ENVIRONMENTAL IMPACT ASSESSMENT REPORT

South Kinross Flood Protection Scheme

Volume II – Main Report

IBE2011
F01
29 February 2024

rpsgroup.com

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
D01	Draft	Various			
D02	Draft for client review	Various	AMG/RB	RB	08/08/23
F01	Final	Various	AMG/RB/DM	RB	27/02/24

Approval for issue

Andrew Jackson  29 February 2024

Prepared by:

RPS

James Hamilton
Graduate Engineer

Elmwood House
74 Boucher Road, Belfast
Co. Antrim BT12 6RZ

T +44 2890 667 914
E james.hamilton@rpsgroup.com

Prepared for:

Perth & Kinross Council

Russell Stewart
Engineer (Flooding)

Pullar House
35 Kinnoull Street,
Perth, PH1 5GD

T 01738477277
E RSStewart@pkc.gov.uk

Contents

Tables

Figures

TABLE OF ACRONYMS

Term	Definition
AADT	Annual Average Daily Traffic
ACM	Asbestos Containing Material
AEP	Annual Exceedance Probability
AGS	Association of Geotechnical and Geo-Environmental Specialists
AIA	Arboriculture Impact Assessment
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQS	Air Quality Standards
ASSI	Area of Special Scientific Interest
BCA	British Car Auctions
BoCC	Birds of Conservation Concern
BQE	Biological Quality Elements
CAS	Chemical Abstracts Service
CBA	Cost / Benefit Analysis
CC	Climate Change
CDW	Construction and Demolition Waste
CEMP	Construction Environmental Management Plan
CHP	Combined Heat and Power
CIEEM	Chartered Institute of Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
DMRB	Design Manual for Roads and Bridges
DRS	Deposit Return Scheme
EC	European Commission
EcIA	Ecological Impact Assessment
ECoW	Ecological Clerk of Works
EHV	Extra High Voltage
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIC	Environmental Industries Commission
EL	Electrofishing Location
EPA	Environmental Protection Agency
EPR	Extended Producer Responsibility
EPS	European Protection Species
EST	Environmental Standards Test
ETS	Emissions Trading Scheme
EWC	European Waste Codes
FNRC	Fife Nature Records Centre
FPS	Flood Protection Scheme
FRM	Flood Risk Management
GAC	Generic Assessment Criteria
GEP	Good Ecological Potential
GHG	Greenhouse Gas
GIR	Ground Investigation Report
GIS	Geographical Information System
GPP	Guidelines on Pollution Prevention
GQRA	Generic Quantitative Risk Assessment
GWDTE	Groundwater Dependent Terrestrial Ecosystems
HDV	Heavy Duty Vehicle
HER	Historic Environment Record
HES	Historic Environment Scotland
HMWB	Heavily Modified Water Body
HP	Hazardous Property
HRA	Habitats Regulation Appraisal
HSE	Health and Safety Executive
HV	High Voltage
IAQM	Institute of Air Quality Management
IEF	Important Ecological Features
IEMA	Institute of Environmental Management and Assessment
IGDL	Inventory of Gardens and Designated Landscapes
INNS	Invasive Non-Native Species

Term	Definition
IOF	Important Ornithological Features
IPCC	Intergovernmental Panel on Climate Change
LAQM	Local Air Quality Management
LBAP	Local Biodiversity Action Plan
LCRM	Land Contamination Risk Management
LCT	Landscape Character Type
LDP	Local Development Plan
LDV	Light Duty Vehicle
LLA	Local Landscape Area
LNR	Local Nature Reserves
LOD	Limit of Detection
LV	Low Voltage
LVIA	Landscape and Visual Impact Assessment
MCA	Multi-Criteria Analysis
MCL	Morphological Condition Limit
MImAS	Morphological Impact Assessment System
MPD	Morphological Pressures Database
MPS	Morphological Pressures Survey
MRV	Minimum Reporting Values
NAD	No Asbestos Detected
NGO	Non-Governmental Organisation
NNR	National Nature Reserve
NPF	National Planning Framework
NSAs	National Scenic Areas
oCEMP	Outline Construction Environmental Management Plan
OS	Ordnance Survey
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PINS	UK Planning Inspectorate
PKC	Perth and Kinross Council
PKHT	Perth and Kinross Heritage Trust
PLP	Property Level Protection
PFR	Property Flood Resilience
PPC	Pollution Prevention Control
PPG	Pollution Prevention Guidance
PPV	Peak Particle Velocity
PRA	Preliminary Risk Assessment
pSPA	Proposed Special Protection Area
PVA	Potentially Vulnerable Area
RPA	Root Protection Area
RPL	Relevant Pollutant Linkage
RPV	Resource Protection Values
RSPB	Royal Society for The Protection of Birds
rWFD	Revised Waste Framework Directive
SAC	Special Area of Conservation
SAL	Single Activity Limit
SBL	Scottish Biodiversity List
SCCAP	Scottish Climate Change Adaptation Programme
SEPA	Scottish Environmental Protection Agency
SFFS	Scottish Flood Forecasting Service
SGV	Soil Guideline Value
SNCB	Statutory Nature Conservation Body
SNH	Scottish Natural Heritage
SOM	Soil Organic Matter
SoP	Standard of Protection
SPA	Special Protection Area
SPL	Significant Pollutant Linkage
SSEN	Scottish and Southern Electricity Networks
SSSI	Site Of Special Scientific Interest
SVOC	Semi-Volatile Organic Compounds
SWMP	Site Waste Management Plan
TDP	Traffic Disturbance Plan
TMP	Traffic Management Plan

Term	Definition
TPH	Total Petroleum Hydrocarbon
TS	Transport Statement
UKBAP	UK Biodiversity Action Plan
UKCCRA	UK Climate Change Adaptation Programme
VOC	Volatile Organic Compounds
VP	Vantage Point
WAC	Waste Acceptance Criteria
WFD	Water Framework Directive
WHO	World Health Organisation
WML	Waste Management Licence
WWT	Wildfowl and Wetlands Trust
ZTV	Zone of Theoretical Visibility

1 INTRODUCTION

1.1 Context

This Environmental Impact Assessment Report (EIAR) has been prepared by RPS on behalf of Perth & Kinross Council (PKC) for the South Kinross Flood Protection Scheme (FPS), hereafter referred to as the 'Proposed Development', for which development consent is sought.

The Proposed Development falls under paragraph 10(h) of Schedule 2 of The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 and The Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Amendment Regulations 2017. As such, an Environmental Impact Assessment must be carried out in support of the Licence Application.

1.2 Purpose of the EIAR

Environmental Impact Assessment (EIA) is a procedure under the terms of European Directives[1] for the assessment of the likely significant effects of a project on the environment. An EIAR is a statement prepared by the applicant, providing information on the likely significant effects on the environment based on current knowledge and methods of assessment. It is carried out by competent experts, with appropriate expertise, to provide informed assessment within their discipline.

The primary objective of the EIAR is to identify the baseline environmental context of the proposed project, predict potential beneficial and/or adverse effects of the project and propose appropriate mitigation measures where necessary. In preparing the EIAR, the following legal provisions and guidelines were considered:

- The requirements of EU Directives and Scottish law regarding Environmental Impact Assessment (including The Town and Country Planning (Scotland) Act 1997, as amended by the Planning (Scotland) Act 2019, the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017), and The Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Amendment Regulations 2017;
- European Commission Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU) (European Commission, 2017);
- Planning Circular 1/2017: Environmental Impact Assessment regulations; and
- Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland (Scottish Natural Heritage & Historic Environment Scotland, 2018).

[1] *EU Directive 85/337/EEC as amended by Directives 2011/92/EU and DIRECTIVE 2014/52/EU*

In addition, specialist disciplines have had regard to other relevant guidelines, as noted in the specific chapters of the EIAR.

1.3 Function of the EIAR

This EIAR is a report of the effects, if any, which the Proposed Development, if carried out, would have on the environment, and includes the information specified in Annex IV of the Environmental Impact Assessment Directive and Schedule 2 of The Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Amendment Regulations 2017. The EIAR is the document prepared on behalf of the applicant that presents the output of the assessment conducted on behalf of the applicant, and contains information regarding:

- The Proposed Development;
- Reasonable proposed alternatives;
- The baseline scenario;
- The proposed alternatives;
- The likely significant effects of the project;
- Any additional information laid out in Schedule 2 of The Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Amendment Regulations 2017; and
- The Non-Technical Summary.

The EIAR must include the necessary information for the competent authority to reach a reasoned conclusion and should be of a sufficient quality to enable this judgement. Many of the requirements and provisions of The Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Amendment Regulations 2017 aim to ensure that the EIAR is of a sufficient quality to effectively serve this purpose.

The EIAR has been prepared following an examination, analysis and evaluation of the direct and indirect significant effects of the project in relation to the receiving environment.

1.4 The Proposed Development

In 2018, PKC appointed RPS to develop, promote and implement an FPS for South Kinross based on the options explored in the 2010 Mouchel Flood Study. This involved:

- Developing understanding of flooding issues and mechanisms in the study area;
- Reviewing and updating existing fluvial flood modelling for the area and develop a new (and linked) pluvial model to study and manage surface water flood risk;
- Improving knowledge of existing flood risk to properties and businesses;

- Developing and appraising measures to provide sustainable flood risk management in the South Kinross study area;
- Developing an outline design for a preferred scheme (as identified in Mouchel's 2010 flood study);
- Providing additional recommendations for the future management of flood risk;
- Engaging with partners, stakeholders and land managers in the development of the flood scheme;
- Producing detailed designs for the confirmed flood scheme; and
- Implementing a Flood Protection Scheme.

The Proposed Development considers flooding from the South Queich, the Clash Burn and the Gelly Burn. PKC recommended that the scheme be based on Option A (flood walls and embankments) established in Mouchel's 2010 draft study report.

The study area for the Proposed Development is shown in Figure 1-1.

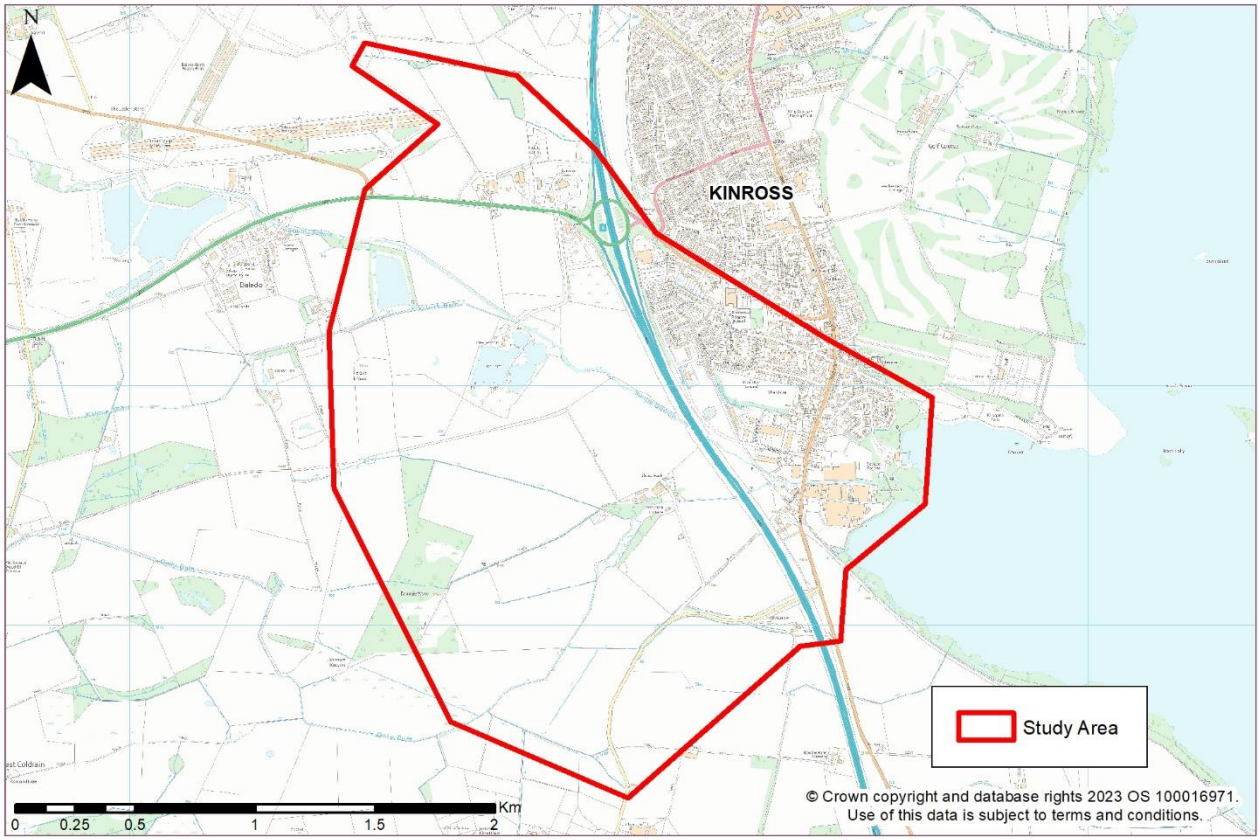


Figure 1-1: South Kinross FPS Study Area

1.5 Requirement for the EIAR

An EIA Screening Report on the Proposed Development was undertaken by RPS and issued to the PKC planning department in July 2021 for their opinion. The report determined that the Proposed Development falls under paragraph 10(h) of Schedule 2 of The Town and Country Planning (Environmental Impact Assessment)

(Scotland) Regulations 2017. In accordance with The Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Regulations 2010, as amended, it was determined that there is a potential for likely significant effects on the surrounding environment of South Kinross. Therefore, likely significant impacts need to be considered in a detailed EIA for the Proposed Development. PKC agreed to carry out the recommendation in the EIA Screening Report.

