing, flows increase both northbound and southbound on Abbotsinch Road and on Inchinnan Road. This is because the Gateway Crossing provides an alternative less congested route to the airport and to the new CWRR river crossing areas;
- the Gateway Crossing records a significant reduction in flow on Love Street in both a northbound and southbound direction. This is due to the downgrading of Love Street under the Gateway Crossing option;
- there are a large number of new trips using the new Gateway Crossing in both directions;
- flows on Abercorn Street south have increased as a result of the introduction of the Gateway Crossing; and
- flows on Renfrew Road northbound and southbound are lower under the Gateway Crossing option. This is linked to the increase in flows using the Inchinnan Road/Abbotsinch Road corridor.

The realignment of Abbotsinch Road at Netherton Farm has no impact on traffic volumes, while the Wright Street Corridor accommodates only development traffic from Westway and adjacent development plots[28]. There are predicted to be congestion issues at the Rolling Lift Bridge junction just to the north, which is significantly congested under the LDP scenario particularly in the PM peak, which will remain with the proposed development in place. As such it not only acts as a constraint to traffic movements, it also acts to push traffic away from the area to other alternative routes. Further mitigation therefore will need to be developed (during Specimen Design stages) for the Rolling lift bridge junction.

9.4.2.3 Journey Times

The introduction of the Gateway Crossing helps to manage the queues on the network more efficiently compared to the LDP scenario, thus is predicted to provide a minor positive impact on journey time reliability and traffic speeds in the GAIA area.

[28] In the traffic model, the LDP scenario assumes that the Wright Street bridge crossing is in place. This link is not proposed to carry general traffic but only commercial vehicles associated with the industrial site.

The multi-modal accessibility tool TRACC was used to assess any potential differences in motorised and non-motorised journey time savings for the Gateway Crossing. However, due to the similarity in the alignments, any journey time savings differences for motorised and non-motorised users were not significant. The new NMU route will be of a higher standard to cater for leisure and commuter trips, thus a minor positive impact for accessibility. Vehicle journey time savings relating to the introduction of the Wright Street Link have also been assessed and these are reported in Table 9.2.

Table 9.2: Vehicle Journey Time Savings from Wright Street

From Westway to:	Existing Journey Time (Google)	Wright Street Alignment (TRACC)	Journey time savings (mins)
West College Scotland, Paisley	8 minutes	2 – 4 minutes	-4
UWoS Paisley	12 minutes	4 - 6 minutes	-6
Glasgow Airport	7 minutes	2 – 4 minutes	-3
Inchinnan Business Park	11 minutes	6 – 8 minutes	-3
Junction 28	5 minutes	2 – 4 minutes	-1
Total			**-17**

There is a minor positive impact for the journey times, speeds and accessibility of traffic entering and exiting the Wright Street Link. There is no change due to the realignment of Abbotsinch Road at Netherton Farm.

A queue length accumulative review was undertaken in the GAIA area during the AM peak and Figure 9.3 shows the comparison between the base, LDP and Gateway option.

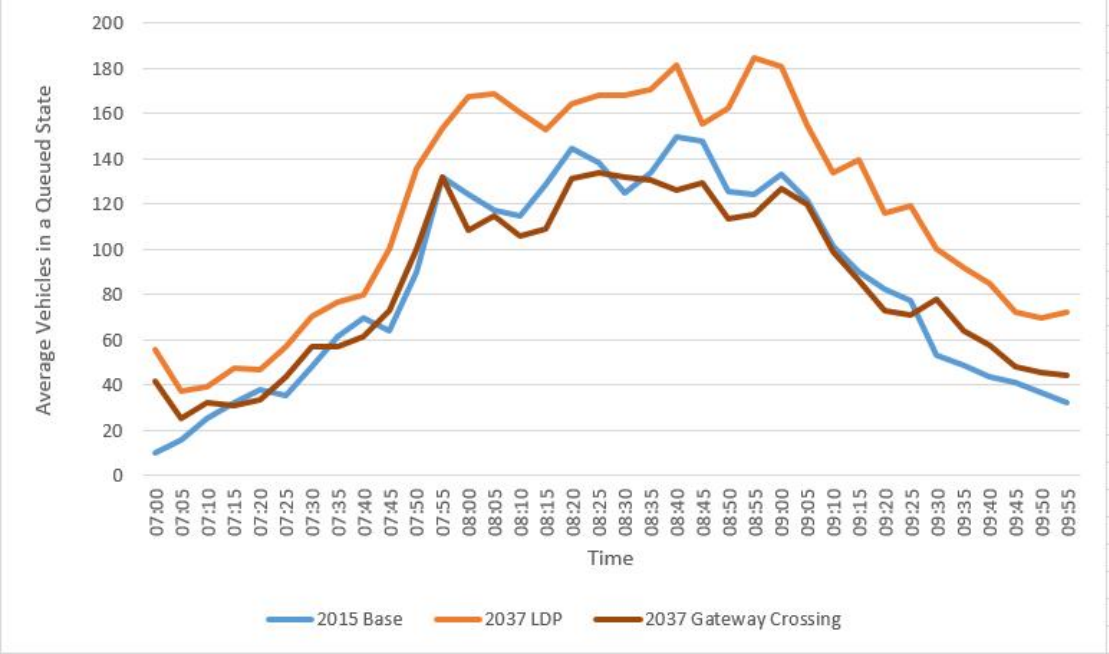


Figure 9.3: GAIA Average Vehicles in Queued State

Table 9.3 summarises the assessment results for the preferred alignments of the GAIA project when comparing from 2037 LDP to 2037 preferred option test across three key assessment criteria.

Table 9.3: GAIA Key Traffic Assessment

Criteria	Abbotsinch Road Re-Alignment	Wright Street Crossing	Gateway Crossing
Traffic Flows	0	0	✓
Journey Times and Speeds to key destinations	0	✓	✓
Accessibility (TRACC)	0	✓	✓

As Table 9.3 shows the proposals for the Netherton Farm, Wright Street Crossing and the Gateway Crossing show that the alignments are generally predicted to provide transport benefits as a result of their implementation.

9.5 Proposed Scope of Assessment

For Traffic and Transport, three main criteria will be used to inform the transport assessment process. These are:

- Traffic Flows
- Journey times and speeds to key destinations
- Accessibility (TRACC)

The detailed information and analysis prepared for the traffic and transport economic assessments will be summarised and used to present an overview of the predicted effects of the proposed development's construction and operation in a traffic chapter for the ES. Traffic modelling will also be undertaken for the GAIA project in combination with the infrastructure measures proposed for the adjacent CWRR City Deal project. The outputs from this modelling will be presented in the cumulative effects assessment volume of the ES (see **Section 13.4**) and will be used to inform noise and air quality modelling of these changes.

10. Noise and Vibration

10.1 Introduction

This section describes the scope and approach of the noise and vibration impact assessment. Drawing on the results of work that has already been undertaken for the options assessment stages of the proposed development, initial consideration is given to potentially significant effects that could arise during the construction and operational phases.

The noise and vibration impact assessment methodology will be based on guidance contained in the *Design Manual for Roads and Bridges, Volume 11:Environmental Assessment, Section 3: Environmental Assessment Techniques,* in particular *Part 7: HD 213/11- Revision 1 Noise and Vibration* (HD 213/11).

Assessment of the construction phase impacts would be focussed in the region of the proposed new routes and any improvements to the existing network. Operational phase impacts could also arise in these areas, but also across the wider area due to associated traffic redistribution.

The potential for impacts over a wider area during the operational phase is recognised in the determination of the Study Area as defined within HD 213/11. The Study Area is derived based on distance buffers around the proposed new routes but also those routes which are being '*bypassed or improved*'. In the case of this development, the alternative routes to the two proposed crossings of White Cart Water are:

- White Cart Bridge, which is 1.5km to the north of the proposed crossing linking to Wright Street,
- the White Cart Viaduct (M8) which is 700m south of the proposed crossing to Wright Street, but use of which would be a notable alternative detour including use of Abbotsinch Road, Sanderling Road, the M8, Arkleston Road, the A741 Paisley Road and Wright Street
- The A726 Niddry Street, which is 660m south of the proposed crossing linking to Harbour Road.

Those routes which might therefore be considered to be 'bypassed' would include not only these existing White Cart Crossings, but also the direct routes between these crossings and the proposed new routes. This will clearly result in a large Study Area.

The work undertaken to date has recognised that road traffic noise impacts could arise across such a large Study Area, but has focussed on a comparison of the impacts which could arise across a common area local to the proposed new route options that were assessed. This is because it is the new routes that have the potential to generate the greatest adverse effects and so were identified as a key differentiator between the options being compared.

The noise and vibration assessment work that has been undertaken to date has included initial consultation with West Dunbartonshire Council, Renfrewshire Council, and Glasgow City Council, a review of baseline conditions local to the proposed development, including the identification of nearby noise and vibration sensitive receptors and a review of the prevailing local noise environment.

Pertinent information from this work is presented below, but the need to quantify the impact of the proposed development across the wider DMRB compliant Study Area is recognised and accounted for in the proposed assessment methodology.

10.2 Consultation

Initial consultation has been undertaken with the Environmental Health Department of Renfrewshire Council.

Additional consultation will be undertaken as the detailed noise and vibration assessment progresses. In particular, this consultation will seek input on:

- available information on known local sources of noise and vibration across the area;
- any specific noise or vibration related local planning policies;
- national noise and vibration policies that are considered particularly relevant to the local area;
- any known local receptors, other than dwellings, that could be particularly sensitive to noise and vibration (e.g. medical facilities, research centres etc.);
- sources of historic noise or vibration complaint; and
- if any Candidate Nosie Management Areas (CNMAs) and Candidate Quiet Areas (CQAs) are within the jurisdiction of each Local Authority and any information on work undertaken to progress these from 'candidate' status to 'confirmed'.

10.3 Baseline Description

10.3.1 Prevailing Noise and Vibration Environment

The introduction of a new noise source to a low noise area usually has greater potential to generate significant impacts than if it were introduced to a high noise area. There is however a judgement to be made in that it may be desirable not to significantly increase noise levels in areas where high noise levels already exist, for example within any NMAs or CNMAs as defined within agglomeration Noise Management Plans[29].

In response to the *European Parliament and Council Directive for Assessment and Management of Environmental Noise 2002/49/EC,* more commonly referred to as the *Environmental Noise Directive* (END), the Scottish Government has undertaken an environmental noise mapping exercise. Separate noise maps have been prepared for the L_{den} noise index (a weighted average of the daytime, evening and night-time noise levels) and the L_{night} noise index (night-time only noise levels). For each index, noise maps have been prepared for the following:

- road traffic noise only;
- rail traffic noise only;
- industrial noise only;
- aircraft noise only; and
- consolidated noise (all sources combined).

[29] Glasgow Agglomeration Noise Action Plan, The Scottish Government, July 2014 ISBN 978-1-78412-702-2 (Web only - http://www.scottishnoisemapping.org/downloads/NAPS/round-2/Glasgow%20Noise%20Action%20Plan.pdf)

This exercise is repeated every five years and the latest 'second round' noise maps were completed in 2012. **Figure 10.1** presents the second round L_{den} (day, evening and night) noise map for the consolidated sources, whilst **Figure 10.2** presents the second round L_{night} (night only) noise map (also consolidated sources).

Also presented on these figures is an outline of the proposed development routes that are to be assessed and a nominal 300m buffer around these routes (but not including the proposed Inchinnan Cycleway as this will not be generating a new noise source).

Whilst the Study Area for the noise and vibration assessment will be greater than this, (see Section 10.5.2), it is considered that the greatest potential for adverse noise and vibration effects will be in the vicinity of the proposed new road traffic routes upon which these 300m buffers have been determined.

With regards to baseline vibration, the key operational phase vibration impact that could arise from the proposed development is road traffic induced airborne vibration, e.g. that associated with low frequency noise causing movement in building elements (window rattle etc.). In accordance with HD 213/11, the potential for this is directly related to noise levels. Therefore consideration of the environmental noise maps, in conjunction with the location of receptors, inherently accounts for consideration of those existing receptors which are either more, or less, susceptible to existing levels of airborne vibration.

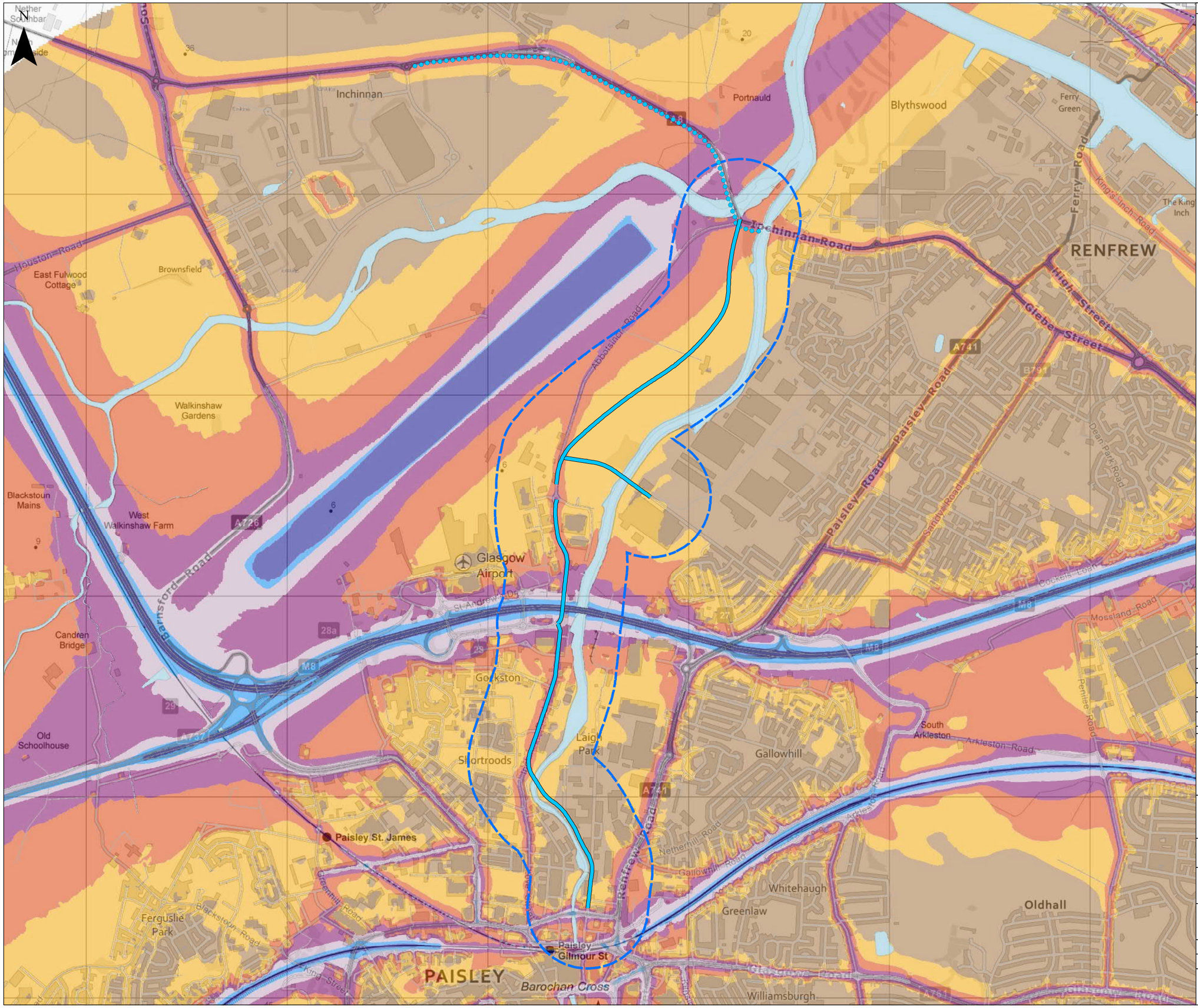
From consideration of **Figures 10.1** and **10.2** it can be seen that the main sources of environmental noise in the vicinity of the proposed new road elements are transport related, including road traffic noise and air traffic noise. With regards to rail traffic noise, the Glasgow Central to Paisley Gilmour Street railway (linking onwards to Ayr, Largs and Gourock in the west) is just within the southern bounds of the 300m buffer, providing a contribution to the noise environment in this area. No obvious sources of industrial noise are present within the 300m buffers.

The key sources of road traffic noise are Inchinnan Road, Greenock Road, Abbotsinch Road and the M8, Love Street, the A726, Weir Street, Renfrew Road, whilst the Glasgow Airport noise contours cover a significant portion of the local area to the north-west.

Considering the wider area, beyond the vicinity of the proposed development, the Scottish Government noise maps depict a noise environment typical of what is expected of an urban / suburban area, comprising a combination of road, rail, aircraft and industrial / commercial noise sources.

10.3.2 Noise and Vibration Sensitive Receptors

HD 213/11, details that examples of sensitive receptors include 'dwellings, hospitals, schools, community facilities, designated areas (e.g. National Park, SAC, SPA, SSSI, SAM), and public rights of way'. Consideration will be given to sensitive receptors that exist and those that are proposed / approved.



Notes

Key

- Indicative Line of New / Upgraded Road
- Indicative Line of New Cycle Link
- Indicative Line of New / Upgraded Road 300m buffer
- x < 55 dB (A)
- 55 => x<= 60 dB (A)
- 60 => x <= 65 dB (A)
- 65 => x <= 70 dB (A)
- 70 => x <= 75 dB (A)
- 75 => x <= 80 dB (A)
- x >= 80 dB (A)

0 200 400 800 Meters

Reference Drawings

-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D

Sweco
City Park Suite 3/5
368 Alexandra Parade
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SWECO

Client: RENFREWSHIRE COUNCIL

Drawing Status: BIM AUTHORISATION

Suitability: S6

Project Title: GLASGOW AIRPORT INVESTMENT AREA

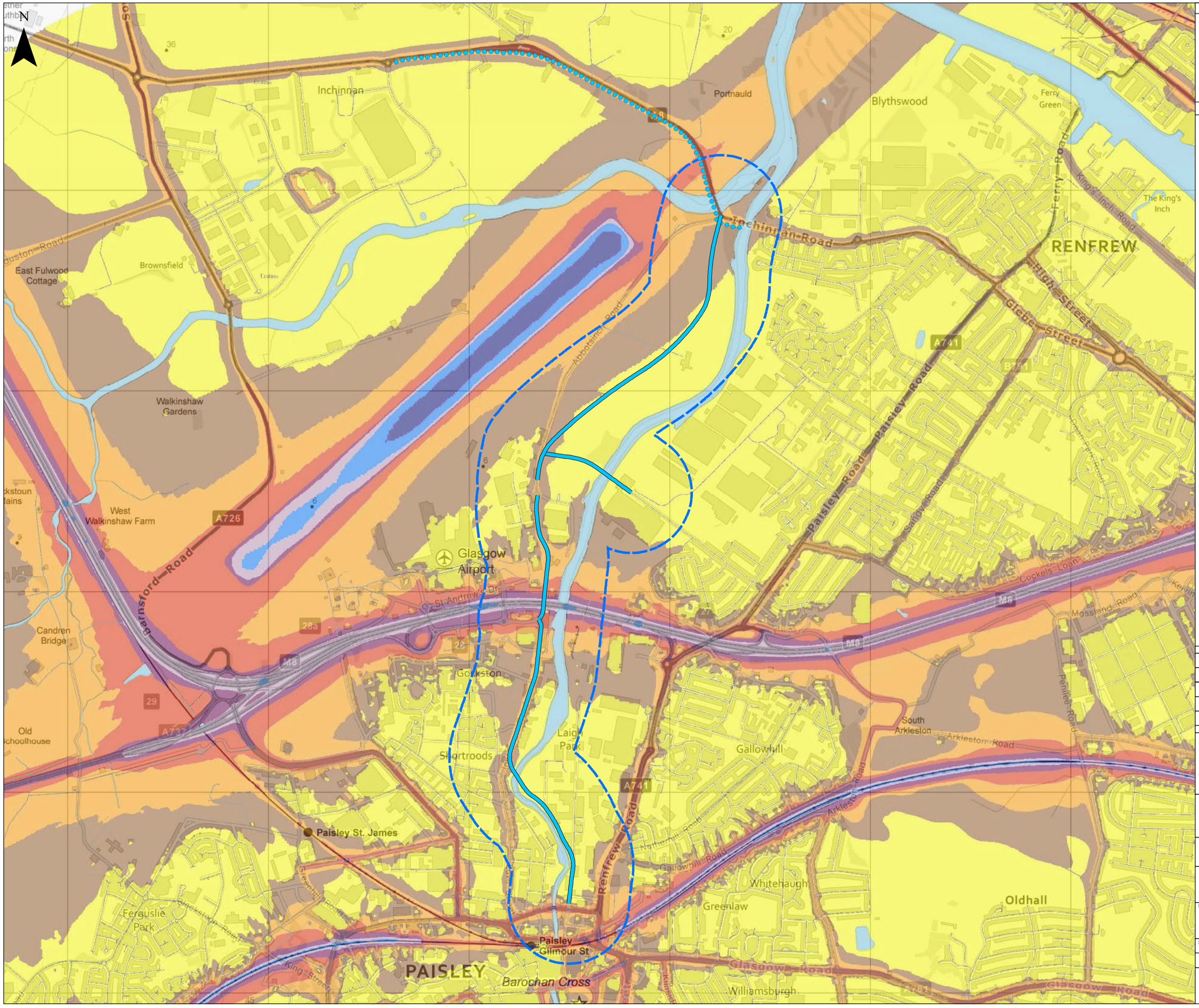
Drawing Title: Figure 10.1: Scottish Government Noise Mapping (L_{den}), Proposed Development Alignment and 300m Buffers

Scale	Designed	Drawn	Checked	Approved
1:18,000	BR	BR	JP	HC
Original Size	**Date**	**Date**	**Date**	**Date**
A3	07/09/2016	07/09/2016	07/09/2016	07/09/2016

Drawing Number: 117084 - SWECO - EAC - 00 - SP - EN - 00003 (Project Originator Volume Location Type Role Number)

Project Ref. No.: 117084 (R06)

Revision: 0A



Notes

Key

- Indicative Line of New / Upgraded Road
- Indicative Line of New Cycle Link
- Indicative Line of New / Upgraded Road 300m buffer
- x < 50 dB(A)
- 50 to 55 dB(A)
- 55 => x <= 60 dB(A)
- 60 => x <= 65 dB(A)
- 65 => x <= 70 dB(A)
- 70 => x <= 75 dB(A)
- 75 => x <= 80 dB(A)
- x >= 80 dB(A)

0 200 400 800 Meters

Reference Drawings

-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D

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SWECO

Client: RENFREWSHIRE COUNCIL

Renfrewshire Council

Drawing Status: BIM AUTHORISATION

Suitability: S6

Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure 10.2: Scottish Government Noise Mapping (L_{night}), Proposed Development Alignment and 300m Buffers

Scale	Designed	Drawn	Checked	Approved
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Original Size	**Date**	**Date**	**Date**	**Date**
A3	07/09/2016	07/09/2016	07/09/2016	07/09/2016

Drawing Number: Project Originator Volume Location Type Role Number
117084 - SWECO - EAC - 00 - SP - EN - 00003

Project Ref. No.: 117084 (R06)

Revision: 0A

10.3.2.1Existing Receptors

Address based noise and vibration sensitive receptors in the vicinity of the proposals have been identified by means of:

- a desk review of the Ordnance Survey (OS) AddressBase Premium database;
- a review of OS mapping and freely available aerial and street scene photography; and
- observations made during a site walk-over.