A request for a Scoping Opinion was subsequently submitted to PKC on 14th February 2022. This was accompanied by an EIA Scoping Report provided to assist PKC and the statutory and non-statutory consultees to form an opinion upon the likelihood of significant environmental effects and hence to topics to be assessed in the EIA. The scoping report also provided an opportunity for consultees to comment upon suggested methodologies for technical assessment. Further Optioneering by RPS identified additional flood mechanisms upstream of Kinross from the South Quiech and in town from the Clash Burn. The study was therefore expanded to include these areas.

1.6 Methodology & Structure of the EIAR

The main aim of this EIAR is to provide information on the Proposed Development to the public concerned, prescribed bodies and the competent authority. To this end, Article 3(1) of the EIA Directive requires that significant effects are identified, assessed and described in an 'appropriate manner'.

Article 5(1) of the EIA Directive sets out the information should be presented in an EIAR to enable stakeholders and authorities to form opinions, and to make decisions regarding the project. While there are no formal requirements concerning the format and the presentation of the report, this EIAR clearly sets out the methodological considerations and the reasoning behind the identification and assessment of likely significant effects.

1.6.1 EIAR Content

Article 5(1) sets out what must be included as a minimum in the EIAR. Annex IV to the Directive, expands on these requirements. In short, this includes the following:

- A description of the project: this is an introduction to the project and includes a description of the location of the project, its characteristics, including land use requirements during capital dredging operations and operational phases, as well as estimates of the expected residues, emissions, and waste produced during each phase.
- Baseline scenario: a description of the relevant aspects of the current state of the environment, and the likely evolution thereof, without the implementation of the project, on the basis of the availability of environmental information and scientific knowledge.
- Environmental factors affected: a description of the environmental factors likely to be significantly affected by the project, including consideration of climate change mitigation and adaptation, biodiversity, natural resource sustainability, and the risks of major accidents and disasters.

- Effects on the environment: a description of the likely significant effects of the project on the environment. Such significant effects include direct and indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, and positive and negative, as appropriate.
- Assessment of alternatives: a description of the studied reasonable alternatives to the project, with an indication of the main reasons for the selection of the option chosen, including a comparison of environmental effects.
- Mitigation measures: a description of the measures envisaged to avoid, prevent, reduce and, where possible, offset any identified significant adverse effects on the environment, including a determination of the effectiveness of such measures, their reliability and certainty, as well as the commitment to ensuring their practical implementation and monitoring of results.
- Monitoring: a description of any measures proposed to monitor significant adverse effects on the environment and/or measures taken to mitigate them.
- Non-Technical Summary: an easily accessible summary of the content of the EIAR presented without technical jargon, hence understandable to anybody without a background in the environment or the project.
- Quality of the EIAR: the experts responsible for preparing the EIAR are competent.

1.6.2 Assessment of Environmental Effects

1.6.2.1 Assessment Methodology

The assessment of whether the Proposed Development is likely to have a significant effect on the environment has been undertaken through a variety of methods:

- Professional judgment and experience based on published guidance criteria;
- Assessment of both temporary and permanent effects (direct, indirect, secondary and residual);
- Assessment of interaction and cumulative effects;
- Assessment of duration and reversibility of these effects;
- Assessment against local, regional and national planning policy; and
- Consultation with statutory and non-statutory consultees.

Generally, the significance of effects is determined referring to the Institute of Environmental Management and Assessment (IEMA) guidance as illustrated in Table 1-1 unless otherwise outlined in specific chapters of this report.

Table 1-1: General categorisation of the scale of significance

		Magnitude of change			
		Major	Moderate	Minor	Negligible
Sensitivity	High	Major	Major/Moderate	Moderate	Minor
	Medium	Major/Moderate	Moderate	Moderate/ Minor	Minor
	Low	Moderate	Moderate/Minor	Minor	Minor/Negligible

Significant impacts are in dark shading

The cumulative effects of the Proposed Development, in conjunction with other proposed projects, are considered within each topic chapter. Relevant developments considered within the cumulative assessments include those which are:

- Under construction;
- Permitted, but not yet implemented;
- Submitted, but not yet determined; and
- Identified in the Local Development Plan (and emerging Local Development Plans), recognising that much information on any relevant proposals is limited.

It is noted that projects that are built and operational at the time of submission are considered to be part of the existing baseline conditions.

Each chapter further considers whether there are significant cumulative effects which are likely to arise as a result of interactions within topic chapters and/or as a result of the Proposed Development.

1.6.2.2 Mitigation and / or Compensation Measures

Where required, mitigation measures are identified and described within individual topic chapters. These are measures which could further avoid, prevent, reduce and, where possible, offset likely significant adverse effects upon the environment.

The description of mitigation measures includes details regarding the specific adverse effects for which measures are proposed, an assessment of the expected effectiveness, reliability and certainty of the measures, and any commitments regarding their implementation and future monitoring.

1.6.2.3 Monitoring

Further to mitigation measures, appropriate and proportionate monitoring measures are also identified and summarised within individual topic chapters.

Such monitoring measures may arise either because of legislative requirements and/ or directly in relation to the effects of the Proposed Development upon environmental factors. Nevertheless, duplication of efforts will be strictly avoided.

1.6.2.4 Conclusion on Likely Significant Effects

A conclusion by the authors of the EIAR on the likely significant effects of the Proposed Development on the environment, taking into account the results of the examination of the information presented in the EIAR, is provided. In addition, a summary of the key impacts and mitigation and monitoring measures associated with the Proposed Development is provided, along with a discussion of cumulative impacts, interactions and inter-relationships between environmental topics. This conclusion will inform the reasoned conclusion to be made by the competent authority in conducting the EIA.

1.6.3 Structure of the EIAR

The EIAR has been structured in accordance with the European Commission's Guidance "Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)" (2017). Accordingly, the EIAR:

- Is presented with a clear structure with a logical sequence that describes, inter alia, existing baseline conditions, predicted impacts (nature, extent and magnitude), scope for mitigation, proposed mitigation measures, significance of unavoidable/residual impacts for each environmental factor;
- Contains a table of contents at the beginning of the document;
- Comprises a description of the consent procedure and how Environmental Impact Assessment fits within it;
- Reads as a single document with appropriate cross-referencing and is concise, comprehensive and objective;
- Is written in an impartial manner without bias;
- Includes a full description and comparison of the alternatives studied;
- Makes effective use of diagrams, illustrations, photographs and other graphics to support the text;
- Uses consistent terminology with a table of acronyms;
- References all information sources used;
- Has a clear explanation of complex issues;
- Contains a good description of the methods used for the studies of each environmental factor;
- Covers each environmental factor in a way which is proportionate to its importance;
- Provides evidence of effective consultations;
- Provides a basis for effective consultations to come;
- Makes a commitment to mitigation (with a programme) and to monitoring;
- Contains a Non-Technical Summary which does not contain technical jargon; and

- Contains, where relevant, a reference list detailing the sources used for the description and assessments included in the EIAR.

The EIAR is broken down into the Chapters shown in Table 1-2 below.

Table 1-2: EIAR chapters

Chapter Number	Chapter Title	Additional Information
N/A	Table of Acronyms	Table of Acronyms
1	Introduction	Introduction to the project, purpose and function of the EIAR, and methodology and structure of the EIAR.
2	Need for the Project	Description of the current baseline conditions in South Kinross, the objectives of the Proposed Development and spatial planning policy relevant to the project.
3	Project Description	Description of the Proposed Development being assessed through this EIAR. Includes a description of the site location.
4	Assessment of Alternatives	Summary of alternative options explored as part of the project. Includes strategic level and project level options.
5	Project Scoping and Consultation	Summary of EIA Scoping and consultation undertaken to date.
6	Air Quality	These Chapters address specific environmental factors and provide a description of the existing environment, the likelihood of effects, the significance of effects, remedial and mitigation measures, residual impacts and monitoring measures. The specific environmental factors considered, following Environmental Impact Assessment Scoping as described in Chapter 5 of this report.
7	Biodiversity – Ornithology	
8	Biodiversity – Terrestrial & Aquatic	
9	Cultural Heritage & Archaeology	
10	Landscape & Visual	
11	Material Assets & Land Use	

Chapter Number	Chapter Title	Additional Information
12	Noise & Vibration	
13	Soils, Geology, Hydrogeology & Contamination;	
14	Waste	
15	Flood Risk, Hydrology & Drainage	
16	Water Quality	
17	Cumulative Effects & Environmental Interactions	Summary of the assessment of cumulative effects which may arise from adjacent or nearby developments together with those predicted for the Proposed Development as well as the environmental interactions which have been examined within the individual technical assessment chapters.
18	Mitigation Measures and Conclusions	Summary of mitigation measures, conclusions and any further recommendations.
19	References & Bibliography	List of references for each of the chapters of the EIAR.

The advantages of using this type of format are that it is easy to examine each environmental topic and it facilitates easy cross-reference to specialist studies undertaken as part of the assessment.

Each topic of environmental assessment is considered as a separate chapter and is drafted by relevant specialists.

The EIAR is presented in three volumes of the application documentation, as follows:

- Volume 1 EIAR Non-Technical Summary
- Volume 2 EIAR Main Document
- Volume 3 EIAR Appendices

In addition to the EIAR and its appendices, the application for consent also includes:

- Outline Construction Environmental Management Plan (oCEMP);

The following companies were involved in the preparation of the EIAR:

- RPS – Lead Environmental Consultants

The production of the EIAR has been co-ordinated by RPS. The EIAR structure, responsibility and qualified input for each chapter are detailed in Table 1-3.

Table 1-3: List of Contributors to EIAR Chapters

Chapter of EIAR	Lead Author(s)	Company	Subject	Qualifications
Chapter 1	James Hamilton	RPS	Introduction	BSc, MSc, MCIWEM
Chapter 2	James Hamilton	RPS	Need for the Project	BSc, MSc, MCIWEM
Chapter 3	James Hamilton	RPS	Project Description	BSc, MSc, MCIWEM
Chapter 4	James Hamilton	RPS	Assessment of Alternatives	BSc, MSc, MCIWEM
Chapter 5	James Hamilton	RPS	Project Scoping and Consultation	BSc, MSc, MCIWEM
Chapter 6	Stephen McAfee	RPS	Air Quality & Climate	BSc, MSc, C.Sci, AIEMA, IAQM
Chapter 7	Kirstene Campbell	RPS	Biodiversity – Ornithology	MSc, BSc, ACIEEM
Chapter 8		RPS	Biodiversity – Terrestrial & Aquatic	
Chapter 9	Richard Conolly	RPS	Cultural Heritage & Archaeology	MA, MCIfA, FSA Scot
Chapter 10	Stuart Anderson	RPS	Landscape & Visual	BSc, PG Dip LandMan, CMLI
Chapter 11	James Hamilton	RPS	Material Assets & Land Use	BSc, MSc, MCIWEM
Chapter 12	Catriona Cooper	RPS	Noise & Vibration	BSc, PG Dip, MCIEH, MIoA, MIAQM
Chapter 13	Joseph McGrath Josh Fullerton	RPS	Soils, Geology, Hydrogeology & Contamination;	BSc, MSc, MCIWEM, C.WEM, CSci, MIEnvSc BSc, MSc
Chapter 14	Ciara Devine	RPS	Waste	BSc, MSc, MCIWM
Chapter 15	Diane McGinnis	RPS	Flood Risk, Hydrology & Drainage	BEng, MSc, CEng, MIEI, MICE

Chapter of EIAR	Lead Author(s)	Company	Subject	Qualifications
Chapter 16	Mark Magee	RPS	Water Quality	BSc, MSc, CSci, C.WEM, MCIWEM
Chapter 17	James Hamilton	RPS	Summary of Mitigation Measures	BSc, MSc, MCIWEM
Chapter 18	James Hamilton	RPS	Cumulative Effects & Environmental Interactions	BSc, MSc, MCIWEM
Chapter 19	James Hamilton	RPS	Summary & Conclusions	BSc, MSc, MCIWEM

2 NEED FOR PROJECT

2.1 Introduction

This chapter of the EIAR details the need for the Proposed Development and examines this in the context of relevant spatial planning policy having regard to national, regional and local policy objectives.

This chapter should be read in conjunction with Chapter 3 ‘Project Description’, which describes the Proposed Development and provides information on the project site, design and other relevant features.

2.2 Project Rationale

2.2.1 Introduction

There has been a history of flooding in the South Kinross area from the South Queich, the Clash Burn and the Gelly Burn. There are two distinct areas affected by flooding in South Kinross. The northern area suffers from flooding from the Clash Burn, with the southern area affected around the confluence of the South Queich and the Gelly Burn. The Proposed Development Study Area and associated river catchments are shown in Figure 2-1.

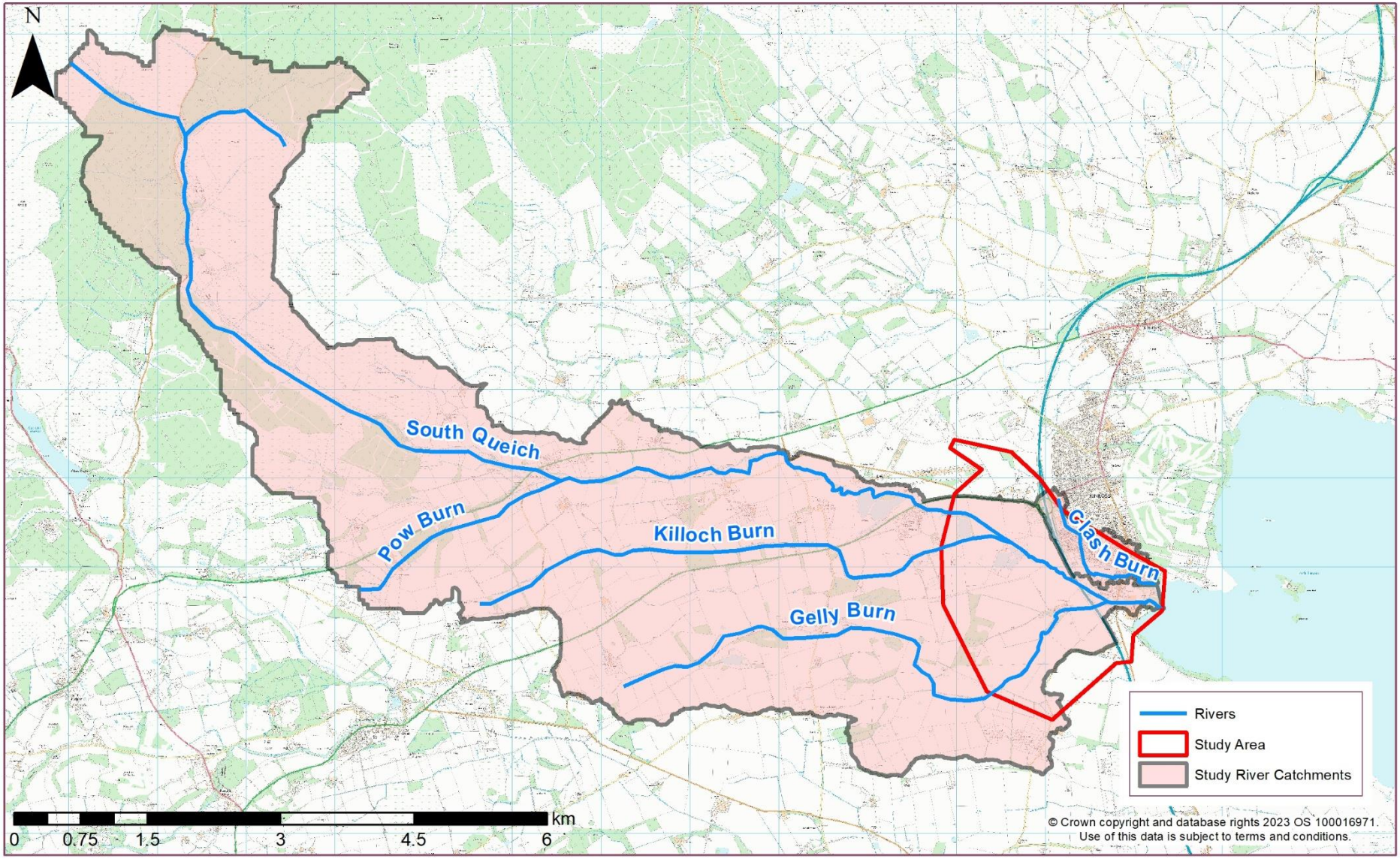


Figure 2-1: Proposed Development Study Area and associated River Catchments

The catchment for the South Queich stretches westwards from Kinross and encompasses the catchment of the Gelly Burn and the Killoch Burn. It is a rural catchment made up of mainly grassland and arable lands, with only 2% being urbanised areas. The geology is 88% low permeability bedrock. The lower section of the South Queich (east of the M90) passes through 300m of industrial land, before passing a wastewater treatment works for textiles production and 250m of loch side vegetation, before flowing into Loch Leven

The solution to the issue of flooding in South Kinross is the construction of flood walls and embankments along the South Queich and Gelly Burn, upgrades and diversions to culverts along the Clash Burn, a storage pond at The Myre and a storage embankment near Kinross Services.

2.2.2 Proposed Development Objectives

The objectives of the Proposed Development are:

- To reduce the economic damages to residential and non-residential properties in the South Kinross area from the South Queich, the Gelly Burn and the Clash Burn; and
- Where possible to improve the WFD status of the bodies of water in the area.

2.3 Spatial Planning Policy

2.3.1 Introduction

This section of the EIAR considers national, regional and local planning and development policy guiding and regulating development in the town of Kinross and the surrounding area. Figure 2-2 illustrates an overview of the Scottish Planning System and the importance of policy in the assessment of planning applications. The relevant planning policies are set out for each section for each level within the hierarchy in the sections that follow.

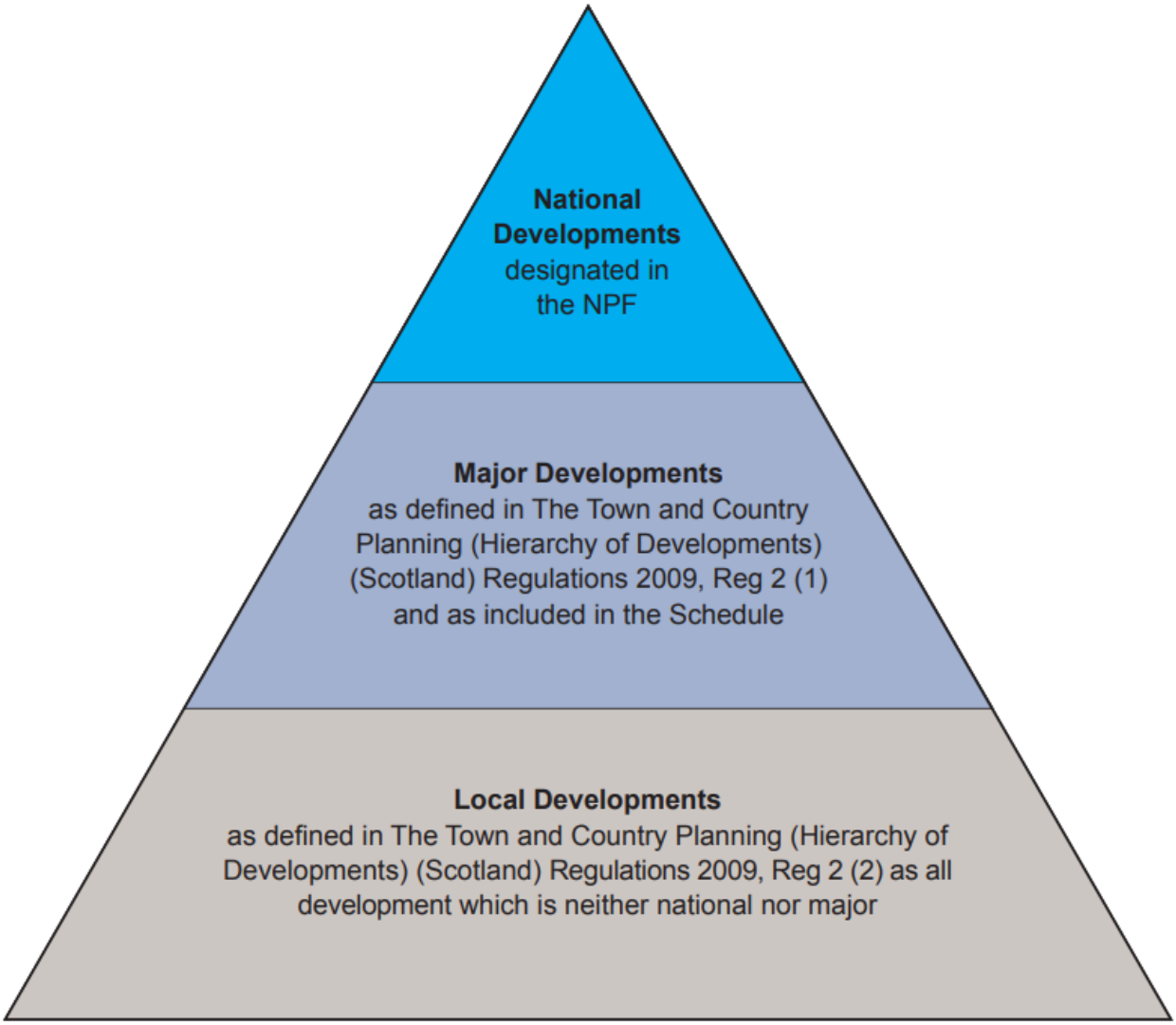


Figure 2-2: Planning Policy Hierarchy (Source: https://www.gov.scot/publications/guide-planning-system-scotland/documents/)

2.3.2 Relevant National Planning and Development Policy

2.3.2.1 National Planning Framework

The National Planning Framework (NPF) is a long-term strategy for Scotland which is the spatial expression of the Government Economic Strategy. NPF identifies national developments and other strategically important development opportunities in Scotland. Statutory developments must have regard to the NPF along with the National and Regional Marine Plans where necessary. NPF aims to help the planning system to deliver Scottish Government visions for Scotland.

In 2023, the NPF4 was adopted by Ministers, and this replaces the NPF3 which was published in 2014.

2.3.3 Relevant Regional & Local Planning and Development Policy

2.3.3.1 TAYplan

TAYplan sets the overall planning vision from 2016-2036 for the whole Dundee and Perth area, including North Fife and parts of Angus and Perth & Kinross. The plan's vision is to improve people's quality of life and the policies included within lay out where development is required and how the plan will help shape good quality places. The plan states that encouraging investment, creating new jobs, better connecting places and strong community empowerment can help achieve a strong economy and good quality places to live and work. TAYplan works as a guide for the production of strategies, plans, programmes within the relevant council areas.

TAYplan is divided into 10 policies:

- Location Priorities
- Shaping Better Quality Places
- A First Choice for Investment
- Homes
- Town Centres First
- Developer contributions
- Energy, Waste and Resources
- Green Networks
- Managing Assets
- Connecting People, Places and Markets

TAYplan divides settlements into tiers based on settlement size and influence as well as share of additional development:

- **Tier 1** – principal settlements which have the potential to accommodate the majority of the region's additional development over the plan period and make a major contribution to the region's economy;
- **Tier 2** – principal settlements which have the potential to make a major contribution to the regional economy but will accommodate a smaller share of the additional development; and
- **Tier 3** – principal settlements which have the potential to play an important but more modest role in the regional economy and will accommodate a small share of the additional development.

Kinross is classified as a Tier 2 settlement under TAYplan.

2.3.3.2 Perth & Kinross Local Development Plan

The Perth & Kinross Local Development Plan (LDP), adopted in 2019, is the Council's statutory corporate document that guides all future development and use of the land. It allows for improvement and change in the area while shaping the environment and economy of Perth & Kinross.

The LDP lays out how the council aim to work towards their vision for Perth & Kinross by showing which land is being allocated to meet development needs to 2029 and beyond.

The Plan contains a spatial strategy which outlines the overall view of where development should go and the principles behind those decisions. Perth & Kinross Council have identified future development sites and the scale of development expected. They have also outlined requirements for designing and delivering development, emphasising the need for masterplans, for all the major sites. Council policies explain what uses are acceptable in different areas and set out the requirements for different types of development.

Policies in the LDP have been split into four groups, in line with the NPF4:

- A Successful Sustainable Place
- A Low Carbon Place
- A Natural Resilient Place
- A Connected Place

Each policy section contains a Vision, Key Objectives and Spatial Strategy as it relates to that policy theme.

Figure 2-3 shows the Settlement Strategy for Kinross and Milnathort in the South Kinross LDP.

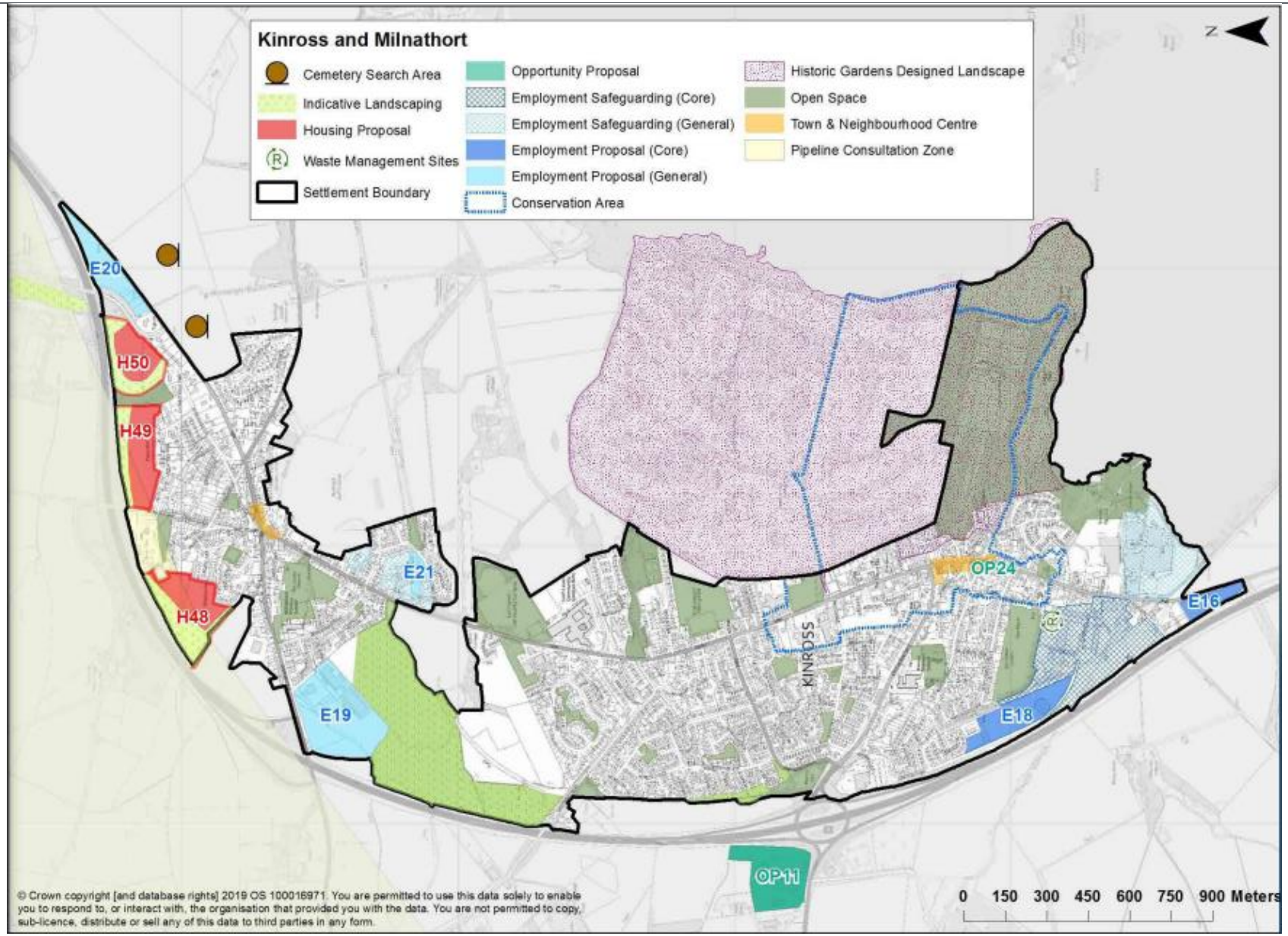


Figure 2-3: Kinross & Milnathort Settlement Strategy

3 PROJECT DESCRIPTION

3.1 Location of Project and Site Characteristics

3.1.1 Site Location

Kinross is a town in Perth & Kinross, Scotland and is situated approximately 21km south of Perth and approximately 32 km northwest of Edinburgh (Figure 3-1). The town is bounded to the west by the M90 motorway, which links Edinburgh with Perth. Kinross is situated along the western bank of Loch Leven in the south of the PKC area.