The OS AddressBase Premium database includes address point classification codes such as 'residential', 'other', 'land' and 'commercial' and also includes over 560 subcategories, e.g. 'medical', 'dentists', and 'general practitioners' etc.

These address data have been filtered to include only those entries for sub-categories considered both noise-sensitive and falling within the overarching descriptors of 'residential / temporary residential' or 'community facilities (both 'sensitive' and 'less sensitive'), educational, medical and outdoor recreation and parks', and a separate sub category for entries falling within the OS classification code of 'unclassified'. Other addresses / data entries have been filtered out, e.g. non-sensitive commercial addresses and garages etc.

The address data which are within the nominal 300m distance buffers have been geographically mapped onto OS StreetView mapping along with these buffers.

The results of the OS mapping and aerial photography review have been used to identify potential key areas of anomalies within the address data. These areas have then been subject to a site walk-over and visual inspection. The results of this review and site walk-over have been used to complete manual updates to the address data.

Figure 10.3 and **10.4** present the resulting residential and non-residential address based receptors that have been identified within the 300m buffers.

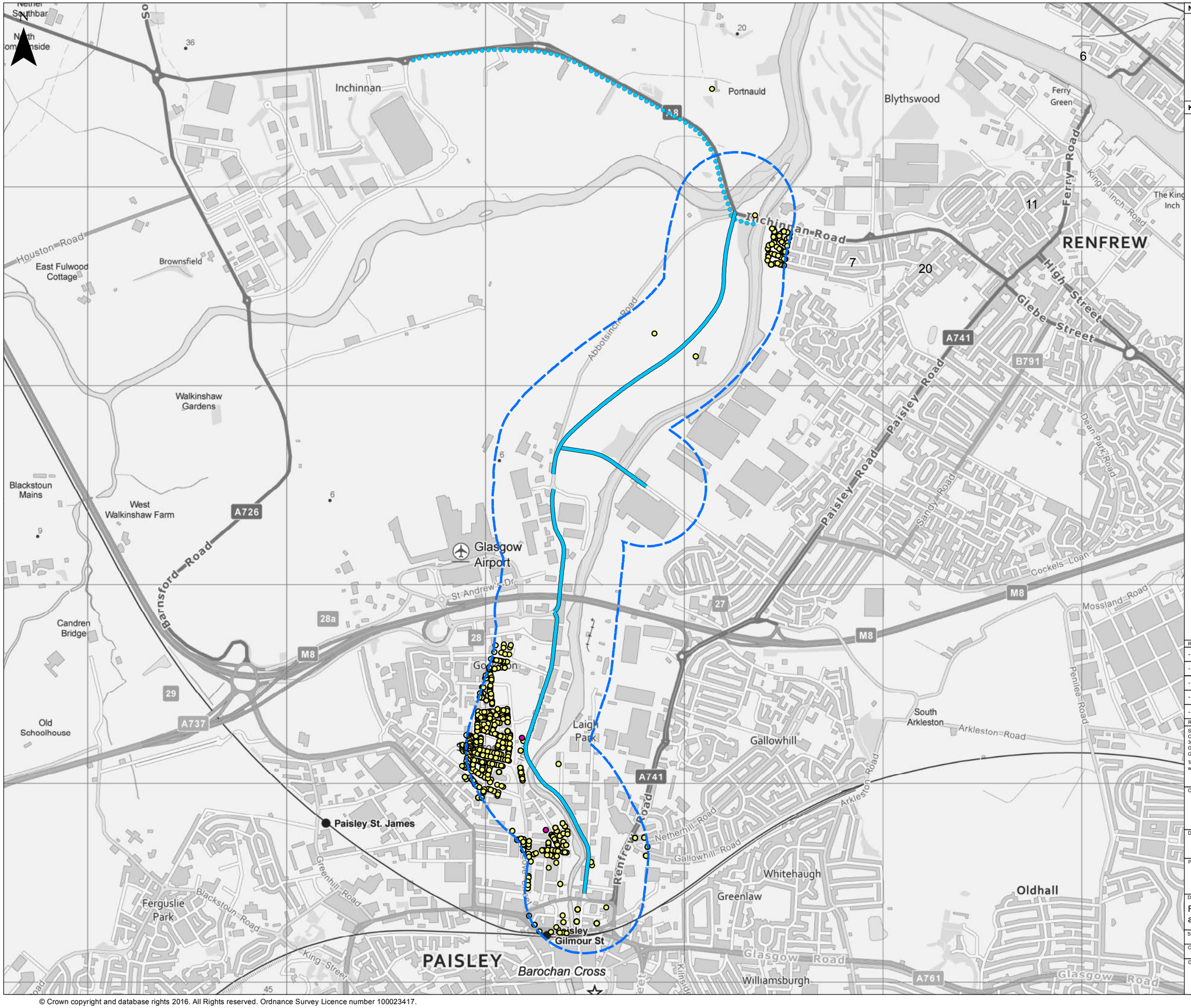
Digital mapping has been reviewed to identify local Core Paths and designated areas. These are presented in Figure **10.5** along with the proposed scheme elements and the 300m buffers.

The latest Glasgow Agglomeration Noise Action Plan[30] has also been reviewed to identify local CNMAs and CQAs in the vicinity of the proposed development. These are also detailed on **Figure 10.5**.

The wider area, beyond the vicinity of the proposals comprises general suburban and urban areas including the conurbations of Erskine, Inchinnan, Gockston, Shortroods, Laigh Park, Paisley, Gallowhill, Kirklandneuk, Porterfield and Renfrew. All of these areas, include noise sensitive development such as residential dwellings.

As part of the noise and vibration assessment work to be undertaken, the identification of noise and vibration sensitive receptors, as described above, will be extended to cover the final determined Study Area.

[30] Glasgow Agglomeration Noise Action Plan, The Scottish Government, July 2014 ISBN 978-1-78412-702-2 (Web only - http://www.scottishnoisemapping.org/downloads/NAPS/round-2/Glasgow%20Noise%20Action%20Plan.pdf)



Notes

Key

- Indicative Line of New / Upgraded Road
- Indicative Line of New / Upgraded Road 300m buffer
- Indicative Line of New Cycle Link
- Residential Receptors
- Temporary Residential Receptors

0 200 400 800 Meters

Reference Drawings

-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D

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SWECO

Client: RENFREWSHIRE COUNCIL

Drawing Status: BIM AUTHORISATION

Suitability: S6

Project Title: GLASGOW AIRPORT INVESTMENT AREA

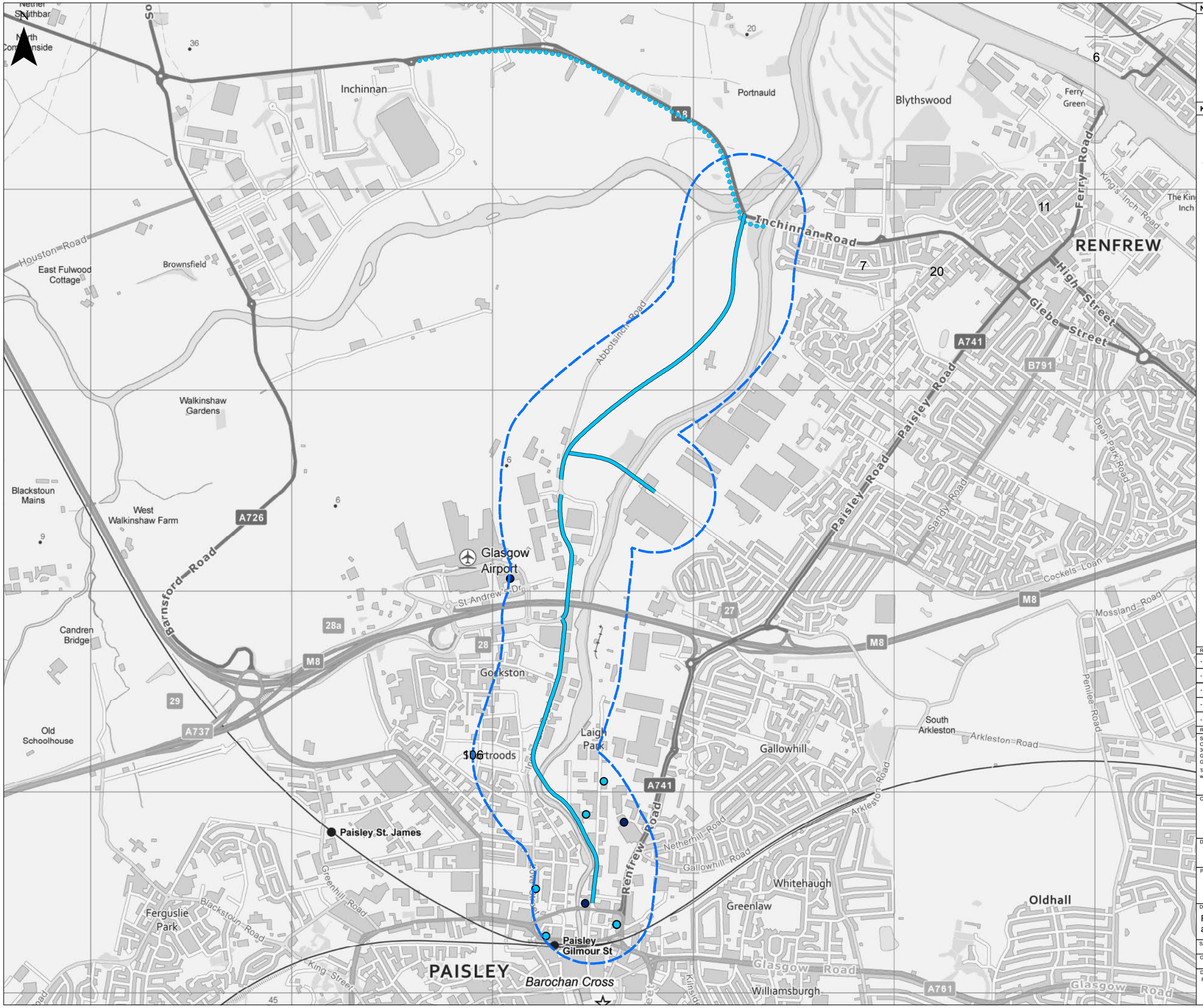
Drawing Title: Figure 10.3: Proposed Development Alignment, 300m Buffers and Residential Receptors

Scale	Designed	Drawn	Checked	Approved
1:18,000	BR	BR	JP	HC
Original Size	**Date**	**Date**	**Date**	**Date**
A3	07/09/2016	07/09/2016	07/09/2016	07/09/2016

Drawing Number: Project Originator Volume Location Type Role Number
117084 - SWECO - EAC - 00 - SP - EN - 00003

Project Ref. No.: 117084 (R06)

Revision: 0A



Notes

Key

- Indicative Line of New / Upgraded Road
- Indicative Line of New Cycle Link
- Indicative Line of New / Upgraded Road 300m buffer
- Educational Receptors
- Medical Receptors

0 200 400 800 Meters

Reference Drawings

-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D

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Client: RENFREWSHIRE COUNCIL

Renfrewshire Council

Drawing Status	Suitability
BIM AUTHORISATION	S6

Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure 10.4: Proposed Development Alignment, 300m Buffers and Non-Residential Receptors

Scale	Designed	Drawn	Checked	Approved
1:18,000	BR	BR	JP	HC
Original Size	**Date**	**Date**	**Date**	**Date**
A3	07/09/2016	07/09/2016	07/09/2016	07/09/2016

Drawing Number: 117084 - SWECO - EAC - 00 - SP - EN - 00003 (Project Originator Volume Location Type Role Number)

Project Ref. No.: 117084 (R06)

Revision: 0A

N

Notes

Key

- Indicative Line of New / Upgraded Road
- Indicative Line of New Cycle Link
- Indicative Line of New / Upgraded Road 300m buffer
- Scheduled Monument - Area (Sco)
- Core Paths (Sco) (<60k)
- Site of Special Scientific Interest (Sco)
- Special Protection Area (Sco)
- Glasgow Road Candidate Noise Management Area
- Glasgow Rail Candidate Noise Management Area
- Candidate Quiet Area for Glasgow

0 200 400 800 Meters

Reference Drawings					
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
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REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D

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RENFREWSHIRE COUNCIL
Renfrewshire Council

Drawing Status	Suitability
BIM AUTHORISATION	S6

Project Title
GLASGOW AIRPORT INVESTMENT AREA

Drawing Title
Figure 10.5: Proposed Development Alignment, 300m Buffers, Designated Area Receptors and CNMAs and CQAs

Scale	Designed	Drawn	Checked	Approved
1:18,000	BR	BR	JP	HC
Original Size	**Date**	**Date**	**Date**	**Date**
A3	07/09/2016	07/09/2016	07/09/2016	07/09/2016

Drawing Number
Project Originator Volume Location Type Role Number
117084 - SWECO - EAC - 00 - SP - EN - 00003

Project Ref. No.
117084 (R06)

Revision
0A

10.3.2.2Proposed / Approved Receptors

As well as considering existing receptors HD 213/11 states that 'Where planning permission for a residential development or any other sensitive receptor has been granted but for which construction has not started, the potential impacts on these locations should be estimated and reported separately'. Consideration will also therefore be given to those proposed developments which: a) include a residential element, and b) benefit from a planning consent. Such consented developments as identified within the 300m buffers are depicted in **Figure 10.6.**

As part of the noise and vibration assessment work to be undertaken, account will be given to consented developments, with residential elements, across the final determined Study Area.

10.4 Potential Effects

10.4.1 Construction

The following construction phase impacts are considered to have the potential to give rise to significant effects and have been 'scoped-in' to the proposed assessment:

- construction noise on existing and consented noise-sensitive receptors;
- construction traffic noise on existing and consented noise-sensitive receptors; and
- construction vibration on existing and consented vibration sensitive receptors.

The above impacts would be short term, only having the potential to arise during the construction period.

At this stage it is not known whether any substantial or lengthy traffic diversions will be required to facilitate delivery of the on-line aspects of the project, although this is considered unlikely. Where such diversions are not required, an assessment of associated temporary noise level changes will be scoped-out of the assessment methodology. This will be reviewed as the construction detail / construction programme for the project is developed.

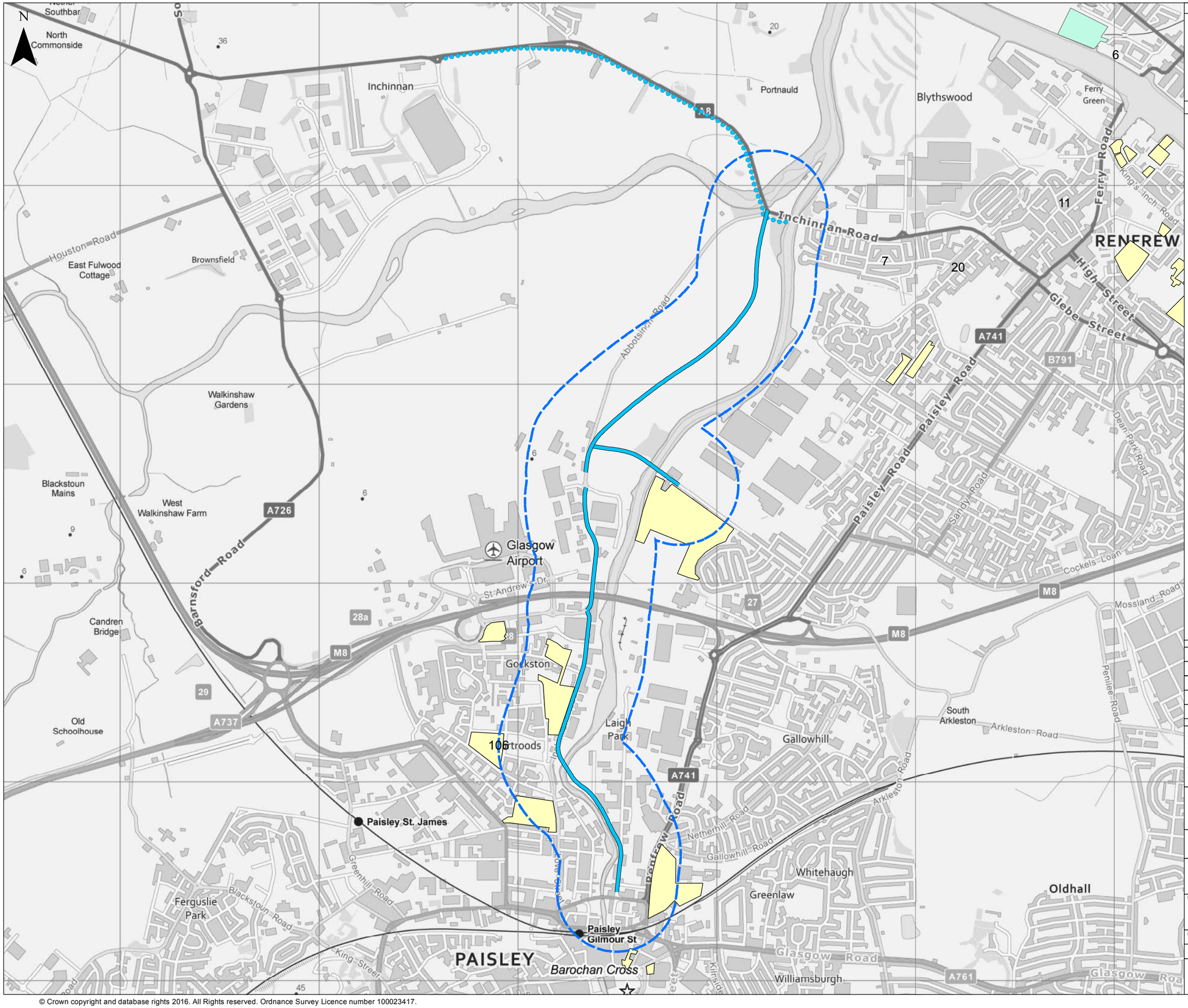
10.4.2 Operation

The following operational phase impacts are considered to have the potential to give rise to significant effects and have been 'scoped-in' to the noise and vibration assessment:

- road traffic noise level changes (from both new routes and traffic redistribution) on existing and consented noise sensitive receptors; and
- road traffic induced airborne vibration (from both new routes and traffic redistribution) on existing and consented vibration sensitive receptors.

The above impacts would be long term / permanent.

With regards to groundborne vibration, HD 213/11, states that an assessment of this "*will only apply in rare cases where, for example, traffic is expected to pass very close to buildings*". In the case of this development, new road traffic routes are not proposed in very close proximity to residential dwellings. The only road sections proposed in very close proximity to dwellings are where the scheme ties-in to existing route sections. Therefore, an assessment of groundborne vibration has been scoped-out of the assessment.