Figure 3-1: Proposed Development (Site Location)

3.2 Proposed Development

The Proposed Development forms one of the selected actions identified as part of the Potentially Vulnerable Area (PVA) (10/4) in the Forth Estuary Flood Risk Management (FRM) Strategy (December 2015), and Forth Estuary Local FRM Plan (June 2016). A feasibility study was carried out following the Scottish Government's 'Options appraisal for flood risk management: Guidance to support SEPA and the responsible authorities' by Mouchel in 2010. As a result, a preferred option was identified based on cost, levels of protection, impact upon the natural environment and any potential impact on social receptors. The preferred option for the Proposed Development consisted of flood defence walls to provide a 1 in 200 year (plus 20% climate change uplift) standard of protection for the South Queich and the Gelly Burn. A preferred option was not presented for the Clash Burn. Subsequently, in 2018, RPS investigated the previously identified solutions further, using updated hydrological analysis and hydraulic modelling to determine their feasibility. New flood mechanisms from the Clash Burn and the South Queich further north in Kinross were identified. This has resulted in solutions for these locations being it was incorporated into the final design.

It should be noted that minor amendments have been to the scheme design layout used in the assessments outlined in Chapters 6 to 16. This is because the design has been tweaked in response to public consultation and additional technical information being made available. This is common in EIAs and has not constituted a material change in the design. On this basis the assessment areas, methodologies or findings for any topics assessed are unchanged. An overview of the Proposed Development is provided in Figure 3-2 (Flood Cells 1 & 2) and Figure 3-3 (Flood Cell 3) which differs slightly from figures provided in Chapters 6 to 16 and associated Appendices.

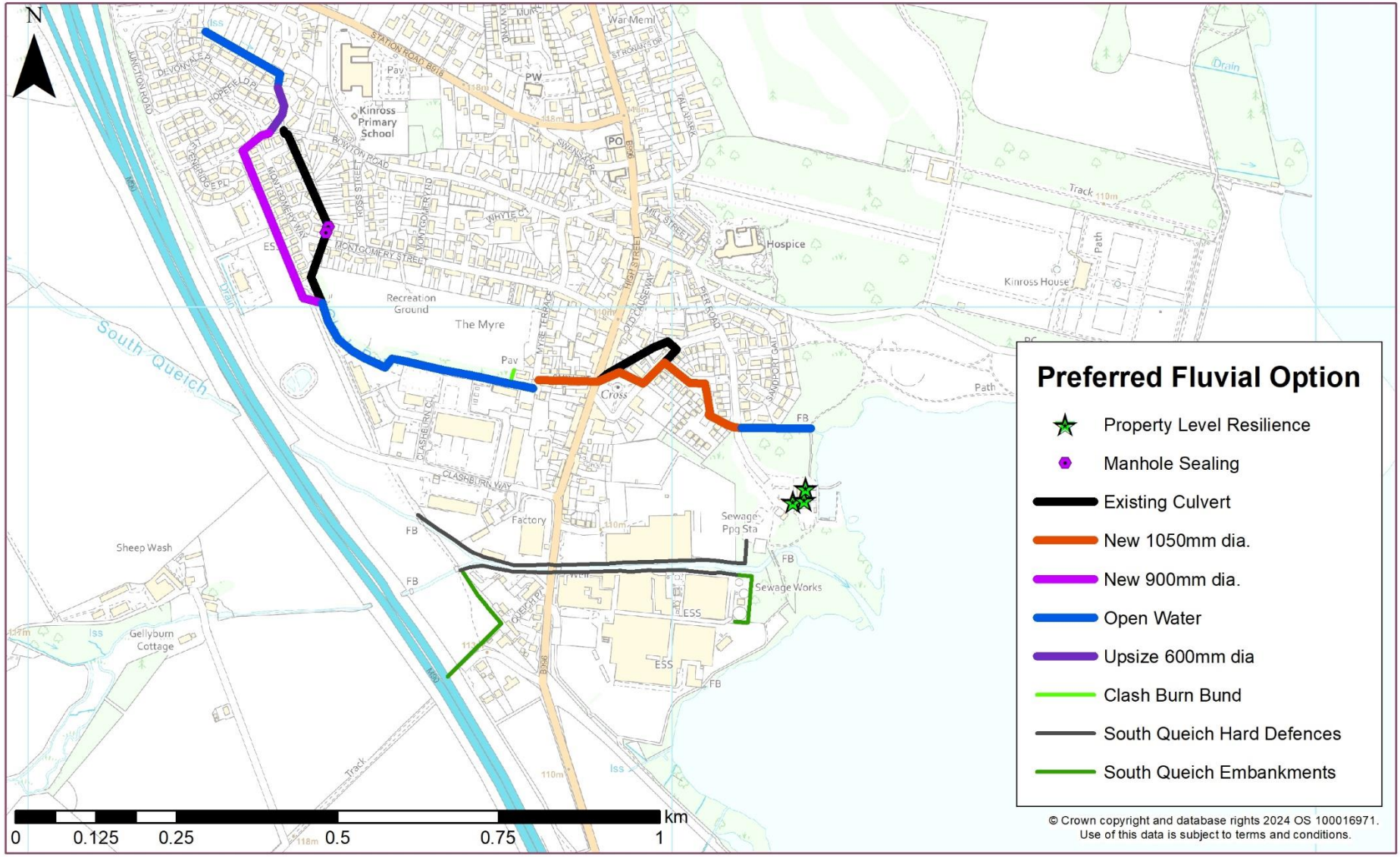


Figure 3-2: Proposed Development Overview (Flood Cells 1 & 2)

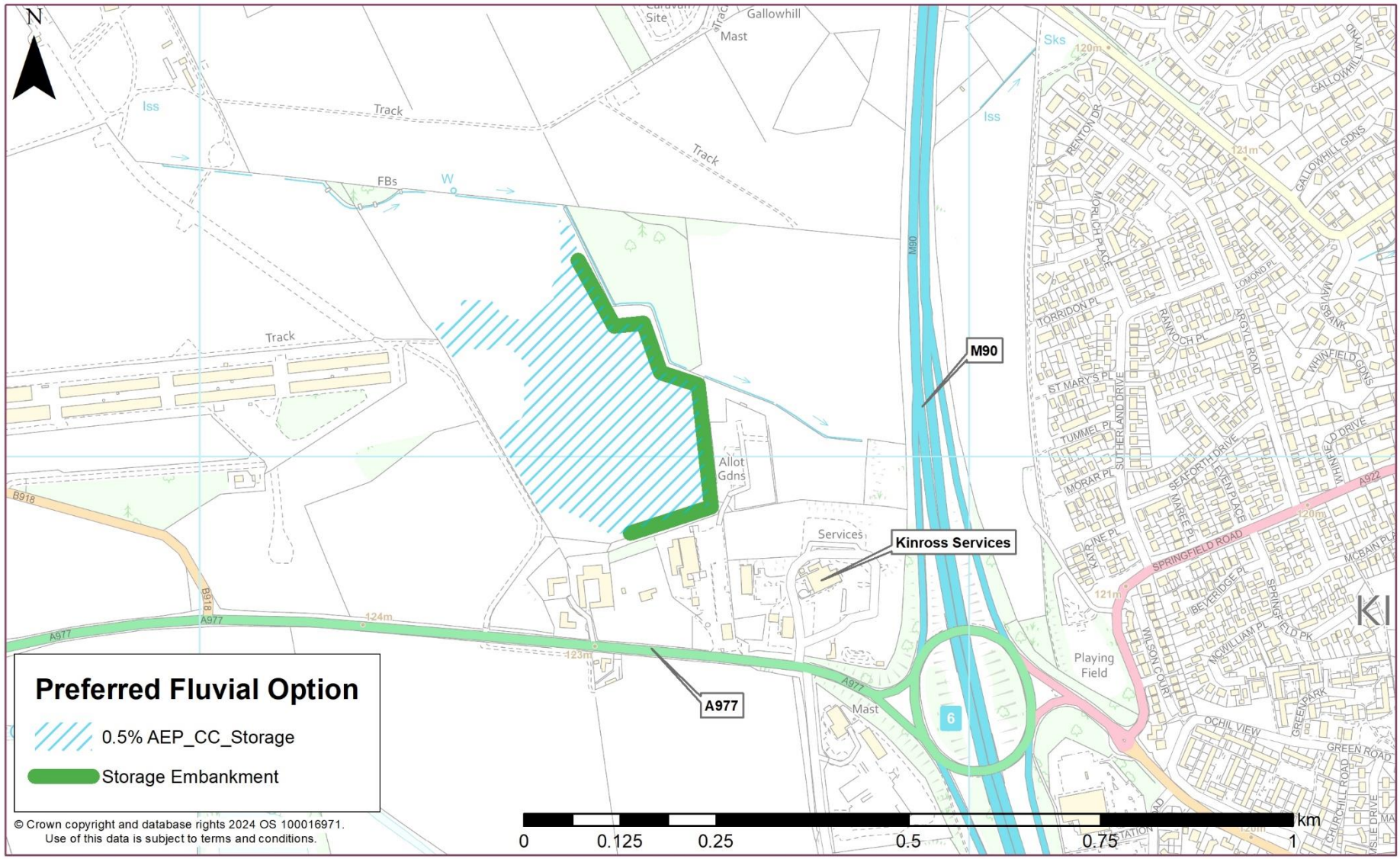


Figure 3-3: Proposed Development Overview (Flood Cell 3)

A 0.5%+Climate Change (CC) Annual Exceedance Probability (AEP) Standard of Protection (SoP) will be afforded to the majority of properties at risk within the study area (c. 232 ha). Through a combination of hard defences (walls and embankments) proposed along the South Queich and the Gelly Burn, and a combination of culvert upgrades, culvert diversions and construction of a bund for the Clash Burn. Four non-residential properties situated near the Loch Leven pier at Kinross are to be afforded property-level-protection to reduce the impact of flooding from the Loch, whilst maintaining access to the pier.

There have been seven elements proposed for the Proposed Development. These have been identified and briefly summarised below (the finer details are subject to change (detailed design):

- **Element 1 – Direct Defences**

  This will involve the construction of a variety of direct defences including embankments, retaining walls and sheet pile walls. Walls will be situated predominantly along the banks of the South Queich from the Old Railway Bridge to the Loch Leven Heritage Trail footbridge. Embankments will be placed between the M90 and Queich Place to utilise an existing area of floodplain. A further small stretch of embankment will also be placed near the woollen mill's wastewater treatment plant at the right bank of the South Queich close to Loch Leven. This element will provide a SoP of 0.5% (Present Day) Fluvial AEP. See Figure 3-2 for an overview map of this element.

- **Element 2 – Hopefield Place Culvert Upgrades**

  Culverts will be upgraded at Hopefield Place. This element will provide a SoP of 0.5%+CC Fluvial AEP. See Figure 3-2 for an overview map of this element.

- **Element 3 – Clash Burn Diversion Culvert**

  A diversion culvert at Bowton Road will divert flows from the Clash Burn behind the properties on Montgomery Way before discharging back into the Clash Burn at the Myre playing fields. Two manholes will also be sealed at Montgomery Street. This element will provide a SoP of 0.5%+CC Fluvial AEP. See Figure 3-2 for an overview map of this element.

- **Element 4 – Clash Burn Bund**

  A small bund is proposed on the Myre playing fields. This element will provide a SoP of 0.5%+CC Fluvial AEP. See Figure 3-2 for an overview map of this element.

- **Element 5 – Clash Burn Diversion Culvert, Smith Street**

  A second diversion culvert will be constructed at the junction of Smith Street and High Street to take flow along Sandport Road, then along Nan Walker Wynd and directed between two properties and back into the Clash Burn at Sandport Close. This element will provide a SoP of 0.5%+ CC Fluvial AEP. See Figure 3-2 for an overview map of this element.

- **Element 6 – Upstream Storage**

  An embankment will be constructed close to the M90 services to intercept an overland flow path from the South Queich. This element will provide a SoP of 0.5% (Present Day) Fluvial AEP. See Figure 3-3 for an overview map of this element.

- **Element 7 – Property Level Resilience (PFR)**

PFR will be afforded to four properties affected by high water levels in Loch Leven. See Figure 3-2 for an overview map of this element. This will provide resilience to 4 properties blocking flood entry routes to these properties, reducing effects of flooding and reducing time of recovery.

The main structural elements of the schemes (culverts, flood defences and upstream storage) have been designed for a minimum working life of 100 years with suitable maintenance activities included in the whole life cost of the scheme.

3.3 Outline Method Statement

This section includes details on the construction methodology, plant machinery and any other relevant related activities for the various elements of the Proposed Development preferred option which is summarised in Section 3.2.

3.3.1 Preliminary Works

The following preliminary works will be undertaken, where required:

- Site dilapidation survey and level surveys;
- Site compound establishment;
- Installation of temporary haul roads and accesses;
- Erection of temporary fencing;
- Site clearance works including removal of vegetation and topsoil;
- Installation of temporary pollution control measures;
- Installation of temporary drainage measures;
- Installation of temporary flood mitigation measures;
- Service diversions;
- Traffic management; and
- Transport of material to site.

3.3.2 Main Works

It is envisaged that the proposed works will be completed in phases, of which the following elements are identified:

- Flood defence structures;
- Back drainage along line of flood defence structures;
- Relocation of Gelly Burn Footbridge;

- Construction of the flood storage area upstream of Kinross Services;
- Upgrading of existing culvert and construction of new culverts; and
- Erosion protection works downstream of High Street Bridge.

3.3.3 Finishing Work

It is envisaged that the finishing works will be completed in conjunction with the Main Works phases listed in Section 3.3.2. The finishing works will include:

- Landscaping; and
- Removal of site facilities and temporary access routes.

3.3.4 Phasing

It is anticipated that construction of the Proposed Development will commence in 2025 and that construction would be phased over a period of approximately 53 weeks, with substantial completion expected during 2026.

A detailed works programme is yet to be developed, however, estimations on phasing and timeframes have been established using experience from other similar schemes in Scotland.

Assuming that culvert upgrade works and upstream storage works are one work package and carried out in parallel with direct defence construction:

- Culvert upgrades and diversions – 40 weeks
- Upstream storage – 8 weeks
- Flood defences – 53 weeks

A 5-day work week is anticipated with the works being undertaken only during weekdays from 07:00 to 19:00. The exact form of temporary works for access to the watercourse is not yet known but there may be a requirement for water pumps to keep working areas dry. The water pump will be on standby 24 hours a day and start removing water when the water level exceeds a desired height; hence it will be necessary for them to operate at night.

3.3.5 Direct Defences

3.3.5.1 Construction Methodology

Flood Walls

The available working area for hard defences is extremely constrained by existing properties. The following is the likely construction method based on this constraint:

- Utilities are congested and will require substantial engagement and potential enabling works with the relevant providers to reach an agreement on any necessary alterations. All major utility diversions should ideally be carried out in advance of construction works where possible (See Volume III, Appendix A).

- A 20m working strip will be required to allow the construction of the defences and establishment of a haul road will be required in grassed areas. The existing tarmac areas are suitable, but these may need reinstated on completion of the works.
- Temporary fencing of the working area will be required for the duration of the construction works for security and health and safety purposes.
- Construction access for walls upstream of High Street will be gained from industrial areas at Clashburn Road on the left bank and Quiech Place on the right bank. The working area available between the riverbank and properties will be sufficient for this construction from land and hardstanding areas on the left bank can be used to store equipment and materials (See Volume III, Appendix B).
- Access downstream of the High Street bridge is more challenging due to limited space between buildings and the river. The British Car Auctions (BCA) site and parts of the Todd and Duncan site will be demolished to facilitate access over the extent of the right and left bank defences.
- Over the extent of the BCA building (140m, left bank) and for most of the right bank (200m) it is anticipated temporary in-river platforms or temporary culverting will be required to provide access to the piling rig. It may be possible to install the piles “self-sufficiently” without in-river platforms, however it is likely an in-river platform would be required over these lengths to support the Pile Press and an excavator for finishing works where a reinforced or masonry finish is required.
- Topsoil will be stripped and stockpiled ready for reinstatement on completion of the works.
- Piles will be installed using either Silent Pile Press or track mounted piling rig depending on the available working area. The silent piling approach will use a Giken Silent Pile Press (pre-boring as required). This method is vibration free thus reducing risk to foundations from nearby buildings. Additionally, the Pile Press and reaction stand covers an area of appropriately 6x6m and can ‘self-walk’ along the pile heads, reducing the required working area. No crane support is required to move the pile press along the line, meaning that the pile press can effectively be employed over water.
- A reaction stand will be used for the initial piling work. A press in machine will be horizontally loaded onto the reaction stand and counterweights added depending on soil conditions and required pile length. The first pile will then be pressed in using all weights on the machine and counterweights as a reaction. After installing the first pile, this then becomes the first reaction pile for the second pile. Once the press in machine is fully sat on reaction piles, the initial piling work is complete, and the reaction stand, and counterweight will be removed.
- The Silent Piler self-moves and clamps the previously installed reaction piles to generate a reaction force from the negative skin friction and interlocking resistance of the reaction piles. The reaction force then provides the required press-in force to hydraulically jack subsequent piles into the ground.
- Where a track mounted piling rig is used driven piles will be hammered, jacked or vibrated into the ground into the ground using a percussion hammer, hydraulic driver or rams (likely to be used for sheet piles) or diesel-powered vibratory drivers used to reduce surrounding ground resistance and allow the pile to slide into the ground.

- The finish of the wall will either be bare sheet pile in industrial areas with concrete finish in residential facing areas. A pre-cast concrete coping will be fixed to the top of the wall.
- Where a concrete facing is required, on completion of pile installation process, excavation around the top of the pile will be undertaken to facilitate the construction of a capping beam. A blinding layer of site concrete will be formed, capping beam reinforcement will be tied and erection of formwork and pouring of in-situ concrete will bring the flood wall up to existing ground level with starter bars protruding to extend into the cantilevered wall above ground level.
- The steel reinforcement for the above ground concrete wall can then be fixed, shuttering work erected and pouring of in-situ concrete. The walls can either be a patterned concrete finish - formed by fixing a mould to the inside of the shuttering or stone faced once the wall has cured depending on requirements of PKC Structures. Given the proximity of the historic bridge a sympathetic finish will be required. If required by PKC or residents, a pre-cast concrete coping will be fixed to the top of the wall.

Flood Embankments

The construction of the flood embankments will involve the following construction methodology:

- Utility diversions would be facilitated prior to main construction works.
- Initial clearing of vegetation and trees within a working strip up to 40m in width for embankments. The clearance will facilitate the construction of the defences and provide sufficient space for the movement of site traffic.
- Treatment of invasive species will be required in advance of the works to avoid any spreading as a result of the works.
- Temporary fencing of the working area will be required for the duration of the construction works for security and health and safety purposes.
- A stoned haul road will be required to enable the transportation of embankment, wall and culvert materials into the site and along the length of the proposed defences.
- Stripping and storage of topsoil for reuse.
- Import and storage of suitable clay material to form the core of the embankment by lorry and road. This will be stored within the working area and brought to a required location using excavators and dumpers.
- Excavation of a trench up to 2m deep and wide (subject to ground investigation and geotechnical design) will be undertaken by an excavator as a suitable cut off, and clay placed and compacted in layers until the defences have reached the necessary height.
- The remainder of the embankment will be constructed from inert material to meet the required gradient of 1 in 3 or 1 in 2.5. The embankment will then be topsoiled with a suitable, biodegradable geotextile and sown in grass. The geotextile will protect the embankment from erosion until such times as the vegetation has been established.

- A back drain will be required at the rear toe of the embankment. It will require a trench dug by an excavator to facilitate the laying of typically a 100mm diameter perforated drainage pipe in clean stone. Manholes will be required at 50m intervals or at changes of direction of the back drains. Outfalls from this back drain, passing beneath the earth embankment and discharging to the river will be required. These will need to be flapped to prevent backflow during times of flood.

3.3.5.2 Plant Machinery

The plant and machinery required to undertake the hard defence works is likely to include the following:

- Dump trucks;
- Tracked excavators;
- Mobile crane;
- Mobile generators;
- Piling rig;
- Vibratory/roller equipment;
- Cement mixer;
- Import of fill for replacement of unsuitable fill and for embankments;
- Export of unsuitable fill;
- Import of clay for embankment core;
- Import of matting/grasscrete;
- Import of pipe, bedding materials, geotextile;
- Import of sheet piles;
- Import of ready mix concrete;
- Import of precast sections (for outfalls);
- Import of wall facing materials.
- Wheel scraper units;
- Dozer;
- HGV tippers; and
- Grader.

It is likely that the construction work will require approximately 18 staff, comprising:

- Twelve operatives;
- Four managers/admin staff; and

- Two Employer supervisors.

3.3.5.3 Drainage

Back drainage will be constructed behind defences to capture flow paths and ensure the land behind the defences does not become waterlogged. This will consist of a series of perforated pipes bedded in no fines granular material and laid parallel to the defences. Precast concrete manholes will be provided at regular intervals to facilitate access for maintenance or changes in direction. At suitable locations the drainage pipe will need to be cored through the flood wall or laid underneath the flood embankment and outfall to the river via a flapped discharge. It will be necessary to provide a precast concrete headwall at all discharge location points.

It should be noted that a full drainage design will be carried out at the detailed design stage.

3.3.6 Culvert Upgrades

3.3.6.1 Access

Access to the Hopefield culvert section will be gained from the Hopefield Place cul-de-sac. Access to the Clash Burn Diversion will be gained from Junction Road. It is likely a satellite construction compound will be set up in parkland adjacent to Hopefield Place. Bog mats may be required to facilitate plant access.

Access to the diversion section at Bowton Road will be from the carriageway itself with traffic diversions required to facilitate working in the carriageway. Once the culvert continues south the existing access track will be utilised for access and extended into scrubland at Kipper Hire where another satellite compound will likely be set up.

Access for the final section of works will again be at live carriageways including Smith Street, Sandport, Sandport Close and Nan Walker Wynd. Another potential route for the culvert would be through green space to the rear of residential houses at Nan Walker Wynd. Upgrade works may be required to the footbridge at Sandport Close to facilitate the junction of the culvert. A third satellite compound will be set up in green space at the Sandport / Smith Street junction.

Culvert works will be carried out in sequential sections (downstream to upstream) to minimise disruption and maximise access throughout Kinross as much as possible. Specific traffic management measures will be required along the sections of culvert which are located beneath the public road to minimise impacts on traffic particularly at Bowton Road, High Street and Sandport / Nan Walker Wynd. Every effort will be made to carry out the works as quickly as possible to minimise impacts on the residents and businesses in the area. It is envisaged that traffic measures such as a stop-go system, temporary one-way traffic systems or similar will be implemented to allow the trenches for the culverts and utility diversions to be constructed and to manage traffic at the same time. Utility diversions will be action following excavation of the trench.

The main construction compound for work in Kinross likely to be located at the vacant yard at the former BCA site east of High Street. This area will house cabins and site facilities as well as storing plant and material until it is delivered to necessary operations. Due to the scattered nature of operations in Kinross it is likely the Contractor will choose to create satellite compounds for ease of access to plant and material. These satellite

construction compounds are to be reinstated as soon as operations within their reach are complete. Recommended satellite compound locations are discussed in specific sections.

The precise origin of material and plant has yet to be identified and would depend on the appointed Contractor. It is likely material would be sourced from Baldo Quarry.

3.3.6.2 Construction Methodology

The following is the likely construction methodology:

- Utilities in Kinross are congested, particularly where the proposed culverts pass beneath public roads, and will require substantial engagement and potential enabling works with the relevant providers to reach an agreement on any necessary alterations. All major utility diversions should ideally be carried out in advance of construction works where possible. The locations of the utilities are identified in (See Volume III, Appendix A).
- These will largely be constructed on public roads. There is minimal site clearance required at these locations but the establishment of temporary fencing of the working area will be required for the duration of the construction works for security and health and safety purposes. On roadways this will be in accordance with an agreed traffic management plan.
- For the section of the culvert at green space at Hopefield Place and Smith Street, vegetation will be required to be cleared. The open channel section at Hopefield Place will be replaced with a culvert to avoid services and improve hydraulic efficiency of the Clash Burn. This will involve infill of the open section. Vegetation clearance of the area adjacent to Kipper Hire and establishment of a haul road will be required. This will be accessed from the minor road which runs parallel to Montgomery Way. The culvert at Myre Playing fields will require connectivity of local drainage and access through the garden of a residential property, which will require boundary fences to be removed and some smaller trees and shrubs to be removed. Some tree clearance within the working area will be required south at Myre Playing fields to enable the construction of a culvert tail wall and suitable trash / security screen.
- The construction of the Clash Burn culverts will generally be undertaken by excavating and craning in precast culvert units. The precast units come in standard lengths and will be joined on site.
- The Hopefield Place culvert section and Nan Walker Wynd section will have their existing culverts removed. Where the culvert route is being diverted the original culvert will remain in place to maintain drainage connectivity.
- Temporary over pumping or piping of the watercourse will be required to facilitate the construction of the Hopefield culvert sections. Thus, the works will be carried out in dry conditions.
- Short lengths of the culverts may be cast on site at the location of bends or where any large diameter existing surface water sewers are identified during drainage surveys. The foundations will be excavated down to formation level and blinding concrete poured. The precast concrete culverts will be placed in position and where in situ culverts are required, formwork will be prepared and reinforcement bars fixed, followed by the pouring of the concrete. Utilities and drainage pipes will be diverted into permanent

positions as required. The excavations will then be backfilled, and road surfaces reinstated. Landscaping and reinstatement of carriageway will take place in agreement with PKC.

- Manholes will be required at significant changes in direction and will be constructed from precast concrete units installed by the manufacturer's instructions. Manhole rings are likely to vary from 2,100 mm to 2,700 mm in diameter depending on the angles of the incoming and outgoing pipes.

3.3.6.3 Ancillary Works

Road drainage gullies currently discharge to the existing Clash Burn culvert. The connections will be retained and discharge to the existing Clash Burn culvert which will now purely convey road drainage following diversion. This approach introduces surface water flood risk resilience to the area by increasing capacity of the surface water drainage and avoids further disruption by removing the existing culvert and reinstating new drainage connections for the length of the Clash Burn.