Notes

Key

- Indicative Line of New / Upgraded Road
- Indicative Line of New Cycle Link
- Indicative Line of New / Upgraded Road 300m buffer
- Glasgow City Consented Residential Planning Applications
- Renfrewshire Consented Planning Residential Planning Applications

Reference Drawings

-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D

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SWECO

Client: RENFREWSHIRE COUNCIL

Drawing Status: BIM AUTHORISATION

Suitability: S6

Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure 10.6: Proposed Development Alignment, 300m Buffers, Approved Developments with Residential Element

Scale	Designed	Drawn	Checked	Approved
1:18,000	BR	BR	JP	HC
Original Size	**Date**	**Date**	**Date**	**Date**
A3	07/09/2016	07/09/2016	07/09/2016	07/09/2016

Drawing Number: 117084 - SWECO - EAC - 00 - SP - EN - 00003 (Project Originator Volume Location Type Role Number)

Project Ref. No.: 117084 (R06)

Revision: 0A

10.5 Proposed Scope of Assessment

HD 213-11 details a staged approach to the noise and vibration assessment, with the stages named 'Scoping', 'Simple' and 'Detailed'. The methodology for the Scoping stage assessment requires that the Study Area is defined and noise level changes of 1dB $L_{A10,18hr}$ or greater in the short term, or 3dB $L_{A10,18hr}$ or greater in the long term arising as a result of the scheme are determined. However, both of these points are dependent upon the scheme traffic data which are currently being finalised. It is therefore proposed that the Study Area and noise level changes associated with the proposed development are considered at the outset of the detailed assessment work to be undertaken for the EIA.

It is also stated within HD 213/11 that where it is evident there are dwellings within 1km of the scheme / bypassed routes that would be subject to noise level changes of 1dB $L_{A10,18hr}$ or greater in the short term, or 3dB $L_{A10,18hr}$ or greater in the long term, then the Simple stage assessment can be bypassed, with progress directly to the Detailed stage assessment.

It can be seen from **Figure 10.3** that there are several existing dwellings in the vicinity of the proposed development and it is anticipated that at least some of these will be subject to noise level changes greater than these stated criteria.

The proposed assessment methodology has therefore been based upon that prescribed within HD 213/11 for the Detailed stage assessment. It is however proposed that, an initial review of the scheme traffic data will be undertaken for the full DMRB compliant Study Area. This review will be undertaken in the form of a 'sift exercise', to identify those routes which would and would not be subject to the stated 1dB and 3dB noise level change criteria. This initial sift exercise would then be used to reduce the Study Area for the Detailed Stage assessment such that areas that are not anticipated to be subject to significant impacts are scoped-out of the assessment (See **Section 10.5.2**).

10.5.1 Construction Noise

10.5.1.1 Study Area

Whilst HD 213/11 adopts the same Study Area for construction phase impacts as identified for operational phase impacts, the nature of the proposed development is that applying this approach would mean the inclusion of extensive areas in which construction operations are not proposed and therefore for which significant effects are not anticipated.

In accordance with DMRB Volume 11 Section 3 Part 3: Disruption due to Construction it is proposed that a reduced Study Area is adopted for construction noise. The Study Area for construction noise will be defined based on a 100m set back distance from proposed key construction working operations / working areas.

10.5.1.2 Assessment Methodology

Available information on the construction of the proposed development will be reviewed including the construction programme, proposed working method statements, phasing diagram, compound locations and working areas etc. This review will be undertaken to identify those operations which could give rise to significant impacts and will include consideration to potential night-time working and the likely duration of impact.

Based on the results of this review, the construction noise Study Area(s) will be determined as described above and the numbers of receptors will be identified. Any receptors likely to be particularly sensitive to construction noise impacts will be highlighted.

Noise level predictions will be undertaken in accordance with the methodology detailed within BS5228-1 for a sample of key working operations / working phases and local noise sensitive receptors within the Study Area(s).

Appropriate construction noise assessment criteria will be derived based on the guidance contained within BS5228-1+A1:2014, the prevailing local noise environment and the outcomes of consultation with the Local Authority Environmental Health Officers.

The results of the noise level predictions will be assessed by comparison with the adopted assessment criteria and the number of properties likely to be subject to different degrees of effect will be determined. Noise level predictions will take account of any proposed noise mitigation measures, such as environmental barriers etc.

10.5.2 Construction Traffic Noise

10.5.2.1 Study Area

Given the generally urban / suburban nature of the local area, it is anticipated that construction compounds will be located adjacent to the existing road network and therefore that new haul routes will not be required either to access the compounds or to provide access between the compounds and the construction working areas.

The construction traffic noise Study Areas will therefore be defined based on a 50m buffer around any existing local road traffic routes linking the construction compounds to the wider network. The wider network (at which the defined study areas finish), will constitute those existing routes as judged to already be subject to moderate to high existing traffic flows, and therefore for which significant noise level changes would not be anticipated.

10.5.2.2 Assessment Methodology

The proposed construction traffic access routes will be reviewed, as well as the proposed construction compound locations. For each compound, a qualitative assessment of the existing local road network will be undertaken to determine those local routes that are anticipated to be subject to reasonable or high traffic flows currently. The remaining routes (subject to low flows) linking each compound with the wider network will be identified and the construction traffic noise Study Area(s) will be calculated as described above.

For each identified link within the Study Area(s), the Basic Noise Level (BNL) will be determined in accordance with the *Calculation of Road Traffic Noise* memorandum 1988 (CRTN). Calculations will be undertaken for both 'baseline' and 'with construction' scenarios and the associated noise level change will be determined. For each link, the number of receptors within the Study Area will be determined and allied with the calculated noise level changes.

10.5.3 Construction Vibration

10.5.3.1 Study Area

The Study Areas will be defined based on set-back distances from the proposed key construction working areas. The set-back distances adopted will depend on the working operations to be undertaken, as considered further below.

10.5.3.2 Assessment Methodology

BS5228-2:2009+A1: 2014: *Code of practice for noise and vibration control on construction sites. Vibration* details ground-borne vibration prediction methods for a range of common construction working operations such as percussive piling, dynamic compaction, vibratory piling and vibratory compaction etc. Also presented within this Standard are historic measurement results for these operations and assessment criteria corresponding to different degrees of human response to groundborne vibration.

Available information on the construction of the proposed development will be reviewed including the construction programme, proposed working method statements, phasing diagram, compound locations and working areas etc. From this review, the potential vibration generative working operations which are anticipated to be required in the delivery of the development will be identified.

For these working operations, and drawing on the published prediction methods and historic data, typical set-back distances at which different degrees of adverse comment might be expected will be determined.

The construction vibration Study Area will then be defined based on these set-back distances and the location at which such working operations are anticipated to be required.

The number of receptors within the Study Area(s) will be determined and split into categories corresponding to different degrees of effect.

10.5.4 Operational Traffic Noise

10.5.4.1 Study Area

Initially the Study Area for the Operational Traffic Noise assessment will be defined in full accordance with HD 213/11. i.e.:

- The start and end points of the physical works associated with the road project will be identified.
- Existing routes that are being bypassed or improved, and any proposed new routes between the start and end points will be identified.
- A boundary one kilometre from the carriageway edge of the routes identified in bullet point 2 above will be determined.
- A boundary 600m from the carriageway edge around each of the routes identified in bullet point 2 above and also 600m from any other affected routes within the boundary defined in bullet point 3 above will be determined. The total area within these 600m boundaries is termed the ‘calculation area’. An affected route is where there is the possibility of a change of 1dB $L_{A10,18h}$ or more in the short-term or 3dB

$L_{A10,18h}$ or more in the long-term (i.e. conditions (ii), (iii), (iv) or (v) given in paragraph A1.8 of HD 213/11).

- Any affected routes beyond the boundary defined in (iii) above will be determined.
- A boundary 50m from the carriageway edge of the routes identified in bullet point 5 above will be determined.

It is proposed that with regards to the first point above, 'the road project' would be defined to include the proposed new / improved road traffic routes, but not include the Inchinnan cycle path (as this would not generate vehicular noise) or the proposed new access at the northern end of Glasgow Airport (as this would be subject to minimal traffic)

A sift exercise will then be undertaken drawing upon the scheme traffic data to identify those routes which will and will not be subject to significant noise level changes within the above defined Study Area. This sift exercise will be as follows:

1. Basic Noise Level (BNL) calculations will be undertaken for all routes within the Study Area, for the following scenarios:
   - (a) Year of Opening 'Without scheme';
   - (b) Year of Opening 'With Scheme'; and
   - (c) Design Year (Year of Opening +15) 'With Scheme'.
2. The short term noise level changes will be determined based on 'scenario b' minus 'scenario a' and the longer term noise level changes will be determined based on 'scenario c' minus 'scenario a'. Those routes which are predicted to be subject to a short term noise level change of less than 1dB and a long term noise level change of less than 3dB will be identified.

The routes identified from the above sift will be used to reduce the Study Area such that these routes are effectively scoped-out of the assessment. The approach to reducing the Study Area will be that a 600m buffer will be drawn around all proposed new routes and all routes which remain following the completion of the above sift exercise. The 50m boundaries around carriageway edges of effected routes beyond the original 1km boundary will be retained in the determination of the revised Study Area.

The resulting appraisal will be focussed only on those routes for which there is the potential for significant effects to arise. The updated Study Area is referenced here after as the 'final determined Study Area'.

Whilst the approach above is an adaption of the DMRB guidance, it is anticipated that this will give rise to an assessment focused only on those routes for which there is the potential for significant effects to arise.

10.6 Assessment Methodology

For the final determined Study Area (post sift exercise), an assessment of operational road traffic noise impacts will be undertaken following the Detailed stage assessment methodology as defined within HD 213/11. This will include the elements described below.

10.6.1 Baseline Noise Survey

A review of the Scottish Government noise mapping and address based receptor data (see Sections 10.2.1 and 10.2.2.1 above) will be undertaken and the need for a baseline noise survey will be determined. It is anticipated that a baseline noise survey is likely to be required to:

1. establish the prevailing baseline noise conditions for receptors in areas which are well removed from significant sources of road traffic noise;
2. establish the prevailing baseline noise conditions for receptors which are subject to significant sources of noise that are not road traffic, e.g. aircraft noise / industrial / commercial noise; and
3. assist in the determination of appropriate noise level limits / assessment criteria for construction noise.

Subject to access and appropriate site security, it is anticipated that the survey would comprise a series of 24-hour continuous weekday measurements at a sample of locations within the final determined Study Area. Where the site is not sufficiently secure to allow unattended monitoring, a sampled measurement approach may be followed. This would include, for example, a series of fully attended 15 minute measurements at each position during daytime, evening and night-time periods.

10.6.2 Noise Modelling

Using proprietary PC based noise modelling software, detailed 'Do Minimum' and 'Do Something' noise models will be prepared for both the Year of Opening and a Future (+15) assessment year. The noise models will be used to undertake receptor based road traffic noise level predictions in accordance with the methodology detailed within CRTN, and Annex 4 of HD 213/11, for all receptors within the 600m buffers used in the determination of the final determined Study Area.

Predictions will include noise from all roads within the 600m buffers. For sensitive receptors towards the edge of the 600m buffers, consideration will be given to the contribution from roads outside the 600m area, by application of professional judgement.

The noise models will be used to undertake noise level predictions of the $L_{A10,18hr}$ noise index. For building receptors (e.g. dwellings), these predictions will include façade corrections. Predictions will be undertaken for first floor height (i.e. 4m), unless the building is identified as single storey, in which case a 1.5m height will be used. For open space receptors such as parks, free-field noise levels will be predicted at ground floor height (1.5m).

10.6.3 Assessment of Traffic Noise Impacts

For all adopted receptors, the following comparison of the receptor noise levels will be made:

- Do-Minimum baseline year versus Do-Minimum future assessment year (long term);
- Do-Minimum baseline year versus Do-Something baseline year (short term); and
- Do-Minimum baseline year versus Do-Something future assessment year (long term).

Where it is identified that night-time impacts require consideration, only comparisons for the long term will be considered (in compliance with HD 213/11).

The comparisons will be reported by completing Tables A1.1 and A1.2 of HD 213/11.

For each of the routes identified in bullet point 5 of the Study Area definition outlined in **Section 10.5.2** above, calculated BNLs will be reported and counts of sensitive receptors within 50m of the centrelines of these routes will be made. These counts will be reported by completing Tables A1.1 and A1.2 of HD 213/11.

Where a building is predicted to experience different changes in noise level on different façades, the least beneficial change in noise level will be accounted for in the assessment results. When all façades show a decrease in noise level, then the smallest decrease will be reported. When all facades show an increase in noise level then the largest increase will be reported. Where this approach leads to the reporting of two or more facades (i.e. where the same least beneficial change in noise level is shown on two or more facades) then the change on the façades with the highest noise level in the Do-Minimum scenario will be reported. The same approach will be adopted for non-residential receptors. Where this approach is such that beneficial effects from the scheme could potentially be overlooked, these will be reported separately.

Consideration will be given to whether any significant impacts are anticipated to arise outside the final determined Study Area, e.g. in any areas out to the original 1km buffer area applied for the sift study. Where appropriate, a qualitative assessment of any identified significant impacts will be made.

Short term and long term noise level difference maps will be prepared indicating the level of change at each receptor position. These maps will use 1dB or 3dB noise level change bands as appropriate. A list of receptor noise level changes will also be prepared.

For the night-time period, the following sift exercise will be undertaken:

- Night-time noise maps will be prepared for the full Study Area for the following scenarios:
  - Year of Opening 'Without scheme'
  - Year of Opening 'With Scheme'
  - Design Year (Year of Opening +15) 'With Scheme'
- These maps will be prepared by application of the guidance detailed within the TRL report Converting the UK Traffic noise index LA10,18h to EU noise indices for noise mapping, and will present free-field night-time noise levels.
- Receptor locations will be overlaid onto the noise maps and the noise maps will be used to depict those areas which would be subject to noise levels of 55dB Lnight,outside or higher.
- Those receptors which are subject to noise levels lower than the 55dB contour for all scenarios, will be scoped-out of the assessment.
- Those remaining receptors which would be subject to a noise level change of less than 3dB will also be scoped-out of the assessment.

Table A1.2 of HD 213/11 will then be completed for the remaining receptors not scoped-out of the assessment. The following will be highlighted:

1. where the introduction of the project results in a sensitive receptor being exposed to night-time noise levels in excess of 55dB Lnight,outside where it is currently below this level; and
2. where a receptor is exposed to pre-existing Lnight,outside in excess of 55dB and this is predicted to increase.

The above assessment will be undertaken for existing receptors, but consideration will also be given to receptors which benefit from a valid planning consent. For consented receptors, a separate appraisal of potential impact will be undertaken and reported.

10.6.4 Assessment of Traffic Nuisance Impacts

An assessment of traffic noise nuisance will be undertaken in accordance with the guidance detailed within HD 213/11 for the Detailed stage assessment. This will include:

- Calculation of the change in noise nuisance for all dwellings at which full CRTN noise level calculations have been undertaken. The change in noise nuisance will be determined in accordance with Annex 6 of HD 213/11.
- The results will be tabulated to detail the change in the number of people bothered in 10% change bands up to 40%, with a further band for >40%.
- Separate assessments will be undertaken for Do-Minimum baseline year versus Do-Minimum in the future assessment year and for Do-Minimum in the baseline year versus Do-Something in the future assessment year.
- The results of the assessments will be presented by completing Table A1.3 of HD 213/11.
- Calculations will be based on the highest nuisance levels determined during the first 15 years after opening.
- Nuisance calculations will be undertaken on the façade with the least beneficial change in noise (i.e. the one used in the completed noise assessment as detailed above).

10.6.5 Assessment of Traffic Induced Airborne Vibration

A review of the noise nuisance assessment results will be undertaken and it will be considered whether an assessment of airborne vibration nuisance is warranted. Where this is deemed to be appropriate, this will be completed in accordance with the guidance in HD 213/11 for the Detailed stage assessment. This will include:

- Calculation of the change in vibration nuisance for all dwellings within 40m of routes for which full CRTN noise level calculations have been undertaken.
- The results will be tabulated to detail the change in the number of people bothered in 10% change bands up to 40%, with a further band for >40%.
- Separate assessments will be undertaken for Do-Minimum baseline year versus Do-Minimum in the future assessment year and for Do-Minimum in the baseline year versus Do-Something in the future assessment year.

The results of the assessment will be presented in Table A1.4 of HD 213/11.

11. Air Quality

11.1 Introduction

This section describes the proposed approach to the assessment of potential effects to local air quality associated with the proposed development. The method of assessment of air quality effects has been developed with reference to relevant non-statutory guidance, including:

- Design Manual for Roads and Bridges, Volume 11:Environmental Assessment, Section 3: Environmental Assessment Techniques, Part 1: HA 207/07 Air Quality;
- Local Air Quality Management (LAQM) Technical Guidance TG(16);
- Institute of Air Quality Management guidance on *Land-Use Planning & Development Control: Planning for Air Quality*; and
- Institute of Air Quality Management guidance on *Assessment of dust from demolition and construction.*

The proposals have the potential to affect local air quality during the construction and operational (post-construction) phases of the project. During construction, potential effects will occur in proximity to the locations of construction activity, whilst post-construction effects to air quality will occur over a wider area due to the effects of changes in road traffic flows on the local road network.

For the operational phase of the project the assessment considers air pollutants harmful to human health, as identified within the National Air Quality Strategy. The principal source of atmospheric emissions during the operational phase of the project will be from engine combustion (from road traffic) therefore the pollutants considered within the assessment of the operational phase of the project are therefore the products of combustion, namely nitrogen dioxide (NO_2), fine particulates (PM_{10}) and carbon monoxide (CO).

For the construction phase the assessment also considers the combustion generated emissions from road traffic and construction equipment but also considers the potentially effects to receptor amenity through the deposition of dust.

11.2 Consultation

Consultation has been undertaken with the relevant Environmental Health Officer responsible for air quality within Renfrewshire Council.

Initial consultation was undertaken during early project work to identify potential constraints in the options generation and assessment phases of the project design. This consultation included obtaining existing baseline air quality data and discussion on the proposals to undertake additional baseline monitoring.

Further consultation was undertaken in the form of a meeting in August 2016. A presentation was provided of the proposed project design, preliminary findings of the initial assessment work and an outline of the proposed scope of work for the EIA.

11.3 Baseline

Baseline air quality conditions within the study area were determined with reference to ambient monitoring undertaken by Renfrewshire Council, published LAQM reports and Scottish Government collated data on ambient air quality conditions.

The estimated annual average background pollutant concentrations across the study area are below the relevant annual average air quality objectives, indicating air quality is good. The estimates are, however, an average concentration across the grid square and therefore do not reflect concentrations at hotspot locations.

The principal air pollutant emissions sources within the study area are road traffic and emissions associated with Glasgow Airport operations. Monitoring of ambient air quality levels at locations most likely to be affected by these emission sources (hotspot locations) is undertaken by Renfrewshire Council. Ambient air quality monitoring locations across the study area, and locations outside the study area which may provide representative air quality monitoring data for areas potentially affected by the project are presented in **Figure 11.1**.

Monitoring across the GAIA project study area is concentrated around the town centre areas of Paisley and Renfrew including relevant monitoring locations within the Wider Study Area. In most cases monitoring has been of ambient NO_2 concentrations, using passive diffusion tubes (PDTs). Monitoring of NO_2 provides a good indicator of ambient air quality levels attributable to traffic emissions. Additional monitoring using automatic analysers for NO_2 and PM_{10} has been undertaken at locations in Paisley town centre, close to the M8 in Renfrew and historically at the perimeter of Glasgow International Airport.

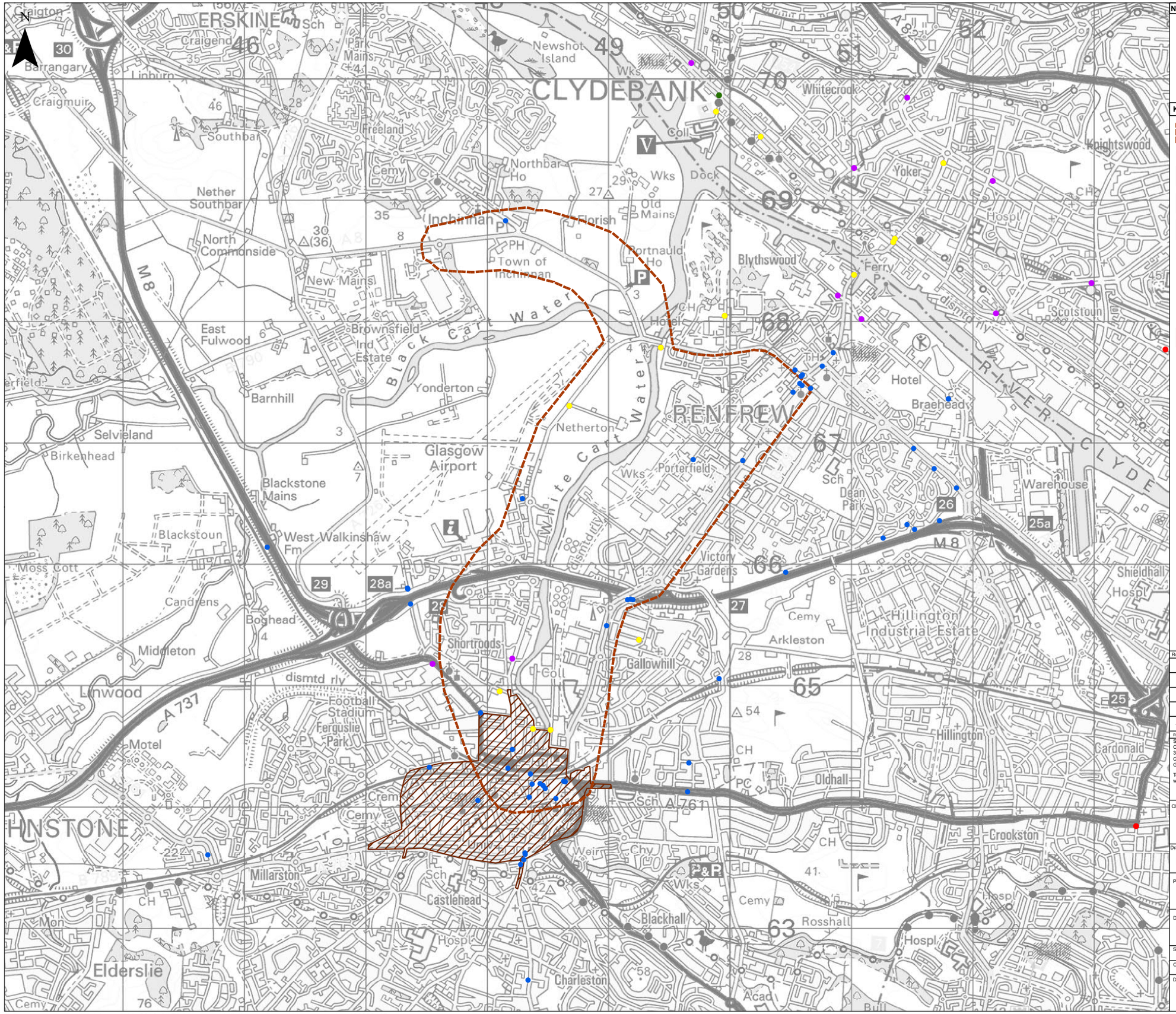
Existing monitoring has indicated that air quality across the study area and buffer is generally good, however potential for exceedance of National Air Quality Strategy (NAQS) objectives for NO_2 and PM_{10} have been identified with both Paisley and Renfrew town centres. An Air Quality Management Area (AQMA) was declared in Paisley town centre in 2009 (amending an existing smaller AQMA), and covers most of the town centre area as indicated in **Figure 11.1**.

The principal source of emissions affecting the AQMA is from road traffic. Renfrewshire Council is currently developing proposals for the declaration of an Air Quality Management Area (AQMA) in Renfrew. Road traffic is again the principal emission source for this area. A further area of elevated concentrations has been identified by the Council in Renfrew, at Cockles Loan, overlooking the M8, however no AQMA is currently proposed at this location.

Some gaps in the monitoring network were identified which would allow appraisal of baseline conditions in respect of the GAIA project, therefore a number of additional monitoring locations have been commissioned to measure ambient air quality (NO_2 as a marker pollutant). The locations of monitoring are indicated on **Figure 11.1**. Only three months of monitoring data are available at the time of writing for most of these locations, however measured air quality levels (NO_2 concentrations) are generally low and significantly below NAQS objective levels.

11.4 Potential Effects

An initial assessment of the potential effects to local air quality associated with the operational phase of the project was undertaken during the options generation and assessment phase of the project.



Notes

Key

- GAIA Core Study Area

Monitoring Sites per Local Authority

- Renfrewshire Council Monitoring Sites
- Glasgow Council Monitoring Sites
- Dunbartonshire Council Monitoring Sites

Additional Monitoring Sites

- Diffusion Tubes Round 1 & 2
- Diffusion Tubes from Round 3 Onwards (including locations from round 1 and 2)
- Paisley AQMA

0 0.25 0.5 0.75 1 km

Reference Drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
-	-	-	-	-	-

Sweco
City Park Suite 3/5
368 Alexandra Parade
Glasgow
G31 3AU
Tel: +44 (0)141 414 1700
web: www.sweco.co.uk

SWECO

Client: RENFREWSHIRE COUNCIL

Drawing Status: FINAL

Suitability: S0

Project Title: GLASGOW AIRPORT INVESTMENT AREA

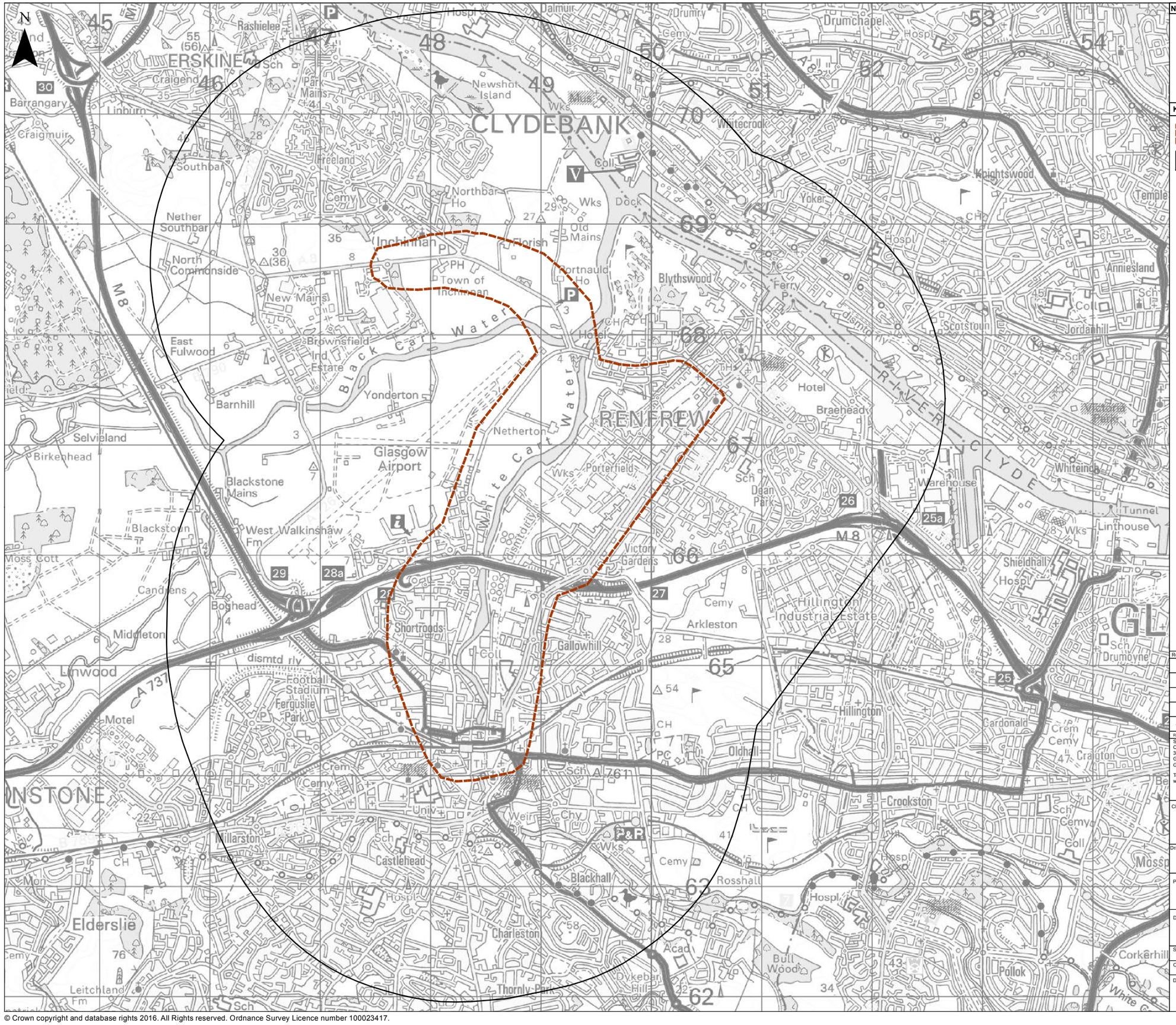
Drawing Title: Figure 11.1: Air Quality Monitoring Site Locations

Scale	Designed	Drawn	Checked	Approved
1:30,000	JB	JB	SMcG	SMcG
Original Size	**Date**	**Date**	**Date**	**Date**
A3	15/09/2016	15/09/2016	15/09/2016	15/09/2016

Drawing Number: Project Originator Volume Location Type Role Number
117084 - SWEC0 - EAC - 00 - SP - EN - 00003

Project Ref. No.: 117084 (R06)

Revision: 0A



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Notes

Key

GAIA Core Study Area

GAIA Wider Study Area

0 0.25 0.5 0.75 1 km

Reference Drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
-	-	-	-	-	-

Sweco
City Park Suite 3/5
368 Alexandra Parade
Glasgow
G31 3AU
Tel: +44 (0)141 414 1700
web: www.sweco.co.uk

SWECO

Client: RENFREWSHIRE COUNCIL

Renfrewshire Council

Drawing Status	Suitability
FINAL	S0

Project Title: GLASGOW AIRPORT INVESTMENT AREA

Drawing Title: Figure 11.2: Core Study Area and Wider Study Area

Scale	Designed	Drawn	Checked	Approved
1:33,000	JB	JB	SMcG	SMcG
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/09/2016	01/09/2016	01/09/2016	01/09/2016

Drawing Number: Project Originator Volume Location Type Role Number
117084 - SWEC0 - EAC - 00 - SP - EN - 00003

Project Ref. No.: 117084 (R06)

Revision: 0A

The initial assessment considered the potential for change to ambient air quality concentrations as a result of potential changes to road traffic flows. The potential changes to road traffic flows across the roads within the study area were determined with reference to preliminary traffic model outputs of predicted traffic flows for differing options for the project design.

The potential significance of changes to local air quality within the study area was determined based on an evaluation of the potential change in road traffic flows (and therefore the potential change in emissions from road traffic), the presence and number of sensitive receptors located in proximity to proposed project development locations or roads affected by the project and the prevailing baseline conditions within each area.

Overall the project proposals were predicted to have both adverse and positive effects on air quality when benchmarked against a future baseline without the project. Potential for improvements in air quality were identified throughout the Paisley Town Centre AQMA, particularly on Love Street and western sections of NiddryStreet. Potential for deterioration of air quality was identified for eastern sections of Niddry Street and Weir Street. Predicted changes in air quality associated with changes to the road network around Abbotsinch Road and the northerly White Cart Crossing were principally neutral.

11.5 Proposed Scope of Assessment

11.5.1 Proposed Approach to EIA

The assessment of potential effects in ambient air quality will be undertaken to establish the change in ambient NO_2, PM_{10} and CO concentrations and the potential for exceedance of ambient air quality standards as set out in the National Air Quality Strategy. The relevant air quality objectives are presented in **Table 11.1.**

Table 11.1 Air Quality Objectives for Scotland

Pollutant	Air Quality Objective Concentration	Averaging period
Carbon monoxide (CO)	10 mg/m^3	Maximum daily 8-hour mean
Nitrogen dioxide (NO_2)	40 µg/m^3	Annual mean
	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
Particles (PM_{10})	18 µg/m^3	Annual mean
	50 µg/m^3 not to be exceeded more than 7 times a year	24-hour mean
Particles ($PM_{2..5}$)	10 µg/m^3	Annual mean

The air quality objectives will apply at all identified sensitive air quality receptors, defined as a location where public exposure over a time period equivalent to the air quality objective averaging period will occur. For annual mean concentrations this will include residential properties and institutional buildings, including schools and hospitals. For shorter term objectives (e.g. 1-hour mean NO_2) the objectives will apply to locations where public exposure is likely, including pavements and locations of leisure activities.

11.5.2 Study Area

The project assessment study area is presented in Figure 11.2. The study area comprises a wider study area, encompassing all roads potential affected by the project, and a core study area encompassing a 1km buffer area around the locations of project development.

11.5.3 Construction Phase

The potential for adverse effects to local air quality and residential amenity during the construction phase of the project will comprise two phases. The initial phase will adopt a screening risk assessment of the potential for adverse effects associated with:

- construction road traffic;
- emissions from construction equipment and temporary power generation;
- dust generated from construction activities, and the storage and movement of materials.

Where the initial screening assessment identifies the potential for significant effects then a more detailed assessment will be adopted.

Construction road traffic will be assessed based on the predicted traffic movements associated with each phase of the project development. The predicted vehicle movements, including heavy goods vehicle (HGV) movements associated with deliveries and transport of materials will be assessed in accordance with established thresholds in technical guidance, including DMRB and LAQM TG(16) to establish the potential for adverse effects to air quality. Where predicted traffic flows exceed threshold levels, or where potential for significant adverse effects is established, detailed dispersion modelling of traffic emissions will be undertaken to predicted the change in ambient air quality levels.

Similarly, screening assessment of combustion generated emissions from fixed or mobile construction equipment will be undertaken in accordance with relevant technical guidance LAQM TG(16). Where potential for significant adverse effects is established then detailed dispersion modelling of emissions will be undertaken to predict the change in ambient concentrations.

Screening assessment of dust generated from construction activities will be undertaken in accordance with relevant IAQM guidance. The potential for significant adverse effects will be assessed based on the potential for emission generation, separation distance between emission sources and receptors, climatic conditions and dust control techniques. Where potential for significant effects are established, a more detailed assessment will be undertaken using dispersion modelling to predict dust migration.

The findings of the various assessments will inform the development of the requirement for mitigation and control measures within the Construction Environmental Management Plan (CEMP).

11.5.4 Operational Phase

The assessment of the operational phase of the development will consider the potential for significant changes to air quality as a consequence of changes to traffic movements on the road

network as a consequence of the project. To determine the potential effects of the project the assessment will consider five scenarios, as follows:

- 2015 baseline scenario;
- 2020 future scenario, without project;
- 2020 future scenario, with project;
- 2037 future scenario, without project; and
- 2037 future scenario, with project.

A two-step approach will be undertaken for assessment of road traffic emissions for each scenario. The initial step will be a screening assessment of the changes to road traffic flows to identify roads which will experience a potentially significant change in traffic flows. The screening assessment will focus on identifying roads where:

- a change in traffic flows of greater than 10% is predicted on a road with a baseline traffic flow greater than 5,000 annual average daily traffic (AADT) flow is predicted;
- a change in traffic flows of greater than 5% is predicted on a road with a baseline traffic flow greater than 10,000 AADT flow is predicted; or
- an overall change in traffic flows of greater than 1,000 AADT is predicted.

The predicted change in traffic flows will be determined from traffic model predictions. The screening assessment will consider all roads within the Wider Study Area.

Any road identified as having a predicted change to traffic flows above the specified criteria, along with all roads within the core Study Area, will be considered in a detailed assessment utilising dispersion modelling to predict changes to pollutant concentrations.

A dispersion model will be developed of the 2015 baseline traffic scenario. The model will be developed using the proprietary dispersion model ADMS Road, an advance new generation model identified as fit for purpose within LAQM technical guidance.

The model will include for a digitised road network, with traffic emissions defined as a series of line emission sources within the model. The emissions will be calculated based on predicted traffic flows (including traffic speeds and breakdown of vehicle types) on each road and the in-built emissions factor database. Traffic flows will be provided from the traffic models discussed in Section 9.

The dispersion model will account for local topography and topology (including street canyons) and will include for meteorological data measured at Glasgow Airport for 2015.

The 2015 baseline model predictions will be verified against local monitoring data from within the study area in accordance with the methods described in LAQM technical guidance. The dispersion model will be refined based on the findings of the verification and a model adjustment factor determined. The adjusted baseline model will be used to establish future pollutant concentrations based on future traffic scenarios.

The dispersion model will be updated for the future scenarios with and without the project. The predicted change in concentrations will be established by the difference in predictions between the 'with and without' project scenarios. The significance of effect will be established based on the magnitude of effect.

11.5.5 Assessment of significance

The significance of effects will be evaluated based on the magnitude of change in air quality concentrations relative to the relevant air quality objective for the pollutant considered. The significance of effects will be evaluated based on the criteria defined in IAQM guidance for development control.

11.5.6 Mitigation

It is anticipated that appropriate controls and management for the release of dust and other emissions during the construction phase of the project will be specified as part of a Dust and Emissions Management Plan which form part of the CEMP. The Plan will be tailored to the findings of the impact assessment and will follow good practice guidance to minimise potential effects.

The requirement for mitigation for any adverse effects identified for the operational phase of the project will be identified during the detailed air quality impact assessment.

11.5.7 Remaining surveys

Monitoring of baseline air quality within the study area is ongoing and will be continued at least until December 2016 to provide a minimum 6-month period of monitoring (incorporating 3-months of summer and 3 months of autumn/winter). The requirement to extend the monitoring into 2017 will be assessed on completion of the survey and agreed in consultation with Renfrewshire Council.

11.6 Summary of Proposed EIA scope

The assessment will consider the potential effects to local air quality and residential amenity as a consequence of the construction and operational phases of the project.

The potential for adverse effects during the construction phase will be established through screening risk assessment of potential for adverse effects based on the likely magnitude of emissions, the separation distance between emission sources and receptors, and climatic factors affecting the transport of emissions. Where potential for significant adverse effects are identified a more detailed assessment will be undertaken to establish the source(s) of locations of concern. The findings of the study will be used to inform the development of appropriate emissions controls and management to mitigate any potential adverse effects.

The assessment of the operations phase will initially consider roads within the Wider Study Area and the predicted change in traffic flows to establish roads which will require further assessment. These roads, along with roads within the Core Study Area, will be considered in detailed dispersion modelling of scenarios, with and without the project. The predicted change in concentrations as a consequence of the project will be established based on comparison of with and without scenarios. The significance of effects will be established based on published industry guidance. The requirement to mitigate significant effects from the operational phase will be considered based on the predicted significance of effects.

12. Climate Change Mitigation and Adaptation

12.1 Introduction

This chapter sets out the proposed scope of the climate change mitigation and adaptation assessment, in accordance with the recent 2014 European Union Directive on EIA[31]. This Directive focuses greater attention on the threats and challenges that face the environment, requiring the consideration of the potential effects of projects on climate (Article 3) and climatic factors (Annex IV).

The EIA process provides an ideal platform for assessing the potential cumulative effects of a project and future climate change on sensitive receptors. It is accepted that the challenges and opportunities associated with climate change mitigation and adaptation should be considered side by side to optimise integration during the design stage.

Consideration of the proposed development's direct and indirect **impact on** climate change and **resilience to** climate change will be based on the recent IEMA guidance documents:

- Principles on Climate Change Mitigation and EIA (2010); and
- IEMA Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation (2015).

12.1.1 Climate Change Mitigation

The consequences of climate change have the potential to lead to significant interrelated cumulative environmental effects, including on the different areas considered by this EIA. The UK has legally binding greenhouse gas (GHG) emissions targets most notably a requirement to achieve an 80% reduction in GHG emissions by 2050 compared to a 1990 baseline. Development projects result in the release of GHGs to the atmosphere, with infrastructure projects, such as this City Deal project, being a particular contributor. Efforts to mitigate these emissions and contribute to the achievement of UK targets should therefore be considered as part of the EIA.

12.1.2 Note on Terminology

The term 'carbon dioxide equivalent' (CO2e) has been used to simplify comparison of the impact of different greenhouse gas emissions (GHGs) and refers to the equivalent global warming potential of carbon dioxide (CO_2). 'Capital Carbon' refers to the GHG emissions associated with the creation of an asset. 'Operational carbon' describes GHG emissions associated with the operation and maintenance of an asset. 'End-user' carbon describes GHG emissions from the end-users of an asset, e.g. emissions from vehicles.

[31] Directive 2014/52/EU amending the EIA Directive 2011/92/EU

12.2 Consultation

We would propose the following list of organisations would be consulted regarding the carbon assessment during the EIA:

- Renfrewshire Council (Carbon Management & Sustainability Teams);
- Transport Scotland;
- Highways England (as creator of the DMRB regional (end-user) carbon tool and its proposed recent updates);
- SNH; and
- SEPA.

12.2.1 Consultation Undertaken to Date

As part of the assessment undertaken to date, Transport Scotland was consulted regarding the capital carbon accounting methodology. Transport Scotland advised that their 2014 Carbon Management System (CMS) tool will shortly be revised, the 2015 version of the tool is anticipated to be available for the EIA for this project.

Highways England (HE) was consulted regarding the end-user carbon assessment undertaken to date. HE advised that the DMRB screening tool used for regional (end-user) carbon assessment is currently being revised and is not available at this time. However, it may be available for the EIA for this project.

12.2.2 Proposed Future Consultation

Transport Scotland and Highways England will be consulted further regarding the carbon assessment methodology. Following the principles of PAS 2080:2016, Carbon Management in Infrastructure, Sweco will also seek to engage early in the process with the potential supply chain regarding project sustainability objectives to minimise whole life carbon.

12.3 Baseline

For the capital and operational carbon the EIA baseline is taken as the current situation where none of the proposed infrastructure is built. Impacts from emissions associated with the construction, operation and decommissioning of the road infrastructure are then assessed.

12.4 Potential Effects from Carbon Emissions

12.4.1 Construction

As noted above, according to the Infrastructure Carbon Review (ICR)32, capital carbon refers to "*emissions associated with the creation of an asset*" and is applied to the construction phase of the project. It is noted to be comparable to the concept of capital cost.

[32] Infrastructure Carbon Review, 2013, Page 7

Activities associated with the construction of the proposed infrastructure elements (roads, structures and earthworks), such as the transport of construction materials on to site and excavation for bridge abutments, will all contribute to the capital carbon emissions of the proposed development. The potential impacts associated with these activities are generally considered to be long term in nature and contribute to global GHG emissions, intensifying the effects of climate change.

12.4.2 Operation

The Infrastructure Carbon Review (ICR) describes **operational** carbon as "emissions associated with the operation and maintenance of an asset" and is "analogous to operation cost and is quantified in tCO_2e/year".