Where any gully connections are identified at the Hopefield Place it is assumed the existing gully pot and pipe will be broken out, replaced and reconnected to the new pipe section.

3.3.6.4 Trash Screens

Five new trash screens are required at the Hopefield culvert upgrade and Clash Burn diversion culverts. Two additional screens are required at the open reach of the Clash Burn through Myre Playing Fields.

All screens will be constructed adjacent to the existing watercourse. This method of construction will minimise the in-channel works required to construct the screen and therefore will have a minimal impact on the South Queich River. Construction of the trash screen will involve excavating to formation level, fixing steel reinforcement, pouring concrete and installing the steel trash screen.

3.3.7 M90 Upstream Storage Area

3.3.7.1 Construction Methodology

The construction of the storage area will involve the following construction methodology:

- Access to the site will be gained from the M90 via an existing farm track. A new haul road will be constructed from here to allow permanent access to the structure.
- Initial clearing of vegetation and trees within a working strip up to 40m in width for embankment. The clearance will facilitate the footprint and provide sufficient space for the movement of site traffic.
- Treatment of invasive species will be required in advance of the works to avoid any spreading as a result of the works.
- Temporary fencing of the working area will be required for the duration of the construction works for security and health and safety purposes.
- Stripping and storage of topsoil for reuse.

- Import and storage of suitable clay material to form the core of the embankment by lorry and road. This will be stored within the working area and brought to a required location using excavators and dumpers.
- Excavation of a trench up to 2m deep and wide will be undertaken by an excavator as a suitable cut off, and clay will be placed and compacted in layers until the defences have reached the necessary height.
- The control structure will then be constructed through the embankment. The foundations will be excavated down to formation level and blinding concrete poured. The precast concrete culvert will be placed in position, formwork will be prepared, and reinforcement bars fixed, followed by the pouring of the concrete. Precast headwalls will also be placed at the inlet and outlet of the culvert and jointed to the pipe.
- The remainder of the embankment will be constructed from inert material to meet the required gradient of 1 in 3. The embankment will then be topsoiled with a suitable, biodegradable geotextile and sown in grass. The geotextile will protect the embankment from erosion until such times as the vegetation has been established.
- A toe drain will be constructed alone the base of the embankment to prevent excessive build-up of flows. This will be collected in a perforated pipe and infiltrated to ground.

3.3.7.2 Plant Machinery

This will involve heavy civil engineering works such as earth moving, concrete works and piling as well as the import of a significant amount of fill and clay (approximately 5,300 m^3) to construct the embankment.

- Tracked excavators;
- Dump trucks;
- Wheel scraper units;
- Dozer;
- Tracked mobile crane;
- Mobile generators;
- Vibratory/roller equipment;
- HGV tippers;
- Grader;
- Import of ready mix concrete;
- Import of puddle clay;
- Import of fill for embankment/export of unsuitable fill;
- Import of matting / grasscrete; and,
- Import of precast culvert units and headwalls, bedding materials, geotextile.

It is likely that the construction work will require approximately 6 staff, comprising:

- Four operatives;
- One manager; and
- One employer supervisor.

3.4 Environmental Management the Proposed Development

3.4.1 Working Hours

A 5-day work week is anticipated, with the proposed works being undertaken only during weekdays from 07:00 to 19:00. The exact form of temporary works for access to the watercourse is not yet known, but there may be a requirement for water pumps to keep working areas dry. The water pump will be on standby 24 hours a day and start removing water when the water level exceeds a desired height; hence it will be necessary for them to operate at night.

3.4.2 Site Compound

There are eight construction compounds for the Proposed Development. The main compound is likely to be located at the vacant yard at the former BCA site east of High Street. This area will house cabins and site facilities (such as the site office) as well as storing plant, material and fuels until it is delivered to necessary operations.

The other seven compounds will be satellite compounds, likely set up by the contractor, for ease of access to plant and construction materials. The satellite compounds will likely be located in the following locations:

- Parkland adjacent to Hopefield Place;
- Behind Kipper Hire, just off Junction Road;
- Green space at the Sandport / Smith Street Junction;
- In field adjacent to Old Cleish Road;
- In green space east of Todd & Duncan facility, just off Loch Leven Heritage Trail;
- In the yard of industrial and commercial units on Clashburn Road; and
- In the field behind Caulders Garden Centre.

It is important to note that the satellite compound locations are not confirmed at this stage and may change depending on the needs of the contractor. Please refer to Volume III, Appendix B for drawings of the site compound locations.

3.4.3 Traffic

A number of roads across Kinross will be required for works access and some new access tracks / roads will need to be constructed. The roads affected by construction traffic include:

- A9 including exits to Kinross town and Kinross Services;

- A977;
- High Street;
- Clashburn Road;
- Sandport;
- Nan Walker Wynd;
- Old Cleish Road;
- Junction Road; and
- Hopefield Place.

New permanent access tracks are proposed in the following locations:

- In the field adjacent to Old Cleish Road;
- In green space east of Todd & Duncan facility;
- Behind Kipper Hire, just off Junction Road with track extending to the Myre playing fields;
- Extension to garden centre access from the A977; and
- Extension of farm access track from A977 around field to the north of Caulders Garden Centre.

Specific traffic management measures will be required during construction. Every effort will be made to carry out works as quickly as possible to minimise traffic-related impacts. A full Traffic Management Plan / Transport Statement will be completed as part of preparations for commencement of works.

3.4.4 Environmental Protection Measures

An outline Construction Environmental Management Plan (oCEMP) (see Volume III, Appendix C) has been prepared and includes relevant environmental protection measures that should be adhered to during construction of the Proposed Development.

3.4.5 Programme

A detailed works programme has not been developed at this stage and will be dependent on the successful contractor. Estimation on phasing and timeframes have been carried out using experience from other similar flood protection schemes in Scotland.

It is anticipated that construction will commence during 2025, with substantial completion expected during 2026. The duration of the works is estimated to be 53 weeks, assuming that culvert upgrade and upstream storage works are one work package and are carried out in parallel with direct defence construction.

A period of 40 weeks is expected for culvert upgrades and diversions, while 53 weeks is expected for flood defences and 8 weeks for upstream storage.

Table 3-1 shows the assumed programme phasing at this stage.

Table 3-1: Assumed Phasing of Proposed Development

Month	May 25	Jun 25	Jul 25	Aug 25	Sep 25	Oct 25	Nov 25	Dec 25	Jan 26	Feb 26	Mar 26	Apr 26	May 26
South Queich Embankment													
Upstream Storage													
Treatment Works & Clash Burn embankment													
Smith Street Culvert													
Diversion culvert													
Hopefield Culvert													
LB Flood Wall													
RB Flood Wall													

3.4.6 Pollution Control

An oCEMP has been prepared and includes relevant pollution control measures that should be adhered to during construction of the Proposed Development.

3.5 Project Change and Decommissioning

There are no plans proposed for the decommissioning of the works of the Proposed Development and as such the project should be considered as 'permanent works'.

With future climate change impacts in mind, the design may change in the future to mitigate against predicted increases in flood risk.

3.6 Other Related Projects and Potential for Ex-situ Effects

3.6.1 Planning History Relevant to the Project

There are plans for the redevelopment of the former BCA site, located on High Street, near High Street Bridge on the bank of the South Queich. Informal consultation has been sought with PKC for a mixed-use redevelopment which has the potential to have a significant benefit to the town of Kinross.

No other relevant planning history was found in the area.

4 ASSESSMENT OF ALTERNATIVES

4.1 Introduction

Assessment of reasonable alternatives is mandatory under the EIA Directive. The process allows for adjustment to minimise environmental impact thus minimising project significant effects on the environment.

Alternatives are different ways of carrying out a Project in order to meet its agreed objectives. There are a range of types of alternative types that can be considered. These relate to the following:

- Design;
- Technology;
- Location;
- Size; and
- Scale.

The assessment of alternatives for the Proposed Development has been undertaken in accordance with the following guidance documents:

- The EU Commission's Environmental Impact Assessment of Projects Guidance on the Preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU).
- The Scottish Government's Planning Series Planning Circular 1/2017: The Town and Country Planning (Environmental Impact Assessment (Scotland) Regulations 2017.
- The Scottish Government's Planning Series 1/2013: Environmental Impact Assessment Planning Advice Note (2013).
- NatureScot's Advice Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and other involved in the Environmental Impact Assessment process in Scotland, Version 5 (2018).

This chapter should be read in conjunction with Chapter 2 'Need for Project' as this provides the statement of need and land-use planning support for the Project, having regard to international, national, regional and local policy and objectives. Chapter 3 'Project Description' is also pertinent as it describes the Proposed Development and provides information on the project site, design, size and other relevant features.

4.2 Examination of Strategic-Level Alternatives

4.2.1 Perth & Kinross Local Development Plan

In the Perth & Kinross LDP, the council lays out its '*Settlement Statement'* for Kinross and Milnathort. Kinross is described as playing an important role in the Kinross-shire economy and are key settlements in Perth & Kinross to meet future housing demands, with a number of areas earmarked for housing development.

Further to this, the council outlines a number of policy themes which are:

- A successful, sustainable place;
- A low carbon place;
- A natural resilient place; and
- A connected place.

Some of the key objectives listed under the policy themes relating to the Proposed Development are as follows:

- *"Creation and continuation of high-quality places that meet the needs of the existing and future communities";*
- *"Improve long term resilience and robustness of the natural and built environment to climate change";* and
- *"Ensure that development and land use makes a positive contribution to helping minimise the causes of climate change and adapting to its impacts."*

Overall, the Perth & Kinross LDP provides an important foundation for which projects should build upon with regard to flood protection and alleviation. Therefore, the Proposed Development is an important project in helping PKC achieve its development goals by 2029.

4.2.2 TayPlan

In the TayPlan, Kinross/ Milnathort is listed as a Principal settlement (Tier 2). Tier 2 settlements are defined as:

> *"…principal settlements which have the potential to make a major contribution to the regional economy but will accommodate a smaller share of the additional development* [than Tier 1 settlements]*."*

Under Policy 2 of TayPlan, titled '*Shaping Better Quality Places'*, a key objective (Objective 2C) is to ensure developments are resilient and future-ready and that climate change adaptability and resilience are built into the natural and built environments. Specifically, regarding flood risk, the policy states that this can be achieved through:

- *"A presumption against development in areas vulnerable to coastal erosion, flood risk and rising sea levels;*
- *Assessing the probability of risk from all sources of flooding;*
- *The implementation of mitigation and management measures, where appropriate, to reduce flood risk; such as those envisaged by Scottish Planning Policy, Flood Risk Management Strategies and Local Flood Risk Management Plans when published;*
- *Managing and enhancing the water systems within a development site to reduce surface water runoff including through use of sustainable drainage systems and storage."*

The Proposed Development therefore will help achieve the aims of the TayPlan, especially with regard to Policy 2C.

4.3 Examination of Project-Level Alternatives

4.3.1 South Kinross Flood Study

At the request of PKC, Mouchel undertook a Flood Study in South Kinross in 2010 to understand flooding issues better and explore practical options to reduce flood risk in the area. This study comprised two key phases (Phase 1 and Phase 2).

Phase 1 collated existing information and reviewed data relevant to flood risk and associated issues within the South Kinross area. In addition to the collation and review of available data and consultation with local stakeholders, this phase also included extensive topographical survey of the watercourses, structures and surrounding lands.

Phase 2 assessed the status of fluvial flood risk to South Kinross using detailed hydrological and hydraulic modelling of catchments and watercourses. Possible options for flood alleviation such as flood defences, river diversions and upstream storage were also assessed. This included an appraisal of technical feasibility and economic viability together with an assessment of associated environmental and health and safety constraints. Several options were considered. These options were broadly as follows:

- Flow controls through the M90 and managed flooding to upstream farmland;
- Traditional hard defences (floodwalls, channel widening, etc.);
- Flow diversion (overflow) of South Queich and Gelly Burn routed directly to Loch Leven (bypassing the town) Off-line / on-line storage attenuation;
- Catchment land management Partial diversion of Clash Burn to South Queich; and
- Combinations of above.

From this, Mouchel developed two potential options for South Kinross:

- **Option A** – Flood Walls / Channel Widening – approximately 715m of walls on the left bank and 740m on the right bank with an average height of 0.8m; and
- **Option B** – Flow Diversions – diversion channel to take excess flows from the Gelly Burn and bypass the town, discharging directly to Loch Leven. The diversion channel would have a length of approximately 640m and a gradient of 1:230.

Each option was subject to a Cost / Benefit Analysis (CBA) to assess the economic viability of each option. An environmental feasibility and constraints assessment was also carried to examine the baseline conditions in the area, identify any environmental constraints associated with any of the options and to provide recommendations for the environmental aspects to be considered further should any of the options be progressed in more detail.

The following sections outline the various options identified as part of the Mouchel Flood Study.

4.3.1.1 Flow Controls

This option involved flow restrictions to the existing culverts under the M90 and using the M90 embankment as a barrier to overland flows. This option would mean flooding of upstream farmland. Figure 4-1 shows an overview of this option.

This option was considered to not be feasible due to existing culverts having to operate under surcharge conditions which could present safety issues during flood events. This means that the consequences of culvert blockages could be significant. Furthermore, due to the cost of this option, it was not considered for further assessment. However, it was determined that some level of flow control could be used alongside other options.

Figure 4-1: M90 Flow Control Option (Source: South Kinross Flood Study (Mouchel, 2010))

4.3.1.2 Flood Walls / Channel Widening

This option involved implementing hard defences (walls and embankments) along the South Queich and Gelly Burn. Walls would need to stretch from the M90 embankment and the proposed location for link road to Loch Leven. This option also explored the possibility of widening the channel of the South Queich.

It was found that while there is little scope for channel widening due to the close proximity of buildings and bridges, the construction of flood walls and embankments is technically feasible. Therefore, this option was taken forward for further assessment.

Figure 4-2: Flood Walls (Source: South Kinross Flood Study (Mouchel, 2010))

4.3.1.3 Flow Diversions

A diversion channel designed to take excess flows from the Gelly Burn and bypass the town, discharging directly to Loch Leven was explored as a potential option. A lateral overflow weir would be used on the Gelly Burn and the diversion channel would flow south-east before turning east through a new culvert under the M90 and towards Loch Leven. Flow control measures under the M90 would also be required to reduce flood risk in South Kinross. Figure 4-3 shows an overview of this option.

This option was considered to be technically feasible and therefore it was carried forward for further assessment.

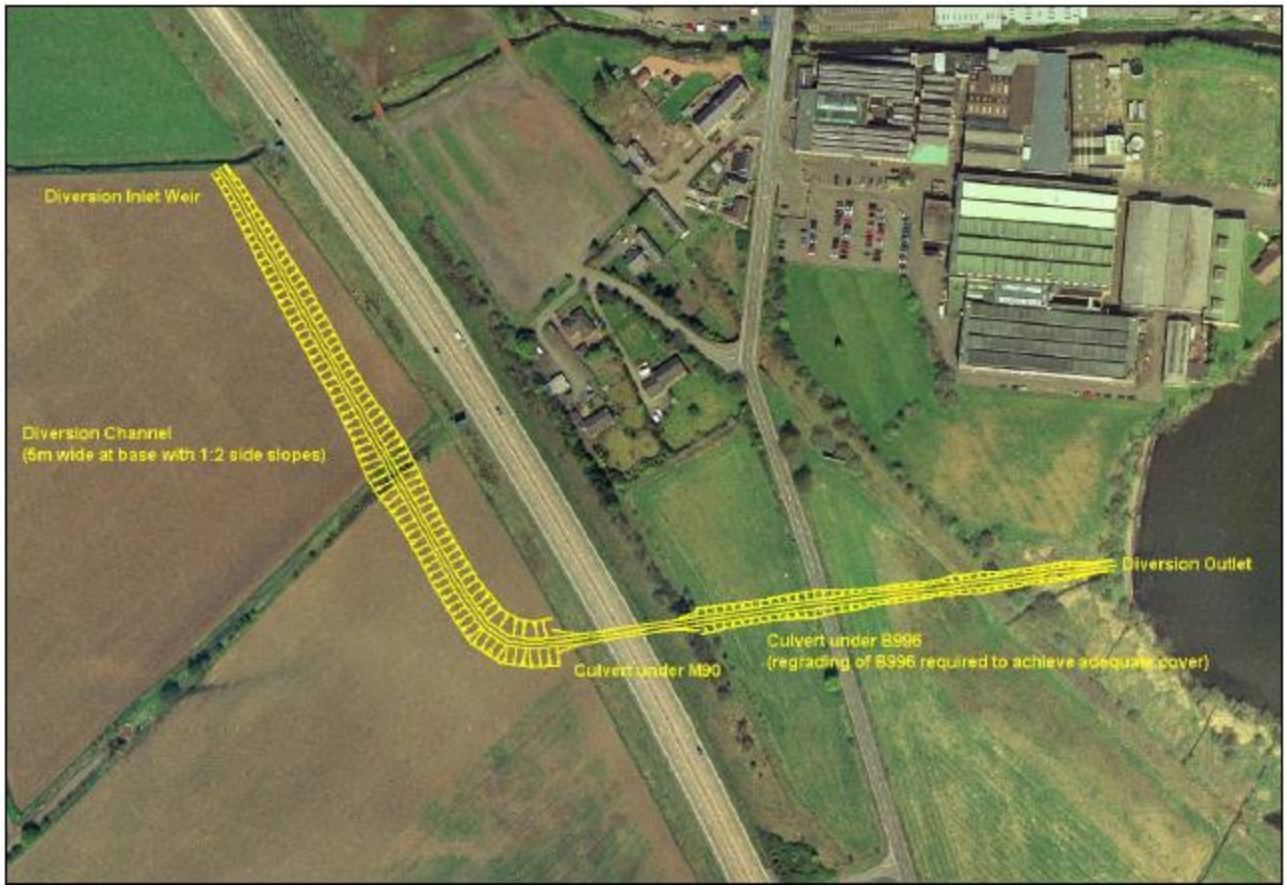


Figure 4-3: Queich / Gelly Burn Flow Diversion (Source: South Kinross Flood Study (Mouchel, 2010))

4.3.1.4 Flood Storage

Options for an offline and online storage area were also explored.

Online storage would require the construction of an impounding structure on the South Queich. This means that flood water can be stored on the upstream side and attenuated through a sluice gate / weir. There were two potential feasible locations for these storage areas assessed at Easter Fossoway and Myrehill which are far upstream of Kinross. It was found that damming at these locations would only provide a partial solution as they are near the head of the catchment and the area only receives a small amount of the total catchment runoff. Also, online storage will be less effective due to the steep and narrow nature of the South Queich river valley in its upper reaches.

Offline storage would be required upstream of the M90 for both the Gelly Burn and the South Queich. This would require the construction of floodable lagoons, connected to the rivers via overflow weirs. These lagoons would be designed to store excess flows and then return flows via a return valve when the peak flows subside. It was estimated that around 1.5 million m^3 of flood storage would be required to alleviate flooding to south Kinross, meaning the scale of works required would be significant.

Due to doubts over the effectiveness of the storage options and the associated environmental and economic costs, they were not taken forward for further assessment.

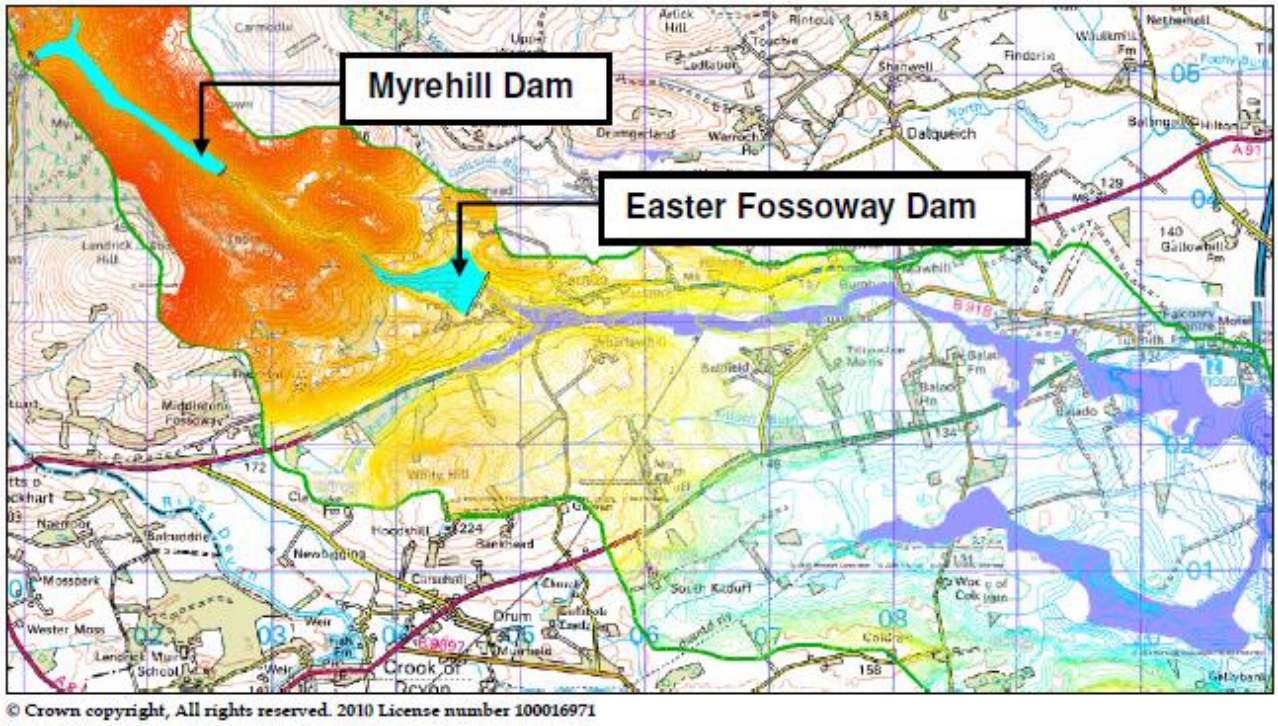


Figure 4-4: Online Storage (Source: South Kinross Flood Study (Mouchel, 2010))

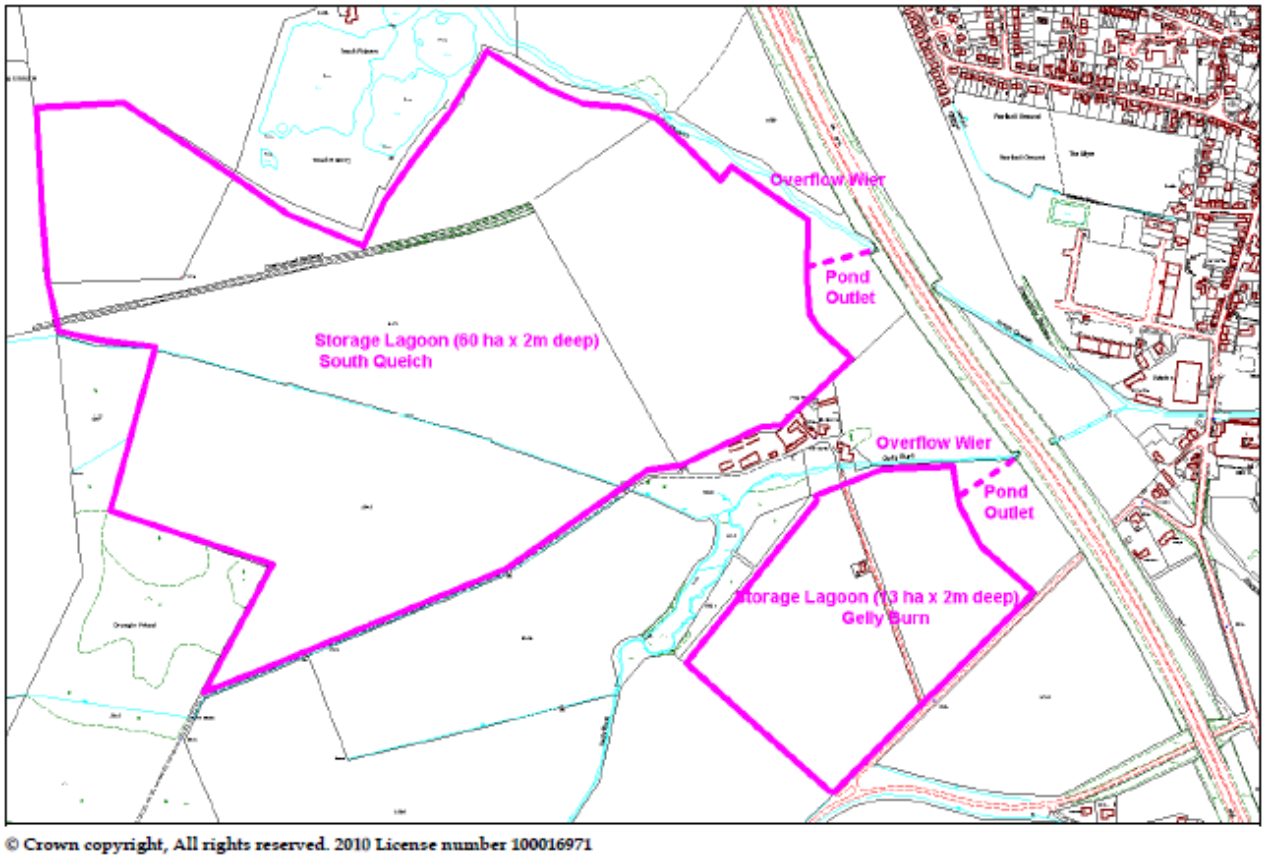


Figure 4-5: Offline Storage (Source: South Kinross Flood Study (Mouchel, 2010))

4.3.1.5 Catchment Land Management

This option explored the feasibility of attenuating flows through land management activities upstream. It was found that this option alone would not provide the level of attenuation needed to significantly reduce the flood risk in South Kinross. While this option was not considered as a practical option for further assessment, Mouchel indicated that this is a long-term measure that may be employed alongside other flood alleviation options.

4.3.1.6 Clash Burn Options

The possibility of diverting the Clash Burn into the South Queich upstream of Smith Street was explored. This option was identified as a potential solution to flooding issues further downstream. The 315m long diversion pipe would follow the line of the old railway line, this would require an in-line weir on the Clash Burn and a non-return valve on the South Queich. Although this option is technically feasible, it would only provide a partial solution to localised flooding issues around Smith Street.