The operation and maintenance over the design life of the proposed roads and structures will contribute to the operational carbon emissions of the proposed development, through various activities, e.g. street lighting, resurfacing, replacement of bridge joints, etc. The potential impacts associated with the operation and maintenance of the proposed project elements (roads and bridges) are also generally considered to be long term in nature and contribute to global GHG emissions and climate change.

The Infrastructure Carbon Review (ICR) describes ***end-user carbon*** as "*emissions from the end-users of infrastructure assets. Although not directly controlled by infrastructure asset owners, end-user carbon can be influenced*".

End-user carbon associated with the proposed development particularly refers to vehicle use of the infrastructure elements (roads and structures), therefore it is regarded as a continuous, long term source of GHG emissions.

It is worth noting that the Infrastructure Carbon Review (ICR)[33] defines ***whole life carbon*** as the combination of both capital and operational carbon and is *"analogous to whole life cost"*. Therefore consideration of the end-user carbon emissions associated with changes to traffic flows in the regional network as a result of the project in comparison to the capital and operational carbon emissions is also considered appropriate in assessing the net climate change impact (release of GHGs to the atmosphere) from the proposed project.

12.5 Proposed Scope of Assessment

The goal, scope and boundary of the assessment will be defined in accordance with Clause 7 of PAS 2080:2016 (Quantification of Carbon Emissions).

12.5.1 Guidelines

PAS 2080:2016, the new standard for carbon management in infrastructure, has informed the proposed approach to carbon assessment and reduction to date. The PAS 2080 principles will continue to be applied during the development of the specimen design to establish the baseline setting for the proposed development and will set out the measures taken as part of the carbon management process of the proposed project. Where relevant, how these measures align with the requirements of PAS 2080 will also be made clear.

[33] Infrastructure Carbon Review, 2013, Page 7

12.5.2 Methodology

At the specimen design stage, the whole life carbon of the proposed project will be considered in greater detail. The carbon assessment will focus on capital carbon emissions associated with the construction of the road, structures and associated earthworks and operational carbon emissions associated with the operation and maintenance of the roads and structures. The end-user carbon emissions associated with the vehicle use of the transport infrastructure will also be considered.

12.5.3 Proposed Approach

The carbon assessment of the different project infrastructure elements (roads, structures and earthworks), and end-user carbon undertaken in the project to date (i.e. for options assessment), will feed into the carbon baseline and target setting for the design development of the proposed project. The emission sources considered during the carbon assessment will be assessed in accordance with Clause 7 of PAS 2080.

The latest version available of sector-specific tools that allow for consistent assessment such as Transport Scotland's Carbon Management System (CMS) tool will be applied where possible. Where a GHG quantification is required to be calculated independently of such tools the study shall be conducted using generic, specific or average data from consistent methodologies and emissions factors as appropriate. It shall be applicable to the UK and reflect the technologies used in the supply chain for the project.

12.6 Climate Change Adaptation

Future projections of how our climate is changing are filled with uncertainties regarding the magnitude, frequency and spatial occurrence of how and when these changes will occur, making accurate assessment of potential effects challenging. However, it is vital to consider the potential effects (positive or negative) of how a project, its objectives and viability, will be affected by these potential future changes as well as the potential effects on the resilience of the receiving environment and communities.

The design and assessment stage of a project is widely agreed be crucial in the minimisation of vulnerability, maximising resilience and managing risk. All uncertainties and assumptions used within the EIA assessment, will be set out within the ES, providing a clear assessment methodology. In order to set out an appropriate proposed approach to this assessment, the following areas are covered in this chapter:

- requirement for assessment;
- identification of key regulations and policies on climate change;
- identification of relevant stakeholders/regulators;
- methodologies that will be adopted for the assessment; and
- identification of a climate change projection for use in the future assessments.

12.6.1 Requirement for Assessment

The key consideration at this scoping stage is whether there is potential for significant effects on the proposed project design arising from climate change to warrant further assessment in the EIA.

The proposed development includes bridge crossings, new roads and cycleways in tidal and fluvial areas where there is the current potential for flood events. It is recognised that the impacts of climate change, e.g. sea level rise and increased precipitation, has the potential to impact upon the accessibility, use and resilience of the project. Potential increases in temperature could also impact upon the operational capacity of the infrastructure or the cost of maintenance. These increases could also significantly change the existing ecosystems and biodiversity that are currently present and therefore impact upon future planting or habitat design/management proposals.

Based on these potential effects, it is considered necessary to consider climate change within the EIA process on an interdisciplinary basis which will consider the design, relevant climate parameters and identify suitable mitigation (pre and post design) that will cover the proposed lifespan of the project.

12.6.2 Key Regulations and Policies

Consideration of the project's resilience to climate change will be based on the recent IEMA guidance document IEMA Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation (2015). The guidance addresses aspects of the 2014 EIA Directive relevant to climate change adaptation. Other relevant programmes, guidance and policies that will be taken into account in the approach to climate change adaptation on the project include:

- Scotland's Climate Change Adaptation Framework (Scottish Government, 2009);
- Scotland's Climate Change Adaptation Framework: Transport Sector Action Plan (Scottish Government, 2011);
- A Climate Change Risk Assessment for Scotland (Defra, 2012);
- Climate Ready Scotland: Scottish Climate Change Adaptation Programme (The Scottish Government, 2014);
- Climate Ready Clyde Vision Document (Adaptation Scotland, Sniffer);
- Climate Change Adaptation in the GCV (GCV Green Network); and
- Green Infrastructure for Overheating Adaptation in Glasgow (GCV Green Network, 2013).

A regional Climate Change and Strategy Action Plan for Glasgow and the Clyde Valley is understood to be in development and will also be taken into consideration if available at the time of the EIA.

12.6.3 Relevant Stakeholders and Regulators

It is proposed that the following list of organisations will be consulted regarding the climate change projections and to discuss the potential effects to be considered.

- Renfrewshire Council (Carbon Management & Sustainability Teams);
- Adaption Scotland;
- Central Scotland Green Network;
- Clydeplan, Glasgow and Clyde Valley Strategic Development Planning Authority;
- Forestry Commission;
- SNH; and
- SEPA.

12.6.4 Methodology

Workshops will be held with each of the disciplines inputting into the EIA to establish a consistent approach to consideration of climate change adaptation. The methodology applied will vary for each discipline and will follow the IEMA Guidance.

12.6.5 Climate Change Projection and Baseline

To accurately assess the potential effects arising from climate change, it is important to agree relevant climate change projections that will be applied to the EIA. Projections will be based on the best available scientific information and future projections, based on a range of probabilities, e.g. the Met Office (2009) UKCP09 maps and key findings[34]. The future environmental baseline will be informed with cognisance of these projections and in accordance with IEMA guidance.

Climate change parameters will be taken into account with particular reference to resilience in the rainfall-related areas of drainage infrastructure and flood risk management. Potential temperature increases will also be considered, noting that SEPA suggests temperatures in Scotland may rise by up to 4 degrees C by the end of the century[35].

[34] http://ukclimateprojections.metoffice.gov.uk/21708

[35] http://www.sepa.org.uk/environment/climate-change/the-effects-of-climate-change/

13. Proposed Approach to EIA

13.1 Introduction

This section outlines the overall approach which is proposed for the EIA. The following information is presented:

- Section 13.2 provides an overview of the approach to securing the required planning and other consents for the project and how the EIA supports these;
- Section 13.3 highlights the overall methodology for the prediction and assessment of environmental impacts and how the significance of environmental effects is to be evaluated;
- Section 13.4 presents a summary of the proposed approach to assessment and reporting of the potential for cumulative effects of the project with other major development proposals; and
- Section 13.5 sets out the proposed draft structure for the Environmental Statement (ES).

13.2 Planning and Consenting Strategy

It is intended that a planning application (or applications) will be submitted by the Renfrewshire Council City Deal team (the Applicant) for the GAIA project to Renfrewshire Council and a marine licence application (and possibly a Harbour Revision Order) will be made to Marine Scotland. Consent to develop the project will be sought under the Town and Country Planning (Scotland) Act 1997, as amended by The Planning etc. (Scotland) Act 2006. At this stage it is anticipated that an application for full (detailed) planning consents will be made.

The proposed development has been positively screened for EIA by Renfrewshire Council (see Section 1.2) and an EIA will be undertaken in accordance with the requirements of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011. Consultation with Marine Scotland has confirmed that EIA is also required for the GAIA project works with the potential to affect the marine environment under the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended). The EIA will therefore be undertaken with reference to both sets of EIA Regulations.

At this stage it is not anticipated that a Habitats Regulations Appraisal (HRA) will be required. Consultation with SNH has indicated that they do not consider there is potential for likely significant effects from the proposed development on the two closest Natura sites to the GAIA project (the Inner Clyde Special Protection Area (SPA) and the Black Cart SPA). Consultation with Marine Scotland has identified some potential for connectivity between the proposed development and the Endrick Water Special Area of Conservation (SAC), a tributary of Loch Lomond which is connected with the River Clyde via the River Leven which outflows to the Clyde approximately 12km downstream of the confluence with the Cart Water. An HRA screening exercise will be undertaken in relation to the potential for likely significant effects on this SAC and the findings agreed with Marine Scotland. If HRA is required then this will be undertaken and the findings captured within the ES.

The proposed development includes proposals for new bridge crossings on the White Cart Water and a number of other development consents are anticipated to be required in addition to planning permission. These may include:

- a Scheme for Crossing of Navigable Waters under Section 75 of the Roads (Scotland) Act (http://www.legislation.gov.uk/ukpga/1984/54) ;
- a Marine Licence for works to be constructed below Mean High Water Springs; and, potentially;
- a Seabed Lease from the Crown Estate.

Other consents which may be required for the proposed development include:

- Traffic Regulation Orders including Redetermination Orders and Stopping Up Orders;
- Compulsory Purchase Orders;
- Controlled Activities Licences; and
- Protected Species Licences.

Applications for these consents will be progressed in parallel with the planning applications, or on programmes to be defined with the relevant consenting authorities.

13.3 Assessment of Environmental Effects and Significance

The environmental assessment will take account of information on the design and characteristics of each element of the proposed development and its likely construction and operational effects including the potential to change traffic flows on existing roads in the study area[36]. This information will be used to inform the prediction of potential impacts and their likely scale (or magnitude).

The assessment will be undertaken for the preferred scheme taking account of the land required for construction and permanent development of the proposals including mitigation. The EIA process is being integrated with the development of the design for the preferred scheme to help reduce impacts through the design and planning process and the ES will report the predicted effects of the final (frozen) design.

The potential significance of environmental impacts will be determined by taking account of the magnitude of impact in combination with the sensitivity of the baseline (or 'receiving' environment). This will include use of matrices to help inform the evaluation of significant effects which are defined as those which in the judgement of the EIA team should be brought to the attention of decision makers, and which can be thought of as analogous to the concept of material considerations in the development management process. The approach to characterising the baseline and its sensitivity will be supported through the use of a project GIS-based analysis with respect to surrounding constraints and areas of environmental sensitivity. The predicted environmental effects of the proposal will be reported after assumed key mitigation has been taken into account (i.e. residual effects).

[36] Transport modelling is being undertaken for a series of future year scenarios and the outputs will be used to inform the EIA

Impact evaluation for each topic area will take account of relevant EIA guidance and will draw on the expertise and professional judgement of key specialists in each relevant discipline. Topic specific consideration of significance will be set out in each key chapter of the ES.

13.4 Cumulative Environmental Assessment

In parallel with the proposed GAIA development, the Applicant is seeking to promote the Clyde Waterfront and Renfrew Riverside (CWRR) City Deal project (see **Section 1.1**). The two projects are adjacent in geographical terms and they have extensive synergies in their objectives and potential impacts. The EIA will take account of the potential for significant cumulative environmental effects across these two projects in particular. A cumulative environmental assessment (CEA) will be undertaken and presented in its own volume of the ES (see **Section 13.5**).

Cumulative effects have been defined as 'those that result from additive effects caused by other past, present or reasonably foreseeable actions together with the project itself and from synergistic effects, which arise from the reaction between the effects of the project on different aspects of the environment'. This may be summarised as those effects added by, or that result from, the interaction of two or more projects or activities[37] [38].

The CEA will focus on the prediction of significant cumulative effects taking account of the following 'scenarios':

- the predicted environmental effects of the CWRR and GAIA projects when combined including:
  - the physical interventions in each project;
  - the combined effects of the projects on modelled traffic flow changes;
- the predicted effects of the 'build out' of residential and commercial development anticipated in the masterplan (see Section 2.7) for City Deal as a result of development of CWRR and GAIA in the longer term; and
- the predicted effects of the CWRR and GAIA projects, plus masterplan build out plus any other reasonably foreseeable major development proposals.

The CEA will identify any 'step' changes in significance for the predicted cumulative effects in each of the above three scenarios. The predicted effects of the proposals on noise, local and global air quality in particular due to changes in future traffic flows will draw from traffic modelling. This is likely to be based on an assumed GAIA and CWRR opening year of 2020 and a future assessment year of 2037.

The identification of other 'reasonably foreseeable' major developments will be agreed with the relevant planning authorities and is proposed to be restricted to a small number of key proposals which are of regional scale i.e. with the potential for significant effects.

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[37] Source: Durning B & Broderick M (2015) Mini Review of Current Practice in the assessment of Cumulative Environmental Effects of UK Offshore Renewable Energy Developments when carried out to aid decision making in a regulatory context. Oxford Brookes University/NERC http://www.nerc.ac.uk/innovation/activities/infrastructure/offshore/cea-mini/

[38] Scottish Government Planning Advice Note 1/2013 (Environmental Impact Assessment) similarly defines two cumulative impact types as 'impact interactions' and 'additive impacts'

Developments which have planning consent and are likely to be constructed prior to 2020 will be included as part of the future baseline for the assessment, rather than specifically as 'cumulative' projects.

To make the CEA process manageable the focus will be on the prediction and evaluation of *significant* cumulative effects. A focused review of the findings of the GAIA and CWRR EIAs in their own right will inform the consideration of significant effect cumulation when the projects are combined. The CEA will also focus on key receptor groups (sometimes called 'valued environmental components') which are the human, physical, cultural and biological receptors which may be significantly affected by cumulative impacts. Defining these groups allows the CEA to focus on key effects/receptors rather than following the baseline topic-led approach in EIA. This also allows for more concise reporting.

The approach to assessing cumulative effects will follow a series of steps anticipated as follows:

- Step 1. identification of predicted significant effects from the developing EIAs for GAIA and CWRR together with those from any available documentation for other projects to be considered;
- Step 2. based on this review, identify the key receptors/groups with the potential to be significantly affected by cumulative impacts and characterise these receptors including their sensitivity and any relevant environmental thresholds;
- Step 3. scope the CEA by listing (e.g. in a matrix) the potentially significant effects from step 1 against the receptor groups in step 2 to identify the potential for significant cumulative effects taking account of both additive and synergistic effects; and
- Step 4. evaluating the significance of the predicted cumulative effects which have been scoped into the assessment from step 3 on the key receptor groups, taking account as far as practical of future baseline conditions.

Significance of residual[39] cumulative and in-combination environmental effects will be evaluated taking account of mitigation measures developed specifically for each topic area based on the identification and scoping of potentially significant cumulative impacts. This process will take account of mitigation commitments already made for the project EIAs. Measures will therefore be presented as additional commitments in the CEA where these are considered necessary to avoid, reduce or offset potentially significant cumulative effects which cannot be mitigated by measures determined for the individual projects' effects.

The approach to assessment of environmental effects will follow similar methodologies in each technical (topic) area to the EIA but will be tailored to be proportionate to the overall CEA approach and taking account of the focus on key receptors. This is expected to result in a shorter and more focused assessment than for the EIAs of the individual projects.

The CEA will consider and report the potential for short term cumulative impacts associated with, for example, concurrent construction of GAIA and CWRR (and any other significant development proposal). It will then report the longer term potential for the two City Deal projects and the anticipated masterplan development they will stimulate to have cumulative permanent and operational effects.

[39] Residual effects are those evaluated following mitigation

The CEA will also assess the cumulative predicted socio-economic benefits of the GAIA and CWRR proposals. This assessment will draw on wider work being undertaken to inform the City Deal programme. It will predict the employment and economic impacts of the development which is anticipated (in the masterplan) in the longer term e.g. resulting from the development of commercial and residential development on land opened up as a result of the transport interventions from GAIA and CWRR.

14. Summary of EIA Scoping

14.1 Summary

Renfrewshire Council City Deal Team is seeking permission to develop two new bridges across the White Cart Water, the realignment of a section of Abbotsinch Road, a Gateway route between airport and paisley town centre, and new cycle and pedestrian links to Inchinnan Business Park. New and upgraded cycling and pedestrian links will also form part of all new infrastructure proposed.

The proposed development falls within Schedule 2 of the TCP EIA Regulations and under MW EIA Regulations with the potential for significant environmental effects. An EIA will be undertaken, and an environmental statement ES produced to accompany the planning application.

This EIA Scoping Report supports a formal request for a Scoping Opinion from Renfrewshire Council and Marine Scotland, as the EIA competent authorities.

Where there are factors which have the potential to cause significant environmental impacts, these will be examined and the results included within the ES.

The planning application for the proposed development will be accompanied by a supporting Planning Statement as well as the ES.

The ES will draw upon the interactions identified in this Scoping Report, in order to provide an assessment of the scale and significance of the potential impacts which are predicted to occur as a result of the proposed development. The ES will propose mitigation measures, as appropriate, to minimise and potential adverse impacts.

As an iterative process, the scope of the assessment will be refined as part of this scoping process but also following consultation with a wide range of stakeholders, statutory agencies and interested parties.

14.2 Issues to be Scoped Out

This scoping exercise has been undertaken to help enable the project to be designed to avoid or minimise negative environmental impacts and provides an opportunity to incorporate positive environmental enhancements into the project. It has also been completed to focus the scope of the EIA on only those '*likely significant effects*', to provide a more pragmatic approach.

The scope of works for each environmental topic is set out in Chapters 3 to 12 of the Scoping Report. The principal elements that are proposed to be scoped out from further detailed consideration in the EIA are set out in **Table 14.1**.

Table 14.1 Elements to be scoped out of the Environmental Technical Assessments

Topic	Elements to be scoped out
Land use and Communities	• impacts upon equestrians; • impacts from demolition of properties.
Geology, hydrogeology, soils and contaminated land	All potential effects are currently scoped in, however following the completion of the detailed Site Investigation, some of these may not be required. Any changes to proposed scope will be agreed in advance with the consultees where required.
Water quality, drainage and flood defence	• Method A of DMRB (water quality modelling for routine runoff) would not be undertaken as discharges will be to transitional waters. • No water quality surveys or monitoring are proposed as part of the EIA. • Detailed pollutant transport modelling in line with SEPA's WAT-SG-11 Guidance[40] is not required as there are no designated shellfish or bathing waters in the vicinity of the proposed project, as agreed with SEPA.
Landscape, townscape and visual impact	Requirement for extensive mitigation planting will be limited and therefore there is no requirement for a Year 15 assessment.
Ecology and nature conservation	Surveys for • great crested newts; • breeding birds; • fresh water fish species or habitats; and • NVC Surveys. Full Habitats Regulations Appraisal (HRA) (although an HRA screening appraisal will be undertaken for Endrick Water SAC)
Archaeology and cultural heritage	A desk based assessment is currently being undertaken assessing the potential impacts identified in Chapter 8. If that assessment predicted that some impacts will clearly lead to no effect, or a negligible effect on heritage assets, it is proposed that these will be scoped out of the final environmental statement following further consultation with the consultees.
Noise and vibration	Groundborne vibration
Air Quality	All potential effects are currently scoped in. Further assessment will confirm the need for quantitative assessment of construction related air quality in accordance with relevant technical guidance.

[40] SEPA Supporting Guidance (WAT-SG-11): Modelling Coastal and Transitional Discharges, v3.0 April 2013

14.3 Format of the Environmental Statement

It is proposed that a single multi-volume ES is prepared to support the planning (and other) applications for the proposed development (GAIA) and which also incorporates the findings of the EIA for the neighbouring CWRR project. This allows for both a 'standalone' presentation of the findings of each project and an integrated approach presenting the cumulative effects assessment for the two projects. This approach has been based on legal advice provided to the Applicant which seeks to provide flexibility through separate presentation of the EIAs for the two projects but which also brings them together to reflect their key inter-relationships and cumulative effects.

The environmental information produced as part of the EIA will be submitted within an ES report. The ES which will comprise a series of technical reports, figures and appendices combined within four volumes as set out below:

- **Volume 1**: Introductory sections for the ES and baseline descriptions for the GAIA and CWRR projects;
- **Volume 2**: Reports the findings of the predicted environmental effects of the CWRR project;
- **Volume 3**: Reports the findings of the predicted environmental effects of the GAIA project; and
- **Volume 4**: Reports the findings of the predicted cumulative environmental effects for GAIA and CWRR projects in combination.

This approach is proposed to recognise the geographical proximity of the two Renfrewshire City Deal projects and their potential to be promoted and developed over similar timescales that could result in cumulative effects.

The information provided within the ES will comply with Schedule 4 of the TCP EIA Regulations and Schedule 3 of the MW EIA Regulations; '*Information to be included within an Environmental Statement'*. The ES will be a publicly available document on the Renfrewshire City Deal website that will be made available on request as hard copy (for a charge) and on display with the scheme documents during the statutory consultation period in locations to be agreed with the relevant EIA competent authorities.

14.4 How to Comment?

This Scoping Report has formed a package of information presented to all regulatory authority, Renfrewshire Council and Marine Scotland requesting their official EIA Scoping Opinion, who will forward it to an agreed list of consultees (**Appendix 14.1**) to gain agreement for the scope of the environmental assessment to be carried out (EIA). Consultee comments will be summarised in the ES with a note on how they have been addressed, and they will be used to help inform the development of the design.

Please send your Scoping Response to the following address;

citydeal@renfrewshire.gov.uk

Please ensure that you title all responses "**GAIA City Deal – Scoping Response**".

If you have any additional baseline information, you wish to comment on the scope of the assessment or you have any other information that you think is relevant to this project please also contact the City Deal team on the email address set out above.

Appendices

Appendix 4.1: Schedule of Historical Contamination Sources

Drawing Source Reference Number	Potential Contamination Source	Historical Map File Reference	Year of First Appearance	Risk Ranking*
1	Railway line	GS-2673721_SS_1_1	1857-1858	Low/Moderate
2	Gasometer	GS-2673721_SS_2_3	1895-1896	High
3	Kilbowie Iron Works	GS-2673721_SS_2_3	1895-1896	Moderate
4	Works	GS-2673721_SS_2_3	1955-1956	Low/Moderate
5	Works	GS-2673721_SS_3_3	1971-1973	Low/Moderate
6	Brickhouse	GS-2673721_SS_2_3	1861	Low/Moderate
7	Chemical Works	GS-2673721_SS_2_3	1895-1896	High
7	Chemical Works & Gravel Pit	GS-2673721_SS_2_3	1915-1920	High
8	Nursery	GS-2673721_SS_3_3	1922-1924	Low/Moderate
9	Clydebank Engineering & Shipbuilding Works	GS-2673721_SS_2_3	1895-1896	Low/Moderate
10	Refuse Destructor	GS-2673721_SS_2_3	1923	Low/Moderate
11	Old Quarry	GS-2673721_SS_3_3	1895-1896	Low/Moderate
12	Old Quarry	GS-2673721_SS_1_3	1857	Low/Moderate
13	Refuse Tip	GS-2673721_SS_2_3	2002	Low/Moderate
14	Goods Shed	GS-2673721_SS_2_3	1923	Low/Moderate
14	Engine Shed & Drill Hall	GS-2673721_SS_2_3	1923	Low/Moderate
15	Dam	GS-2673721_SS_3_3	1861	Low/Moderate
16	Brick & Tile Works	GS-2673721_SS_3_3	1895-1896	Low/Moderate
17	Coal Pit	GS-2673721_SS_3_3	1861	Low/Moderate
18	Sewage Tank	GS-2673721_SS_1_3	1912	Low/Moderate
19	Works	GS-2673721_SS_2_3	1985-1987	Low/Moderate
19	Works	GS-2673721_1250scale_7_11	1982-1986	Low/Moderate
20	Bakery	GS-2673721_SS_2_3	1922-1924	Low/Moderate
20	Depot	GS-2673721_SS_2_3	1985-1987	Low/Moderate
21	Elgin Works (Engineering)	GS-2673721_SS_2_3	1915-1920	Low/Moderate
22	Garage	GS-2673721_SS_1_3	1974-1978	Low/Moderate
23	Curling Pond	GS-2673721_SS_1_3	1895	Low/Moderate
24	Reservoirs	GS-2673721_SS_1_3	1985-1987	Low/Moderate
25	Gravel Pit	GS-2673721_SS_2_3	1911-1914	Low/Moderate
26	Sewage Treatment works	GS-2673721_SS_2_3	1985-1987	Low/Moderate
27	Electricity Generation Station	GS-2673721_SS_2_3	1971-1974	Low/Moderate
27	Fuel Depot	GS-2673721_SS_2_3	2002	High
28	Works (including Cabinet Works)	GS-2673721_SS_2_3	1971-1974	Low/Moderate
30	Corn Mill	GS-2673721_SS_3_3	1861	Low/Moderate
31	Standard Laundry	GS-2673721_SS_3_3	1914	Low/Moderate
31	Motor Works	GS-2673721_SS_3_3	1934	Low/Moderate
31	Factory	GS-2673721_SS_3_3	1971-1973	Low/Moderate
32	Motor works	GS-2673721_SS_3_3	1914	Low/Moderate
32	Albion Works Industrial Estate	GS-2673721_SS_3_3	1983-1987	Low/Moderate
33	Shipbuilding Yard	GS-2673721_SS_2_3	1895	Low/Moderate
33	Timber Dock	GS-2673721_SS_2_3	1895	Low/Moderate
33	Scrap Yard	GS-2673721_SS_2_3	2002	Low/Moderate
34	Flooring Works	GS-2673721_1250scale_8_10	1948-1949	Low/Moderate
34	Asphalt Works	GS-2673721_1250scale_8_10	1966-1969	Moderate
35	Works	GS-2673721_SS_3_3	1914	Low/Moderate
35	Warehouses	GS-2673721_SS_3_3	1934	Low/Moderate
35	Joinery & Cabinet Works	GS-2673721_1250scale_8_10	1948-1949	Low/Moderate
35	Depots & Factory	GS-2673721_1250scale_8_10	1990-1992	Low/Moderate
36	Distillery	GS-2673721_SS_3_3	1857	Low/Moderate
37	Car Breakers Yard	GS-2673721_1250scale_8_10	1990-1992	Low/Moderate
38	Omnibus Depot	GS-2673721_SS_1_3	1939	Low/Moderate
39	Nursery	GS-2673721_SS_2_3	1938-1939	Low/Moderate
40	Spoil Heaps	GS-2673721_SS_2_3	1895-1896	Low/Moderate
41	Quarry	GS-2673721_LS_4_8	1897	Low/Moderate
42	Curling Pond	GS-2673721_SS_2_3	1857	Low/Moderate
42	Curling Pond	GS-2673721_SS_2_3	1861	Low/Moderate
42	Curling Pond	GS-2673721_SS_2_3	1895-1896	Low/Moderate
43	London Works (Shipbuilding & Engineering)	GS-2673721_SS_3_3	1857	Low/Moderate
43	London Works (Shipbuilding & Engineering)	GS-2673721_SS_2_3	1857	Low/Moderate
43	Ship Building Yard	GS-2673721_SS_2_3	1857	Low/Moderate
43	Storage Depot & Factory	GS-2673721_SS_2_3	1973	Low/Moderate
43	Meadowside Industrial Estate	GS-2673721_SS_2_3	1985	Low/Moderate
43	Car Breakers Yard	GS-2673721_1250scale_8_10	1992	Low/Moderate
44	Clyde Trustees Works	GS-2673721_SS_3_3	1857	Low/Moderate
44	Clyde Valley Electrical Power Station	GS-2673721_SS_3_3	1914	Moderate
45	Yoker Mains & Dam	GS-2673721_SS_3_3	1857	Low/Moderate
45	Engine Shed	GS-2673721_SS_3_3	1914	Low/Moderate
45	Yoker Industrial Estate	GS-2673721_SS_3_3	1983-1987	Low/Moderate
46	Works	GS-2673721_SS_1_2	1974	Low/Moderate
46	Works & Factory associated with Inchinnan Industrial Estate	GS-2673721_SS_1_2	1985	Low/Moderate
46	Tyre Works	GS-2673721_SS_1_3	1939	Low/Moderate
46	Factory and Works	GS-2673721_SS_1_3	1985-1987	Low/Moderate
46	Inchinnan Industrial Estate	GS-2673721_SS_1_3	2002	Low/Moderate
47	Allands Nursery	GS-2673721_SS_1_3	1955	Low/Moderate
47	Factory	GS-2673721_SS_1_3	2010	Low/Moderate
48	Tank	GS-2673721_SS_1_2	1985	Low/Moderate
49	Gasholder	GS-2673721_LS_4_7	1895-1897	High
50	Laundry	GS-2673721_SS_2_3	1857	Low/Moderate
50	Gas Works	GS-2673721_SS_2_3	1895	High
51	Sewage Disposal Works	GS-2673721_SS_2_3	1955-1956	Low/Moderate
52	Contractors Yard	GS-2673721_SS_2_3	1971-1974	Low/Moderate
53	Oil Refinery	GS-2673721_SS_3_3	1971-1973	High
54	Metal Works	GS-2673721_SS_3_3	1914	Moderate
55	Bon-Accord Works	GS-2673721_SS_3_3	1914	Low/Moderate

56	Elderslie Brick Works	GS-2673721_SS_3_3	1934	Low/Moderate
57	Works	GS-2673721_SS_3_2	1966	Low/Moderate
57	Docks - works	GS-2673721_SS_3_3	1922-1924	Low/Moderate
57	Elderslie Dockyard	GS-2673721_SS_3_3	1934	Low/Moderate
58	Laboratory	GS-2673721_SS_2_2	1911	Low/Moderate
58	Warehouses	GS-2673721_SS_2_2	1973-1974	Low/Moderate
58	Laboratory	GS-2673721_SS_2_3	1911-1914	Low/Moderate
58	Bonded Warehouses	GS-2673721_SS_2_3	1971-1974	Low/Moderate
58	Tank & Depot	GS-2673721_SS_2_3	1985-1987	Low/Moderate
59	Old Shaft	GS-2673721_SS_2_2	1895-1896	Low/Moderate
60	Gas Works	GS-2673721_SS_3_3	1857	High
60	Gas Works	GS-2673721_SS_3_3	1914	High
61	Clyde Navigation Works (Shipbuilding)	GS-2673721_SS_3_2	1911-1914	Low/Moderate
61	Clyde Navigation Works (Shipbuilding)	GS-2673721_SS_3_3	1914	Low/Moderate
62	Yacht Works	GS-2673721_SS_3_2	1938	Low/Moderate
62	Boatbuilding Works	GS-2673721_SS_3_2	1956	Low/Moderate
62	Boatbuilding Yard	GS-2673721_SS_3_3	1955-1956	Low/Moderate
63	Factory	GS-2673721_SS_3_2	1956	Low/Moderate
63	Factory (Animal Feeding Stuffs)	GS-2673721_SS_3_3	1955-1956	Low/Moderate
64	Goods Shed	GS-2673721_SS_2_2	1924	Low/Moderate
65	Chemical Works	GS-2673721_SS_2_2	1857	High
66	Depot	GS-2673721_SS_3_2	1987	Low/Moderate
67	Factory	GS-2673721_SS_3_2	1956	Low/Moderate
67	Travelling Crane and Coal Conveyors	GS-2673721_LS_8_6	1955	Low/Moderate
68	Spoil Heap	GS-2673721_1250scale_10_8	1968	Low/Moderate
69	Yarrow's Shipbuilding Works	GS-2673721_SS_3_2	1911-1914	Low/Moderate
70	Albion Motor Car Works	GS-2673721_SS_3_2	1911-1914	Low/Moderate
71	Cement Works	GS-2673721_SS_2_2	1955-1956	Low/Moderate
71	Garage	GS-2673721_SS_2_2	1955-1956	Low/Moderate
72	Refuse Heap	GS-2673721_LS_6_6	1949	Low/Moderate
73	Engineering Works	GS-2673721_1250scale_8_8	1972	Low/Moderate
74	Garage	GS-2673721_1250scale_8_8	1972	Low/Moderate
75	Workshop	GS-2673721_1250scale_8_8	1972	Low/Moderate
76	Goods Shed & Electricity Sub Station	GS-2673721_LS_7_6	1913	Low/Moderate
77	Power Station	GS-2673721_SS_3_2	1966	Moderate
78	Braehead Works	GS-2673721_SS_3_2	1956	Low/Moderate
79	Coventry Ordnance Works	GS-2673721_SS_3_2	1911-1914	Moderate
79	Diesel Engine Works	GS-2673721_SS_3_2	1934	Low/Moderate
80	Balmoral Iron Yard	GS-2673721_SS_3_2	1911-1914	Low/Moderate
81	Iron Works	GS-2673721_SS_3_2	1911-1914	Moderate
82	Roxburgh Works	GS-2673721_SS_3_2	1911-1914	Moderate
83	Scotstoun Iron Works	GS-2673721_SS_3_2	1911-1914	Moderate
84	Scotstoun Shipbuilding Yard	GS-2673721_SS_3_2	1895-1896	Low/Moderate
85	Glasgow Airport	GS-2673721_SS_1_2	1968	Low/Moderate
86	Engineering Works	GS-2673721_SS_2_2	1911	Low/Moderate
87	Rifle Range	GS-2673721_SS_2_2	1911	Moderate
88	Carntyne Steel Foundry	GS-2673721_SS_2_2	1911	Moderate
89	Works	GS-2673721_SS_2_2	1973-1974	Low/Moderate
89	Albert Laundry	GS-2673721_SS_2_2	1924	Low/Moderate
90	Garage	GS-2673721_1250scale_8_7	1982-1984	Low/Moderate
91	Works	GS-2673721_SS_3_2	1987	Low/Moderate
92	Braehead Transit Depot	GS-2673721_SS_3_2	1956	Low/Moderate
93	Nursery	GS-2673721_1250scale_8_7	1949	Low/Moderate
94	Old Corn Mill	GS-2673721_SS_3_2	1857	Low/Moderate
95	Dye Works	GS-2673721_SS_3_2	1857	High
96	Works	GS-2673721_SS_3_2	1973	Low/Moderate
97	Gasometer	GS-2673721_SS_1_2	1857	High
98	Brick Works	GS-2673721_SS_1_2	1895	Low/Moderate
98	Walkinshaw Colliery & Shaft	GS-2673721_SS_1_2	1895	Moderate
99	Works	GS-2673721_SS_2_2	1955-1956	Low/Moderate
100	Renfrew Forge & Steel Works	GS-2673721_SS_2_2	1895-1896	Moderate
101	Albert Cabinet Works	GS-2673721_SS_2_2	1895-1896	Low/Moderate
101	Chy Works	GS-2673721_SS_2_2	1973-1974	Low/Moderate
102	Rubber Works	GS-2673721_SS_2_2	1939	Low/Moderate
103	Refuse Destructor	GS-2673721_SS_3_2	1939	Low/Moderate
104	Reservoir	GS-2673721_SS_3_2	1857	Low/Moderate
104	Meadowside Works & Tanks	GS-2673721_SS_3_2	1956	Low/Moderate
104	Renfrew Airport	GS-2673721_SS_3_2	1966	Low/Moderate
105	Cable Works	GS-2673721_SS_3_2	1939	Low/Moderate
106	Deanside Depot	GS-2673721_SS_3_2	1911-1914	Low/Moderate
107	Bonded Warehouses	GS-2673721_SS_3_2	1987	Low/Moderate
108	Goods Shed	GS-2673721_SS_3_2	1934	Low/Moderate
108	Goods Shed	GS-2673721_SS_3_2	1956	Low/Moderate
108	Goods Shed	GS-2673721_SS_3_2	1973	Low/Moderate
109	Thistle Works (Shipbuilding & Engineering)	GS-2673721_SS_2_2	1895-1896	Low/Moderate
109	Depot	GS-2673721_SS_2_2	1955-1956	Low/Moderate
109	Thistle Works (Engineering & Shipbuilding)	GS-2673721_SS_1_2	1895	Low/Moderate
110	Engineering Works	GS-2673721_SS_2_2	1939	Low/Moderate
110	Moorpark Works	GS-2673721_SS_2_2	1939	Low/Moderate
110	Works & Factory	GS-2673721_SS_2_2	1985-1987	Low/Moderate
111	Tramway Depot	GS-2673721_SS_2_2	1911	Low/Moderate
112	Moorpark Mill (Corn)	GS-2673721_SS_2_2	1857	Low/Moderate
112	Cotton Spinning Factory	GS-2673721_SS_2_2	1895-1896	Low/Moderate
113	Poultry Packing Station	GS-2673721_SS_1_2	1974	Low/Moderate
114	Walkinshaw Pit (Ironstone)	GS-2673721_SS_1_2	1857	Low/Moderate
114	Old Shaft	GS-2673721_SS_1_2	1895	Low/Moderate

115	Paisley Foundry	GS-2673721_SS_2_2	1911-1914	Moderate
115	Possible Spoil Deposition	GS-2673721_SS_2_2	1973-1974	Low/Moderate
116	St Rollox Works (Soap & Candle)	GS-2673721_SS_2_2	1934-1939	Low/Moderate
116	Preserve Factory	GS-2673721_SS_2_2	1934-1939	Low/Moderate
116	Reservoir	GS-2673721_SS_2_2	1934-1939	Low/Moderate
116	Depot & Mill	GS-2673721_SS_2_2	1973-1974	Low/Moderate
117	Shipbuilding Yard	GS-2673721_SS_2_2	1895-1896	Low/Moderate
117	Shipbuilding Yard	GS-2673721_SS_1_2	1895	Low/Moderate
118	Sewage Works	GS-2673721_SS_2_2	1973-1974	Low/Moderate
118	Sewage Works	GS-2673721_SS_2_2	1985-1987	Low/Moderate
119	Abattoir	GS-2673721_SS_2_2	1973-1974	Moderate
119	Sub Station	GS-2673721_SS_2_2	1985-1987	Low/Moderate
120	North Sandyford Works (Cement)	GS-2673721_1250scale_4_4	1948	Low/Moderate
121	Brittannia Works	GS-2673721_SS_2_2	1939	Low/Moderate
121	St Andrews Works	GS-2673721_SS_2_2	1955-1956	Low/Moderate
122	New Mains	GS-2673721_SS_2_2	1939	Low/Moderate
122	Tanks	GS-2673721_SS_2_2	1955-1956	Low/Moderate
123	Engineering Works	GS-2673721_SS_3_2	1939	Low/Moderate
123	Engineering Works	GS-2673721_SS_3_2	1956	Low/Moderate
123	Sternette Works & Kelvin Works	GS-2673721_SS_3_2	1956	Low/Moderate
123	Nursery	GS-2673721_SS_3_2	1956	Low/Moderate
124	Deanside Transit Depot	GS-2673721_SS_3_2	1956	Low/Moderate
125	Dock Saw Mills	GS-2673721_SS_3_2	1911-1914	Moderate
126	Timber Yard	GS-2673721_SS_3_2	1987	Moderate
127	Bogmoor Road Storage Yard	GS-2673721_SS_3_2	1956	Low/Moderate
127	Depot	GS-2673721_SS_3_2	1966	Low/Moderate
128	Shieldhall Saw Mills	GS-2673721_SS_3_2	1934	Moderate
129	Shieldhall Co-operative Works	GS-2673721_SS_3_2	1911-1914	Low/Moderate
130	Boghead Pit (Ironstone)	GS-2673721_SS_1_1	1857-1858	Low/Moderate
130	Walkinshaw Brick Works	GS-2673721_SS_1_1	1895-1896	Low/Moderate
131	Hermand Oil Works	GS-2673721_SS_1_1	1895-1896	High
132	Warehouse	GS-2673721_SS_1_2	1974	Low/Moderate
132	Phoenix Industrial Estate	GS-2673721_SS_1_2	1985	Low/Moderate
133	Brick Works	GS-2673721_SS_1_1	1895-1896	Moderate
133	Works	GS-2673721_SS_2_2	1934-1939	Low/Moderate
134	Phoenix Works (Shipbuilding & Engineering)	GS-2673721_SS_1_1	1912-1916	Low/Moderate
134	Phoenix Works (Shipbuilding & Engineering)	GS-2673721_SS_2_1	1895-1896	Low/Moderate
134	Phoenix Works (Shipbuilding & Engineering)	GS-2673721_SS_2_2	1895-1896	Low/Moderate
134	Phoenix Works	GS-2673721_SS_1_2	1895	Low/Moderate
135	Sandyford Works (Chemical)	GS-2673721_SS_2_2	1934-1939	High
135	Works	GS-2673721_SS_2_2	1955-1956	Low/Moderate
135	Abbotsinch Industrial Estate	GS-2673721_SS_2_2	1985-1987	Low/Moderate
136	Printing Works	GS-2673721_SS_2_1	1971-1976	High
137	Arkleston Print Works	GS-2673721_SS_2_1	1857-1858	Moderate
137	Arkleston Print & Dye Works	GS-2673721_SS_2_1	1911-1916	High
138	Reservoirs	GS-2673721_SS_2_1	1896	Low/Moderate
138	Old Quarries	GS-2673721_SS_2_1	1896	Low/Moderate
139	Brick Works	GS-2673721_SS_1_1	1895-1896	Low/Moderate
140	Rope Works	GS-2673721_SS_1_1	1895-1896	Low/Moderate
141	Marchfield Works	GS-2673721_SS_1_1	1938-1939	Low/Moderate
142	Laundrette	GS-2673721_SS_1_1	1895-1896	Low/Moderate
143	Saw Mills	GS-2673721_SS_1_1	1895-1896	Moderate
144	Clay Pit	GS-2673721_SS_1_1	1895-1896	Low/Moderate
145	Slaughter House	GS-2673721_SS_1_1	1857-1858	Low/Moderate
145	Slaughter House	GS-2673721_LS_2_2	1858	Moderate
146	Bellfield Nursery	GS-2673721_SS_1_1	1895-1896	Low/Moderate
147	Shipbuilding Yard & Works	GS-2673721_SS_1_1	1857-1858	Moderate
147	Nethercommon Print Works	GS-2673721_SS_2_1	1857-1858	Moderate
148	Harbour Saw Mills	GS-2673721_SS_2_1	1911-1916	Moderate
149	Warehouses & Factory	GS-2673721_SS_2_1	1971-1976	Low/Moderate
150	Carpet Works	GS-2673721_SS_1_1	1912-1916	Low/Moderate
150	Cement Works	GS-2673721_SS_1_1	1938-1939	Low/Moderate
151	Albion Works	GS-2673721_SS_2_1	1911-1916	Low/Moderate
151	Laighpark Foundry	GS-2673721_SS_2_1	1934-1939	Low/Moderate
151	Works	GS-2673721_SS_2_1	1955	Low/Moderate
152	Dye Works	GS-2673721_SS_2_1	1895-1896	High
153	Works	GS-2673721_SS_1_1	1968	Low/Moderate
154	Abercorn Rope Works	GS-2673721_SS_1_1	1895-1896	Low/Moderate
155	Abercorn Oil Works	GS-2673721_SS_1_1	1895-1896	High
156	Chemical Works	GS-2673721_SS_1_1	1895-1896	High
157	Preserve Works	GS-2673721_SS_1_1	1895-1896	Low/Moderate
158	Starch Works	GS-2673721_SS_1_1	1895-1896	Low/Moderate
159	Retorts Works	GS-2673721_SS_1_1	1895-1896	High
160	Oil Works	GS-2673721_SS_1_1	1895-1896	High
160	Victoria Foundry	GS-2673721_LS_2_2	1897-1898	Low/Moderate
160	Saw Mills & Timber Yard	GS-2673721_LS_2_2	1897-1898	Moderate
160	Bitumen Works	GS-2673721_LS_2_2	1949-1951	Low/Moderate
160	Cabinet Works	GS-2673721_LS_2_2	1949-1951	Low/Moderate
161	Caledonian Brick & Drain Tile Works	GS-2673721_SS_1_1	1857-1858	Low/Moderate
161	Clay Pits	GS-2673721_SS_1_1	1857-1858	Low/Moderate
161	Fire Clay Works	GS-2673721_SS_1_1	1895-1896	Low/Moderate
162	Burgh Slaughter House	GS-2673721_LS_2_2	1913	Moderate
162	Burgh Abattoir & Cold Stores	GS-2673721_LS_2_2	1938	Moderate
163	North Caledonian Brick Works & Clay Pits	GS-2673721_LS_2_2	1858	Low/Moderate
164	Chemical Works	GS-2673721_SS_1_1	1924	High
164	Chemical Works	GS-2673721_SS_2_1	1924	High

165	Cartside Dye Works	GS-2673721_SS_2_1	1857-1858	High
166	Snowdown Soap Works	GS-2673721_SS_2_1	1857-1858	Low/Moderate
167	Builders Yard	GS-2673721_SS_1_1	Current	Low/Moderate
168	Adelphi Cotton Mill	GS-2673721_SS_2_1	1857-1858	Low/Moderate
169	Thread Factory	GS-2673721_SS_2_1	1857-1858	Low/Moderate
170	Rope Works and Engine & Machine Works	GS-2673721_LS_3_2	1897	Low/Moderate
170	Laighpark Engineering Works	GS-2673721_LS_3_2	1950	Low/Moderate
171	Earth Works on Byres Hill	GS-2673721_SS_2_1	1911-1916	Low/Moderate
172	Clay Pits	GS-2673721_SS_1_1	1857-1858	Low/Moderate
173	Works	GS-2673721_SS_1_1	1983-85	Low/Moderate
174	Refuse Destructor	GS-2673721_SS_1_1	1912-1916	Low/Moderate
175	Hot House Works	GS-2673721_SS_1_1	1895-1896	Low/Moderate
176	Caledonian Print Works & Clay Pit	GS-2673721_SS_1_1	1857-1858	Moderate
176	Saw Mills	GS-2673721_LS_2_1	1897	Moderate
177	Dye Works	GS-2673721_SS_1_1	1857-1858	High
178	Saw Mills & Wood Yard	GS-2673721_SS_1_1	1857-1858	Moderate
179	Warehouses & Depots	GS-2673721_SS_1_1	Current	Low/Moderate
180	Timber Yards	GS-2673721_LS_3_2	1858	Moderate
181	Thread Mill	GS-2673721_SS_2_1	1857-1858	Low/Moderate
181	Imperial Starch Works	GS-2673721_SS_2_1	1857-1858	Low/Moderate
181	Station & Works	GS-2673721_LS_3_2	1897	Low/Moderate
182	Works	GS-2673721_SS_1_1	Current	Low/Moderate
182	Nursery & Manure Yard	GS-2673721_LS_2_1	1858	Low/Moderate
183	Brick Works & Clay Pits	GS-2673721_SS_1_1	1857-1858	Low/Moderate
183	Starch Works	GS-2673721_SS_1_1	1857-1858	Low/Moderate
183	Engine Works	GS-2673721_SS_1_1	1895-1896	Moderate
184	Coal Depots	GS-2673721_SS_1_1	1857-1858	Moderate
185	Saw Mills	GS-2673721_SS_1_1	1895-1896	Moderate
186	Aerated Water Factory	GS-2673721_LS_2_1	1950	Low/Moderate
187	Timber Yard	GS-2673721_SS_1_1	1857-1858	Moderate
187	Iron Works	GS-2673721_LS_3_1	1897	Moderate
188	Brass Foundry	GS-2673721_LS_3_1	1913	Low/Moderate
188	Sheet Metal Works	GS-2673721_LS_3_1	1950	Low/Moderate
189	Coachbuilding Works	GS-2673721_LS_3_1	1950	Low/Moderate
189	Mill	GS-2673721_LS_3_1	1962	Low/Moderate
190	Dye Works & Oil Works	GS-2673721_SS_2_1	1857-1858	High
190	Mill	GS-2673721_SS_2_1	1955	Low/Moderate
190	Weaving Mill	GS-2673721_LS_3_1	1938	Low/Moderate
191	Vulcan Foundry (Iron)	GS-2673721_SS_2_1	1857-1858	Moderate
192	Vulcan Works (Engineering)	GS-2673721_SS_2_1	1857-1858	Low/Moderate
192	Starch Works	GS-2673721_SS_2_1	1895-1896	Low/Moderate
192	Goods Station	GS-2673721_SS_2_1	1895-1896	Low/Moderate
193	Timber Yard	GS-2673721_LS_3_1	1858	Moderate
194	Sewage Works	GS-2673721_SS_1_1	1912-1916	Low/Moderate
195	Old Quarries	GS-2673721_SS_1_1	1857-1858	Low/Moderate
196	Chemical Works	GS-2673721_SS_1_1	1857-1858	High
197	Gasworks	GS-2673721_SS_1_1	1857-1858	High
198	Dye Works	GS-2673721_SS_1_1	1895-1896	High
199	Underwood Cotton Mill	GS-2673721_SS_1_1	1857-1858	Low/Moderate
200	Coal Depot	GS-2673721_SS_1_1	1857-1858	Moderate
201	Timber Yard	GS-2673721_SS_1_1	1857-1858	Moderate
202	Print Works	GS-2673721_LS_3_1	1858	Moderate
203	Paisley Foundry (Iron)	GS-2673721_LS_3_1	1858	Moderate
203	Coal Yard	GS-2673721_LS_3_1	1858	Moderate
204	Soap Works	GS-2673721_LS_3_1	1858	Low/Moderate
205	Shipbuilding Yard	GS-2673721_LS_3_1	1897	Low/Moderate
206	Abercorn Timber Yard	GS-2673721_LS_3_1	1858	Moderate
207	Abercorn Works (Engineering)	GS-2673721_LS_3_1	1858	Low/Moderate
208	Works	GS-2673721_LS_3_1	1897	Low/Moderate
209	Smithhills Dye Works	GS-2673721_LS_3_1	1858	High
210	Smithy	GS-2673721_LS_3_1	1913	Low/Moderate
211	Newtown Foundry (Iron)	GS-2673721_LS_3_1	1858	Low/Moderate
211	Abbey Works	GS-2673721_LS_3_1	1858	Low/Moderate
212	Timber Yard & Saw Mill	GS-2673721_LS_3_1	1858	Moderate
213	Timber Yards & Saw Mills	GS-2673721_LS_3_1	1858	Moderate
213	Walneuk Saw Mills	GS-2673721_LS_3_1	1950	Moderate
214	Print Works	GS-2673721_SS_2_1	1857-1858	Moderate
214	Print Works	GS-2673721_LS_3_1	1858	Moderate
214	Timber Yard	GS-2673721_LS_3_1	1858	Moderate
215	East Greenlaw Nursery	GS-2673721_SS_2_1	1857-1858	Low/Moderate
216	Liquor Works	GS-2673721_SS_1_1	1857-1858	High
217	Dye Works	GS-2673721_SS_1_1	1857-1858	High
218	Thread Mill	GS-2673721_SS_1_1	1895-1896	Low/Moderate
218	Store	GS-2673721_SS_1_1	1983-85	Low/Moderate
219	Coal Depot	GS-2673721_LS_2_1	1858	Moderate
219	Timber Yard	GS-2673721_LS_2_1	1858	Moderate
220	Timber Yard & Saw Pit	GS-2673721_LS_2_1	1858	Moderate
221	Brediland Chemical Works	GS-2673721_SS_1_1	1895-1896	High
222	Fireclay Works	GS-2673721_SS_1_1	1857-1858	Low/Moderate
223	Thread Works	GS-2673721_SS_1_1	1857-1858	Low/Moderate
223	Goods Shed, tank	GS-2673721_SS_1_1	1895-1896	Low/Moderate
223	Thread Works	GS-2673721_SS_1_1	1895-1896	Low/Moderate
224	Dye Works	GS-2673721_SS_1_1	1895-1896	High
225	Starch Works	GS-2673721_SS_2_1	1895-1896	Low/Moderate
226	Castlehead Colliery	GS-2673721_SS_1_1	1857-1858	Low/Moderate
227	Lady Lane Works	GS-2673721_SS_1_1	1857-1858	Low/Moderate

228	George Street Powerloom Factory	GS-2673721_SS_1_1	1857-1858	Low/Moderate
229	Quarry	GS-2673721_SS_2_1	1857-1858	Low/Moderate
229	Steam Mills (Flour); Tank	GS-2673721_SS_2_1	1857-1858	Low/Moderate
230	Bladda Dye Works	GS-2673721_SS_2_1	1857-1858	High
231	Tannery	GS-2673721_SS_2_1	1857-1858	Moderate
231	Factory	GS-2673721_SS_2_1	1857-1858	Low/Moderate
232	Engineering Works	GS-2673721_SS_2_1	1895-1896	Low/Moderate
232	Works	GS-2673721_SS_2_1	1983-1987	Low/Moderate
233	Williamsburgh Works	GS-2673721_SS_2_1	1857-1858	Low/Moderate
233	Waste & Sponge Cloth Works	GS-2673721_SS_2_1	1896	Low/Moderate
233	Brick & Tile Works, Clay pits	GS-2673721_SS_2_1	1911-1916	Low/Moderate
234	Ladyburn Dye Works	GS-2673721_SS_2_1	1895-1896	High
235	Bakers Mill	GS-2673721_SS_1_1	1857-1858	Low/Moderate
236	Coal Depot	GS-2673721_SS_1_1	1857-1858	Moderate
237	Goods Shed	GS-2673721_SS_1_1	1912-1916	Low/Moderate
238	Works	GS-2673721_SS_1_1	1983-85	Low/Moderate
239	Brewery & Distillery	GS-2673721_SS_2_1	1857-1858	Low/Moderate
239	Soap Works	GS-2673721_SS_2_1	1911-1916	Low/Moderate
239	Bus Depot	GS-2673721_SS_2_1	1983-1987	Low/Moderate
240	Ship Carpenter's Workshop	GS-2673721_SS_2_1	1857-1858	Low/Moderate
241	Espedair Dye Works	GS-2673721_SS_2_1	1857-1858	High
242	Mills (Thread)	GS-2673721_SS_2_1	1857-1858	Low/Moderate
242	Bleach Works & Filtering tanks	GS-2673721_SS_2_1	1857-1858	Low/Moderate
242	Finishing Works (Dress & Weaving Material)	GS-2673721_SS_2_1	1895-1896	Low/Moderate
242	Anchor Mills (Thread)	GS-2673721_SS_2_1	1895-1896	Low/Moderate
242	Works & Mills	GS-2673721_SS_2_1	1955	Low/Moderate
243	Lonend Dye Works	GS-2673721_SS_2_1	1857-1858	High
244	Blackhall Factory	GS-2673721_SS_2_1	1857-1858	Low/Moderate
244	Tapestry Works	GS-2673721_SS_2_1	1895-1896	Low/Moderate
245	Bleach Works	GS-2673721_SS_2_1	1938-1939	Low/Moderate
245	Mills (Thread)	GS-2673721_SS_2_1	1955	Low/Moderate
246	Blackhall Reservoir	GS-2673721_SS_2_1	1857-1858	Low/Moderate
247	Sanitary Engineering Works	GS-2673721_SS_2_1	1896	Low/Moderate
247	Engineering Works	GS-2673721_SS_2_1	1896	Low/Moderate
247	Works	GS-2673721_SS_2_1	1955	Low/Moderate
247	Laundry	GS-2673721_SS_2_1	1955-56	Low/Moderate
247	Works	GS-2673721_SS_2_1	1971-1976	Low/Moderate
247	Tanks	GS-2673721_SS_2_1	1983-1987	Low/Moderate
248	Depot & Works	GS-2673721_SS_2_1	1966-69	Low/Moderate

Low/Moderate risk of potentially significant contamination constraints which may require some remediation depending on the sensitivity of proposed use.

Moderate risk of potentially significant contamination constraints which may require some remediation.

High risk of potentially significant contamination constraints which is likely to require some remediation.

Appendix 6.1: LVIA Methodology

Appendix 6.1 – Proposed LVIA Methodology

The purpose of a Landscape and Visual Impact Assessment (LVIA) is to identify and describe the likely landscape and visual effects of a development and to determine whether or not they would be significant. The LVIA will consider the effects of the proposed development on both the landscape as an environmental resource and on people's visual amenity. The intended use of this environmental information is to inform stakeholders and to assist decision making. An LVIA is undertaken in a sequence of iterative stages:

- Identification of aspects of the development that may give rise to significant effects on the landscape resource or on visual amenity;
- Description of baseline landscape and visual conditions: for the landscape assessment this provides an understanding of the character and value of the landscape resource and for the visual assessment this identifies the people in specific locations that may be visually affected;
- Identification of the landscape and visual receptors that may be affected by the development and an initial assessment of the likely significant effects upon them;
- Identification of mitigation measures appropriate to the development and its landscape context; and
- Assessment of the residual landscape and visual effects of the development incorporating mitigation and categorisation of their significance to decision makers.

The significance of the likely effects of the proposed development on identified landscape and visual receptors will be assessed using professional judgement. This professional judgement may take into account a number of different considerations including: the susceptibility of different receptors to the likely changes that would be associated with the scheme; the value or importance that is attached to the landscape receptor or a particular view; and the degree, geographical extent, duration and reversibility of the change that is likely to arise. The relevance and weighting of these many considerations will vary depending on the type of receptor being assessed.

As has been stated previously within this report, the LVIA will also include a townscape assessment..

1.1.1 Guidance

The LVIA will be carried out in accordance with all current and relevant advisory guidelines comprising:

- *Guidelines for Landscape and Visual Impact Assessment, 3rd Edition* (2013) E & FN Spon, Copyright the Institute of Environmental Assessment and the Landscape Institute
- *Landscape Character Assessment – Guidance for England and Scotland* (2002) Prepared on behalf of the Countryside Agency and Scottish Natural Heritage by Land Use Consultants; and

- Advice Note 01/09 - Use of Photography and Photomontages in Landscape and Visual Impact Assessment (2009) Landscape Institute; and
- *DMRB Volume 11, Section 3, Part 5 Landscape Effects (1993) (hereafter referred to as DMRB) The Highways Agency.*

Reference to DMRB relates to the stages of assessment through which the project has developed and not the specific approach to LVIA.

1.1.2 Assessing the level and significance of landscape effects

The level and significance of the likely effects of the proposed development on identified landscape receptors will be assessed using professional judgement. This professional judgement may take into account a number of different considerations including:

- The susceptibility of different landscape receptors to the likely changes that would be associated with the Proposed Development;
- The value or importance that is attached to them; and
- The degree, geographical extent, duration and reversibility of the change to the landscape that is likely to arise.

Considerations of susceptibility and value may both be considered as the 'sensitivity' of landscape receptors. Considerations of degree, geographical extent, duration and reversibility of landscape change, may be considered as the 'magnitude of landscape change' that may arise due to the proposed development.

The level of landscape effect is categorised using a four point scale: major; moderate; minor; and negligible. The level of effect is assessed by combining all of the considerations and criteria set out above. This is described by GLVIA3 as an 'overall profile' approach to combining judgements and requires that all the judgements against each of the identified criteria (i.e. susceptibility; value; degree of change; extent of change; duration of change; and reversibility of change) are utilised to allow a reasoned professional assessment of the overall level of landscape effect.

The relative weight attributed to each consideration is a matter of professional judgement and will vary depending on the specific landscape receptor being assessed. For example, susceptibility is more relevant to landscape character than to the removal of landscape elements such as tree cover and short term reversible effects on the landscape may still be judged to be significant by the decision makers.

Where possible to do so with a reasonable level of professional objectivity the effects of the proposed development on the landscape are identified as likely to be generally considered positive (beneficial), neutral or negative (adverse).

The significance of landscape effects is categorised as 'significant' or 'not significant'. The judgement on the significance of effect is informed directly by the level of effect that is identified as follows:

- A major or moderate level of effect is considered to be significant; and
- A minor or a negligible level of effect is considered to be not significant.

GLVIA3 states the following with regard to the judgement of significant landscape effects:

"There are no hard and fast rules about what makes a significant effect, and there cannot be a standard approach since circumstances vary with the location and landscape context and with the type of proposal. At opposite ends of a spectrum it is reasonable to say that:

- *Major loss or irreversible negative effects, over an extensive area, on elements and/or aesthetic and perceptual aspects that are key to the character of nationally valued landscapes are likely to be of the greatest significance;*
- *Reversible negative effects of short duration, over a restricted area, on elements and/or aesthetic and perceptual aspects that contribute to but are not key characteristics of the character of landscapes of community value are likely to be of the least significance and may, depending on the circumstances, be judged as not significant;*
- *Where assessments of significance place landscape effects between these extremes, judgements must be made about whether or not they are significant, with full explanations of why these conclusions have been reached."*

1.1.2.1 Susceptibility of Landscape and Townscape Receptors to Change

The susceptibility of the landscape refers to its ability to accommodate the changes likely to be brought about by the proposed development without undue consequences for the maintenance of the baseline situation. Tables 6.2 and 6.3 provides a list of key characteristics and attributes that will be used in this assessment as indicators of levels of landscape and townscape susceptibility. The tables are indicative rather than prescriptive and the susceptibility of the landscape or townscape is categorised as High, Medium or Low using professional judgement.

Table 6.2 – Susceptibility of landscape character to change

Key characteristics	Attributes indicating higher susceptibility to change		Attributes indicating lower susceptibility to change
Scale	Small-scale landform/landcover; fine grained; enclosed; sheltered	<--->	Large-scale landform/land cover; coarse grained
Enclosure	Open	<--->	Enclosed
Landform	A flat, uniform landscape	<--->	An undulating landscape
Landcover and Pattern	Complex, irregular or intimate landscape patterns; diverse land cover	<--->	Simple, regular landscape patterns; uncluttered, sweeping lines; consistent land cover
Engineered / Built Influences	General absence of strongly engineered, built or manmade influences such as: electrical	<--->	Engineered forms/land use pattern; frequent presence of man-made elements, brownfield or industrial

Key characteristics	Attributes indicating higher susceptibility to change		Attributes indicating lower susceptibility to change
	infrastructure, roads, a geometric field pattern or man-made watercourses. Predominance of traditional or historic settlements, buildings and structures		landscapes; presence of contemporary built structures; electrical infrastructure; man-made watercourses; and commercial forestry
Naturalness and Tranquillity	Landscape with predominance of perceived natural features and forms. Sense of peace and isolation; remote and empty; little or no built development	<--->	Non-natural landscape; busy and noisy; human activity and development; prominent movement

Table 6.3 – Susceptibility of townscape character to change

Key characteristics	Attributes indicating higher susceptibility to change		Attributes indicating lower susceptibility to change
Structure	Strong and legible	<--->	Weak and confused
Scale	Fine grained and consistent	<--->	Coarse grained and/or varied
Uniformity of built form	Consistency of built form including regular and consistent facades and rooflines	<--->	Variety of built form including irregular and inconstant facades and rooflines
Uniformity of appearance	Consistency of appearance and limited range of traditional materials and colours	<--->	Diverse and innovative use of materials and colours in building appearance
Uniformity of period	Buildings broadly dating from a similar historical period with general absence of late twentieth century modern and twenty-first century contemporary	<--->	Buildings dating from a variety of periods including modern and contemporary
Building height	Low rise (generally fewer than five storeys)	<--->	Varied building height including buildings of equivalent 15 storey height or greater
Density of built development	Open and fragmented	<--->	Enclosed and continuous
Streetscape enclosure	Open with frequent views between buildings of street frontages	<--->	Enclosed with tightly channelled views and vistas
Presence of open spaces	Frequent open spaces	<--->	Few open spaces
Tree cover	Few mature street trees	<--->	Frequent mature street trees

1.1.2.2 Landscape and Townscape Value

The value of a landscape may reflect communal perception at a local, regional, national or international scale and may be informed by a number of factors including scenic beauty, tranquillity, wildness, cultural associations or other conservation or recreation interests. It

is also the case that a landscape with characteristics that suggest relatively low susceptibility to change may be judged to be of high value because of special values attached to it. Although landscape value or importance is usually determined by reference to statutory or local planning policy designations, an absence of such does not automatically imply a lack of value as other factors, for example scarcity, may be considered relevant. The value or importance of landscape elements is also considered. The degree of landscape value or importance is therefore a matter for reasoned professional judgement. Where relevant to the assessment, the value or importance of landscape elements, character areas or designated resources is categorised as either:

- High: which may refer to: an international designated landscape (rare cases only) – e.g. World Heritage Site; or a nationally designated site, e.g. National Park, AONB, Registered Historic Park or Garden;
- Medium: which may refer to a locally designated landscape, i.e. it has been identified by local planning authorities with a local plan policy or landscape character assessment as demonstrating a particular value; or
- Low: which may refer to a landscape which is valued at a local scale by local communities but has no documented evidence of value (i.e. in a policy, designation or character assessment).

1.1.2.3 Degree of Landscape Change

The degree of likely landscape change is assessed as High, Medium or Low by reference to the criteria set out in Table 6.4.

Table 4 – Degree of landscape/townscape change criteria

Degree of change	Definition
High	The Proposed Development will form a prominent landscape/townscape element, or will result in a substantial alteration to key landscape/townscape characteristics
Medium	The Proposed Development will form a conspicuous landscape/townscape element, or will result in a partial loss of or alteration to key landscape/townscape characteristics
Low	The Proposed Development will form an apparent, small landscape/townscape element, or will result in a minor alteration to key landscape/townscape characteristics
Negligible	The Proposed Development will be a barely perceptible landscape/townscape element, or will not change the key landscape/townscape characteristics

1.1.2.4 Geographical Extent of Landscape Change

This is based on an informed professional judgement and the extent of the change will vary depending on the nature of the proposal. The geographical extent of a landscape effect is assessed as:

- Extensive – the change may influence an extensive area, possibly including several landscape types and/or character areas;

- Medium – the change may influence the wider landscape type and/or character area within which the Proposed Development is located; and
- Localised – the change may be within the PDA itself and its immediate setting.

1.1.2.5 Duration of Landscape Change

For this scheme the following categories of duration of landscape effect have been adopted:

- Short term – an effect likely to last up to five years;
- Medium term – an effect likely to last between five and fifteen years; and
- Long term – an effect likely to last longer than fifteen years.

1.1.2.6 Reversibility of Landscape Change

In terms of the reversibility of landscape change, the following categories have been adopted:

- Reversible – an effect which is entirely reversible, i.e. the landscape can be restored to its original state prior to the development occurring;
- Partially reversible – the landscape can be partially restored to its original state prior to the development occurring; and
- Irreversible – the landscape is considered to be irreversibly altered following the occurrence of the development.

It should be noted however that Duration of Change and Reversibility of Change are linked considerations and where it is deemed that landscape change due to a proposed development is permanent in duration, it is not necessary to consider the reversibility of that change.

1.1.3 Level and Significance of Visual Effects

The significance of the likely visual effects of the proposed development on identified receptors will also be assessed using professional judgement. This professional judgement may take into account a range of considerations including:

- the susceptibility of people in different contexts to the likely visual changes that would be associated with the scheme;
- the value or importance that they are considered likely to attach to the existing view; and
- the degree, geographical extent, duration and reversibility of the visual change that is likely to arise.

As was the case for the landscape assessment approach, considerations of susceptibility and value may be considered as comprising the ‘sensitivity’ of visual receptors. Considerations of degree, geographical extent, duration and reversibility of visual change, may be considered as the ‘magnitude of visual change’.

The significance of visual effects is categorised as 'significant' or 'not significant'. Significance is assessed by combining all of the considerations and criteria set out previously. The relative weight attributed to each consideration is a matter of professional judgement and will vary depending on the specific visual receptor being assessed. For example, the geographical extent of visual change is more relevant to an area or route than to a fixed viewpoint and short term reversible visual effects may still be judged to be significant to decision makers.

Where possible to do so with a reasonable level of professional objectivity the visual effects of the proposed development are identified as likely to be considered positive (beneficial), neutral or negative (adverse).

1.1.3.1 Susceptibility of Visual Receptors to Change and Value Attributed to a View

People's susceptibility to visual change varies depending on their purpose for being in a particular location (principally whether for residence, recreation, travel or employment). The susceptibility to change of different categories of visual receptor is assessed on a scale of High, Medium or Low and is typically defined based on the categories of viewer set out in Table 6.5.

Table 6.5 – Susceptibility of visual receptor types to change

Level of susceptibility	Typical receptors
High	People with a particular interest in the available view or with prolonged viewing opportunities, such as: • Promoted viewpoints (often recognised by the provision of interpretation), promoted scenic drives or tourist routes; • Tourist, visitor and/or heritage destinations providing a specific, important and highly valued view; • Recreational hilltops and peaks; • Residential locations; • Ornamental parks and public open spaces; and • Nationally or locally named trails and cycle routes
Medium	People with a general interest in their surroundings or with transient viewing opportunities, such as: • General and incidental footpaths and rights of way; • Residential distributor and local road network; and • General public open spaces, recreation grounds and play areas
Low	People with a limited or passing interest in their surroundings, such as: • Places of employment; • Major highways (sensitivity may be higher in scenic locations);

Level of susceptibility	Typical receptors
	• Commercial and industrial buildings; • Indoor facilities; and • Commuters

An assessment of visual amenity value or importance refers to the judgement of whether any particular value or importance is likely to be attributed by people to their available views. For example, views experienced by travellers on a highway may be considered to be more highly valued due to the scenic context or views experienced by residents of a particular property may be considered to be less valued or important due to a degraded visual setting. The degree of value or importance is therefore a matter for reasoned professional judgement. Where relevant to the assessment, the value or importance of visual amenity is categorised as either: High; Medium; or Low.

Considerations of visual susceptibility and value overlap, which is in contrast to the equivalent landscape considerations which are more distinct. This is because indicators of landscape value are more readily available, for example documentary evidence of a designation. In the case of visual value, documentary evidence relating to views which are particularly valued exists, however value is more likely to relate to a reasoned judgement, as set out in the previous paragraph. Therefore the judgement as to whether a view is categorised as having high, medium or low value will be applied as a modifier to the judgement of susceptibility to give a combined sensitivity of high, medium or low. For example, a visual receptor may be judged as being of low susceptibility and high value. In this instance it may be appropriate to conclude that this receptor is of medium susceptibility, with the consideration of value being used to modify the original assessment of susceptibility.

1.1.3.2 Degree of Visual Change

The degree of likely visual change is assessed as High, Medium, Low or Negligible by reference to the criteria set out in Table 6.6.

Table 6.6 – Degree of visual change criteria

Degree of change	Definition
High	The visual changes associated with the Proposed Development will form a prominent element within the view, resulting in a prominent change to the quality and character of the view.
Medium	The visual changes associated with the Proposed Development will form a conspicuous element within the view, resulting in a conspicuous change to the quality and character of the view.
Low	The visual changes associated with the Proposed Development will form an apparent small element within the view, without affecting the overall quality and/or character of the view.

Negligible	The visual changes associated with the Proposed Development will result in a barely perceptible change in the view, or will cause 'no change' to the existing view.

1.1.3.3 Geographical Extent of Visual Change

The geographical extent of a visual effect is assessed as: Extensive; Medium; and Localised. This is based on an informed professional judgement and reflects the extent of the area over which the changes will be visible.

However, this consideration is not applicable when the assessment refers to a single visual receptor, such as a single residential property. Geographical extent would apply when assessing the visual effects on multiple users of an extent of road or groups of properties within a settlement for example.

1.1.3.4 Duration of Visual Change

For this scheme the following categories of duration of visual effect have been adopted:

- Short term – an effect likely to last up to five years;
- Medium term – an effect likely to last between five and fifteen years; and
- Long term – an effect likely to last longer than fifteen years.

1.1.3.5 Reversibility of Visual Change

In terms of the reversibility of visual change, the following categories have been adopted:

- Reversible – an effect which is entirely reversible, i.e. the view can be restored to that which was experienced prior to the occurrence of the development;
- Partially reversible – the view can be partially restored to that which was experienced prior to the occurrence of the development; and
- Irreversible – the view is considered to be irreversibly altered following the occurrence of the development.

It should be noted however that Duration of Change and Reversibility of Change are linked considerations and where it is deemed that visual change due to a proposed development is permanent in duration, it is not necessary to consider the reversibility of that change.

1.1.4 Cumulative Assessment

An assessment of likely significant landscape and visual cumulative effects will be undertaken. A list of schemes relevant to the landscape and visual assessment will be agreed in advance with Renfrewshire Council. However, this will comprise developments within the study area which are of a similar: size; appearance; or use. Examples of types of developments which may be considered within the cumulative assessment would be: road developments, including bridges; industrial developments; and medium to large-scale residential developments.

Appendix 7.1: Ecology Survey Methodology

Appendix 7.1

Vegetation Surveys

Phase 1 Habitat Survey

A Phase 1 Habitat Survey was undertaken in February/March 2016 and is scheduled to be updated in August 2016. The surveys will be undertaken in accordance with JNCC's 'Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit'(JNCC, 2007), taking recognisance of best practice guidelines (CIEEM, 2006).

Collectively, the surveys will seek to establish the ecology baseline of the proposed project and wider study area and a 100m zone of influence, which will be used to inform the ecological impact assessment in terms of permanent and temporary habitat loss.

The surveys will catalogue habitats and where applicable, record target notes using the DAFOR scale regarding the abundance of plant species.

Aerial photographs and OS maps will additionally be consulted (where appropriate) to identify potential habitats areas of nature conservation importance within the proposed project and zone of influence.

The Phase 1 Habitat survey additionally seek to identify the presence of non-native invasive species within and adjacent to the proposed project, with particular regard to those species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

Protected Species Surveys

Further detailed species specific surveys will be undertaken during the optimal season, in accordance with the following methods.

Badger Survey

All suitable habitats within the proposed project and 100 m zone of influence will be surveyed in October 2016 by an experienced ecologist for signs of badger following Harris et al. (1989).

As part of the survey, all hedgerows, field boundaries, watercourses, paths and other linear features will be walked to locate badger field signs including but not limited to: badger setts, badger paths, evidence of foraging and dung pits. In addition, all areas of woodland and scrub will be systematically searched for evidence of badger activity.

Where applicable, badger paths will be identified through the observation of field signs including prints, badger hairs on barbed wire or vegetation, dung pits and scratching posts. Similarly, the interiors of fields will be surveyed, in addition to their boundaries, where they exhibit evidence of badger foraging or where badger paths pass through them.

Other areas offering the potential to support badger setts, identified during survey and from OS maps, will be actively searched, where practicable.

Otter Survey

All watercourses and water features within the proposed project and 250 m zone of influence (up and downstream of identified watercourses) were surveyed in June 2016 by an experienced ecologist for signs of otter. Where possible, surveys were conducted from within the water channel, along the river bank and on ground within 10 m of watercourses.

The survey focussed on identifying the presence of otter signs, which included: spraint (droppings) and footprints. Resting sites, for example, holts, couches and hovers, were also identified following 'Ecology of the European Otter: Conserving Natura 2000 Rivers Ecology Series No.10' (Chanin, 2003), in addition to potential signs of otter activity including runs or other well-used access points to watercourses (slides), feeding remains e.g. fish carcasses and sightings, including otter road accident causalities.

Additional survey effort for otter (following the above methods) will be undertaken in autumn 2016 to account for seasonal variation in the use of the White and Black Cart Waters.

Water Vole Survey
All suitable watercourses and water features within the proposed project and 100-200m zone of influence (up and downstream of identified watercourses) will be surveyed in August 2016 by an experienced ecologist for signs of water vole taking cognisance of Strachan & Moorhouse (2006) and Dean et al. (2016).

Survey effort will focus on suitable riparian and/or terrestrial habitats and will seek to determine the presence of the following field signs:

- burrows with entrances surrounded by grazed 'lawns';
- runs through vegetation;
- feeding stations (characterised by neatly chopped pieces of grass, sedge, or rush up to 10 cm long); and
- latrines.

As part of the above proposed methods, it should be noted that following completion of the otter survey, White Cart Water and Black Cart Water were assessed as being un-suitable for water vole and therefore will not be subject to any further investigation for this species as part of on-going and future survey effort.

Bat Survey
Aerial photographs and topographical maps were used to identify areas of potential habitat for bats and to make an initial evaluation of the proposed project and wider study area.

The following survey methods are proposed, which were developed according to good practice standards taking cognisance of the document 'Bat Survey - Good Practice Guidelines' (Bat Conservation Trust, 2016).

Preliminary Roost Assessment
In line with the above best practice guidelines, a Preliminary Roost Assessment (comprising an initial daytime walkover survey) was undertaken by an appropriately qualified bat worker (consultant) to identify potentially valuable foraging, commuting and roosting features for bats within the proposed project and the following zones of influence, which were discussed through consultation with SNH (Graeme Heenan – Operations Officer, Pers. Com., 8 June 2016):

30m - urban/built-up areas and all habitats adjacent to proposed cycleway infrastructure; and

100m - semi-natural areas (including woodland habitats).

As part of the survey, where possible/practicable an external inspection of all suitable structures was undertaken, in addition to a systematic search for evidence of bats (using binoculars where appropriate), for example: live bats, bat corpses, droppings, feeding remains,

scratch marks, and urine and grease staining. However, where access was not available e.g. private third-party residential property, such structures were assessed from areas of public access, with any additional examination undertaken following landowner consent.

Bat Activity Surveys

The above good practice guidelines were consulted to establish survey methods and effort for the Bat Activity Surveys, taking into consideration factors such as likely species present, survey area location, habitat type and presence of suitable features.

Walked Transects

Based on an initial examination of the Extended Phase 1 Habitat Survey data, three walked transects were established along the route of the proposed project and wider study area (to the west of the White Cart Water).

Surveys along each of the three transects will be completed by two surveyors (for health and safety purposes) on six occasions between April to September 2016 ensuring that at least one of the surveys for each transect comprises a dusk and pre-dawn survey separate by less than 24 hours.

Each of the transects will be walked at a steady pace from sunset for a period of up to 2-3 hours after sunset; dawn transects will commence approximately 3-2 hours before sunrise and concluded at sunrise. Each transect will be walked in an alternative direction (clockwise/anti-clockwise) to allow for different emergence times of bat species and to provide a comprehensive representation of habitat use throughout the survey period.

A series of five-minute pre-determined point counts will be incorporated into each of the three transects to allow for a sample of bat activity to be taken within a range of habitat types (including habitats which are considered to be of minimum value to bats). Where possible, listening points will be sampled at the same locations continuously throughout the active season.

Survey data will be recorded using a Batbox Duet, which uses both frequency division and heterodyne functions, and a Tascam DR-07 recording device, using the reference button to provide survey notes.

Data will be stored onto a compact flash card and analysed using BatSound software under the supervision of a licensed bat worker. Where there is any doubt or uncertainties regarding bat echolocation calls, British Bat Calls: A Guide to Species Identification (Russ, 2012) will be consulted as a reference tool.

Automated Surveys

Due to the medium value of the habitats within and adjacent to the proposed project and in line with the requirements of the above good practice guidance, two Songmeter SM2 static detectors will be erected on 1.5m poles (to reduce animal interference) and will be left at two pre-determined positions along each of the three proposed transects – making sure that detector locations are not easily discovered by members of the public due to the highly urbanised nature of the survey areas. However, it should be noted that if detectors are removed and cannot be located, consultation will be undertaken with SNH to determine an alternate means of provided static data.

The static detectors will be programmed to record over a minimum of five consecutive nights during the above survey period (April to September 2016). Survey locations will be selected to

provide a representative sample of all the habitats present within the proposed project and wider study area, in addition to locations along features likely to provide value for bats such as, riparian and edge habitats. Each device will be programmed to record all bat activity from 15 minutes before sunset to 15 minutes after sunrise. Devices will be rotated around each static detector location in accordance with best practice guidelines in order to reduce data errors caused by mechanical differences and failures.

All data collected by the static devices will be converted to zero crossing files and analysed using Analook. British Bat Calls: A Guide to Species Identification (Russ, 2012) was used to aid identification of sonograms.

Bat Surveys: Tree Surveys

Where trees are assessed as having the potential to support bat roost based on the presence of potential roosting features, 'at height' inspection surveys will be completed by licenced and trained tree climbers using an endoscope to inspect trees for current and/or historical presence of roosting bats.

Where evidence of bats is recorded, additional bat roost surveys will be undertaken (as outlined below). However, it should be noted that where it is considered trees of moderate to high suitability are unsafe to climb, emergence surveys will be completed as outlined below.

Bat Roost Surveys: Emergence and Re-entry

Where suitable structures/trees and/or evidence of roosting bats is identified by the Preliminary Roost Assessment, dusk emergence and dawn re-entry surveys were carried out under the supervision of a licenced ecologist (at ground level) by a sufficient number ecologists in order to allow complete visual coverage of the properties, associated buildings and trees.

In line with the above good practice guidelines, surveys will be undertaken as per the following:

Low roost suitability: one survey required between May and August (excluding trees);

Moderate roost suitability: two surveys required between May and August;

High roost suitability: three surveys required, with at least two surveys completed between May and August.

Dusk surveys will begin 15 minutes before sunset and continue for 2 hours (weather dependent) after sunset. Dawn re-entry surveys will begin 2 hours before sunrise and will conclude 15 minutes at sunrise or 10 minutes after the last bat had returned to its roost after sunrise.

As outlined above, the surveys will be recorded using Batbox Duets and Tascam DR-07 recorders and analysed using BatSound software using Russ (2012) as a reference tool.

Baseline Surveys to be 'Scoped Out' of the Ecological Assessment

The following ecological surveys will not be undertaken in support of the assessment of ecological effects.

National Vegetation Classification (NVC) Survey

Due to the disturbed structure of woodland habitats within the proposed project and wider zone of influence, coupled with the presence of large quantities of sycamore, influx of regenerating birch and willow and small quantities of remnant semi-natural woodland habitat, a National Vegetation Classification (NVC) survey will not be undertaken, as the resulting survey

is unlikely to provide a greater level of understanding of the woodland habitats, in terms of characterisation and impact assessment.

Great Crested Newt Survey

As a result of the desk study investigation, which established records of great crested newt for the 10 km OS Grid Square (NS46, NS47, NS56, NS57), coupled with consultation with SNH (Graeme Heenan – Operations Officer, Pers. Com., 25 May 2016), a Habitat Suitability Assessment (HSI) for this species was completed for the proposed project and wider 500m zone of influence taking cognisance of Oldham et al. (2000). HSI is a numerical index, between 0 and 1. Values close to 0 indicate unsuitable habitat; 1 represents optimal habitat. The HSI for the great crested newt incorporates ten suitability indices, all of which are factors known to affect this species.

Following completion of the above assessment, it was determined that due to an absence of authenticated great crested newt records, coupled with low suitability of freshwater habitats for great crested newt populations within the proposed project and wider zone of influence, no further survey effort for great crested newt was required, which was agreed through consultation with SNH (Graeme Heenan – Operations Officer, Pers. Com., 20 June 2016).

Breeding Bird Survey

Consultation with SNH as part of the DMRB Stage 1 Assessment confirmed that surveys for breeding birds would not be required in support of a future EIA, provided vegetation clearance, undertaken in connection with future construction works, is completed outside of the main breeding bird season (Dave Laing – Operations Officer, Pers. Com., 29 January 2016). Consequently, no specific survey effort is proposed in support of the ecological assessment.

Freshwater Fish Surveys

Following consultation with SNH and Marine Scotland, it was determined that specific survey effort for freshwater fish and migratory salmonids would not be required in support of the ecological assessment.

Appendix 14.1: Agreed List of Scoping Consultees

GAIA Consultee List

Consenting Authorities
Renfrewshire Council:
Marine Scotland (MS Lot)

Statutory/Non-Statutory Consultees
SEPA
Scottish Natural Heritage
Historic Environment Scotland
Scottish Water
Transport Scotland
HSE
Forestry Commission
Sustrans
Glasgow & the Clyde Valley Green Network
SPT
Cycling Scotland
Civil Aviation Authority
Crown Estate
Visit Scotland
Central Scotland Green Network
NATS
RSPB Scotland
Scottish Rights of Way & Access Society
Scottish Wildlife Trust
Glasgow Airport Safeguarding
West of Scotland Archaeology Service
MCA
NLB
Clydeport
Clyde Fishermen's Association
Association of Salmon Fishery Boards
British Shipping
UK Chamber of Shipping
DIO
Marine Safety Forum
RYA
SFF
SFO
WDCS
Whales
Ayr Fishery Office
Clydeplan

Landowners/Key Stakeholders
Glasgow Airport
Westway
Inchinnan Community Council
Paisley North Community Council
Gallowhill Community Council
Renfrew Community Council
Paisley West and Central Community Council
Paisley East and Whitehaugh