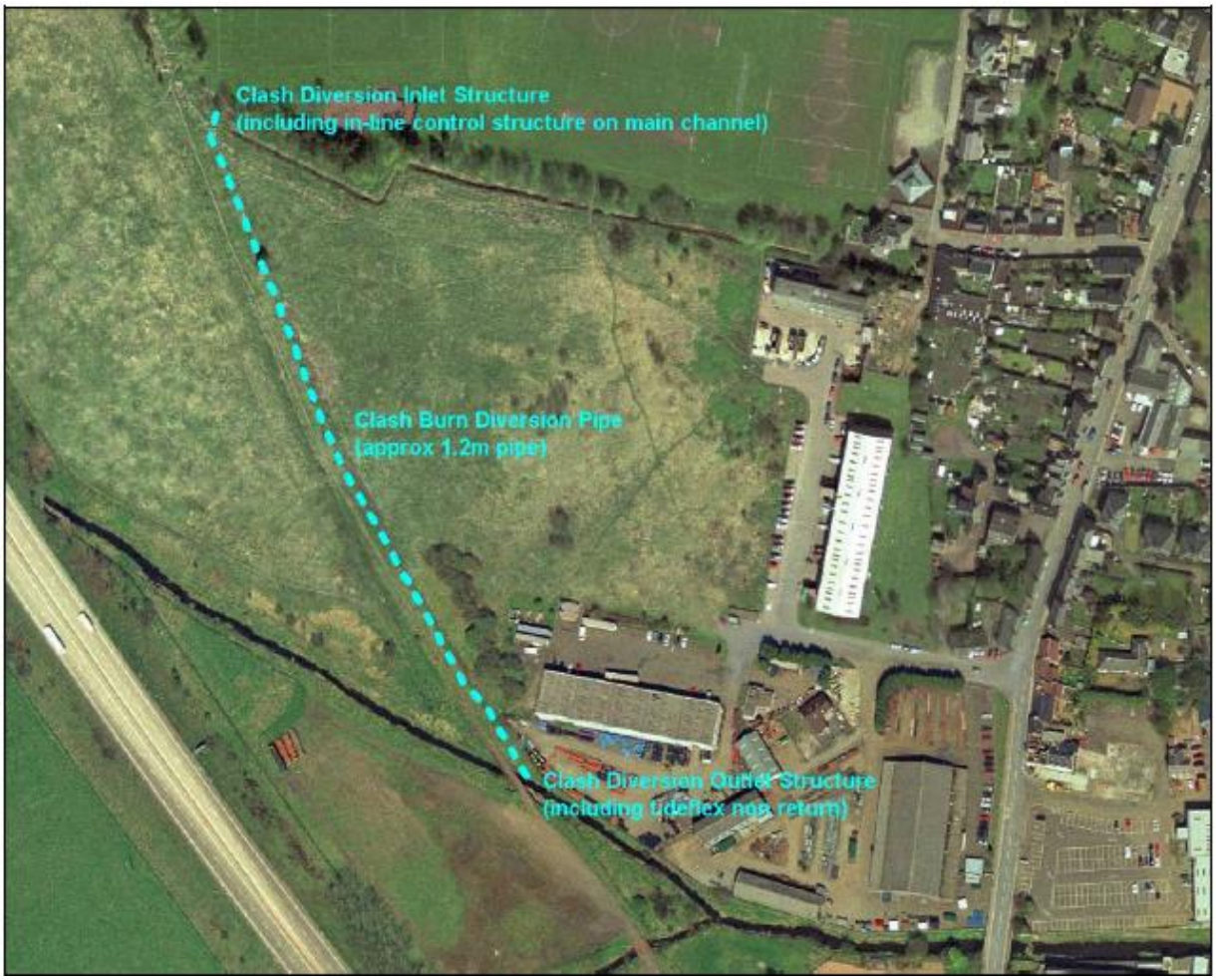


Figure 4-6: Clash Burn Option (Source: South Kinross Flood Study (Mouchel, 2010))

4.3.2 RPS Option Review Report

RPS carried out an Option Review process in December 2022 for the South Kinross FPS. The Option Review Report aimed to build upon the findings of the Mouchel Flood Study through a detailed option review process. This included shortlisting a number of options, ascertaining the protection they provided, then carrying out a CBA to identify the preferred option. This preferred option was updated following engagements with local residents and businesses, and further updated to include protection for increases in flood risk due to climate change.

A number of actions were shortlisted for further assessment utilising a new hydraulic model which was developed for the Proposed Development. The new model includes updated hydrology and better representation of the channel and floodplain. Table 4-1 shows the actions that were identified for South Kinross for each flood cell and Figure 4-7 shows the locations of these flood cells.

Table 4-1: Option review list of actions investigated for each flood cell

Flood Cell 1	Flood Cell 2	Flood Cell 3
Improvement of Conveyance	Diversion	Storage
Diversion	PLP / PFR	
Direct Defences	Storage	
Storage		
Property Level Protection (PLP)		
Property Flood Resilience (PFR)		
Relocation		

In addition to the CBA, RPS also carried out a Multi-Criteria Analysis (MCA) in order to aid in understanding the various social, economic and environmental impacts as well as the technical feasibility of the proposed options.

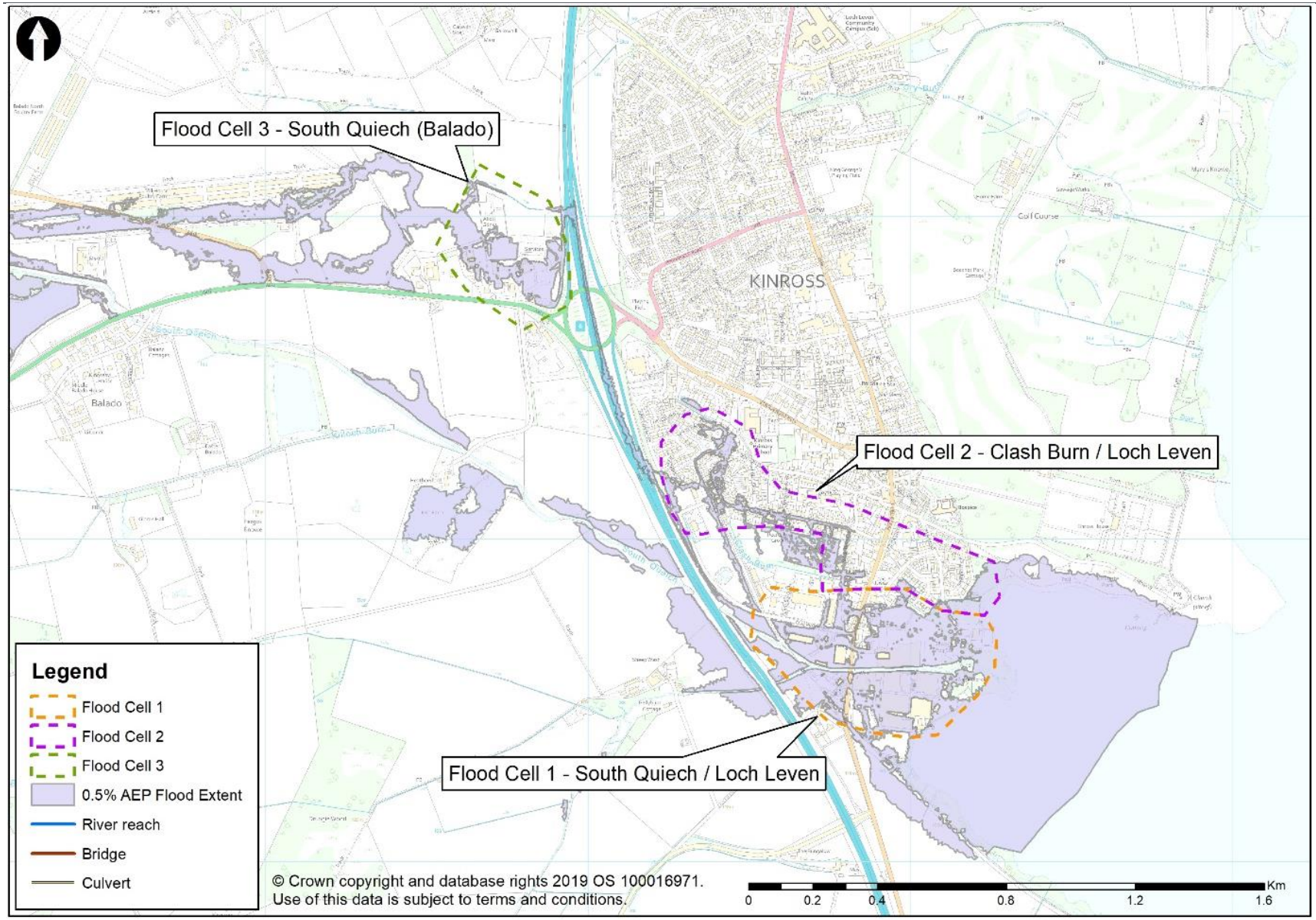


Figure 4-7: Flood Cell Locations for the South Kinross FPS

4.3.2.1 Flood Cell 1 – South Queich/ Loch Leven

Improvement of Conveyance

An increase in channel capacity was simulated within the hydraulic model to alleviate flooding from the South Queich watercourse. The improvement of conveyance option for Flood Cell 1 assessed the impact of excavating approximately 4,731m^3 of bed material over a distance of 745m. The majority of this excavation would reduce the minimum channel bed level by 1m. This would also include increasing the width of some channel sections where possible. Excavation was required between the Old Railway Bridge and the footbridge near Loch Leven. The weir downstream of the High Street Road Bridge was also be removed in this scenario. The areas for reprofiling are illustrated in Figure 4-8.

The hydraulic model indicates that this option is not able to fully alleviate the 0.5% AEP fluvial flood risk within Flood Cell 1. Some commercial properties near Loch Leven are also at risk from the rising water levels in the loch, therefore improving conveyance alone in the South Queich was unable to provide the target SoP for these properties. Another flood alleviation action would be required in combination to protect these properties.

It was established that works would have to be carried out every 10 years to remove the build-up of sediment that would occur after excavation has taken place. It is unknown how quickly sediment will accumulate along this section of the South Queich. This would have to be studied and monitored if this option was to be implemented, hence this option was not carried forward for the preferred option.

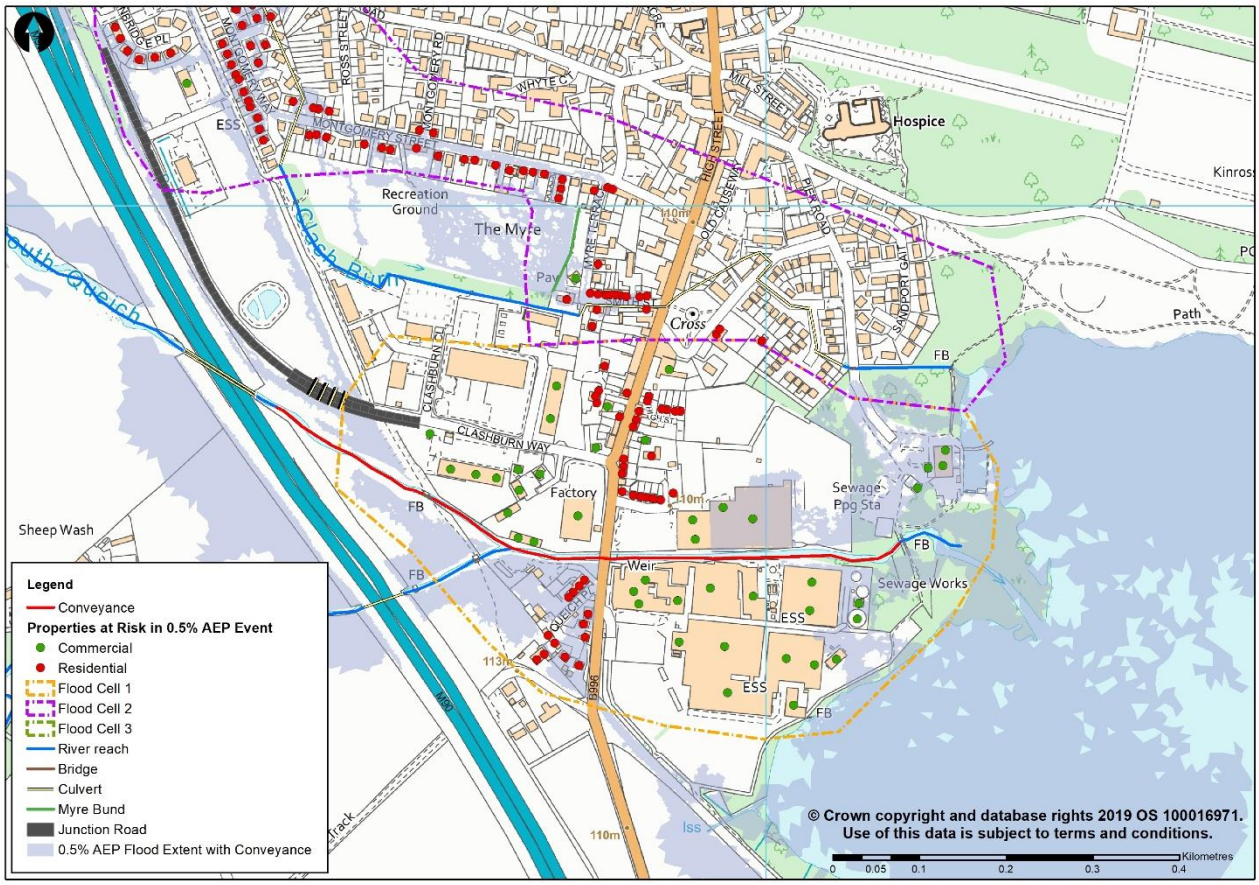


Figure 4-8: Flood Cell 1 Conveyance Solution

Diversion

A diversion option was assessed to divert flow from the Gelly Burn along a new open channel, which would bypass Flood Cell 1. The channel would require a 450m long and 15m wide channel with a bed width of 10m and banks with a 1:1 slope angle. The depth of the channel would range from 1.5m to 2.5m from the existing ground level. The diversion on the Gelly Burn would start upstream of the M90 road bridge and divert flow out of the Gelly Burn into the new channel that would run parallel to the M90. The M90 culvert opening would be reduced by 50% and a spill structure would be added to encourage more flow to be directed into this channel from the right bank. Connecting the diversion channel under the M90 to allow it to discharge into Loch Leven could be achieved in different ways, such as a new culvert underneath the road, or taking a new culvert through an underpass road, approximately 500m to the south of the Gelly Burn. The route underneath the underpass was assessed in the model, through which a 3m diameter circular culvert was modelled. Figure 4-9 illustrates the option.

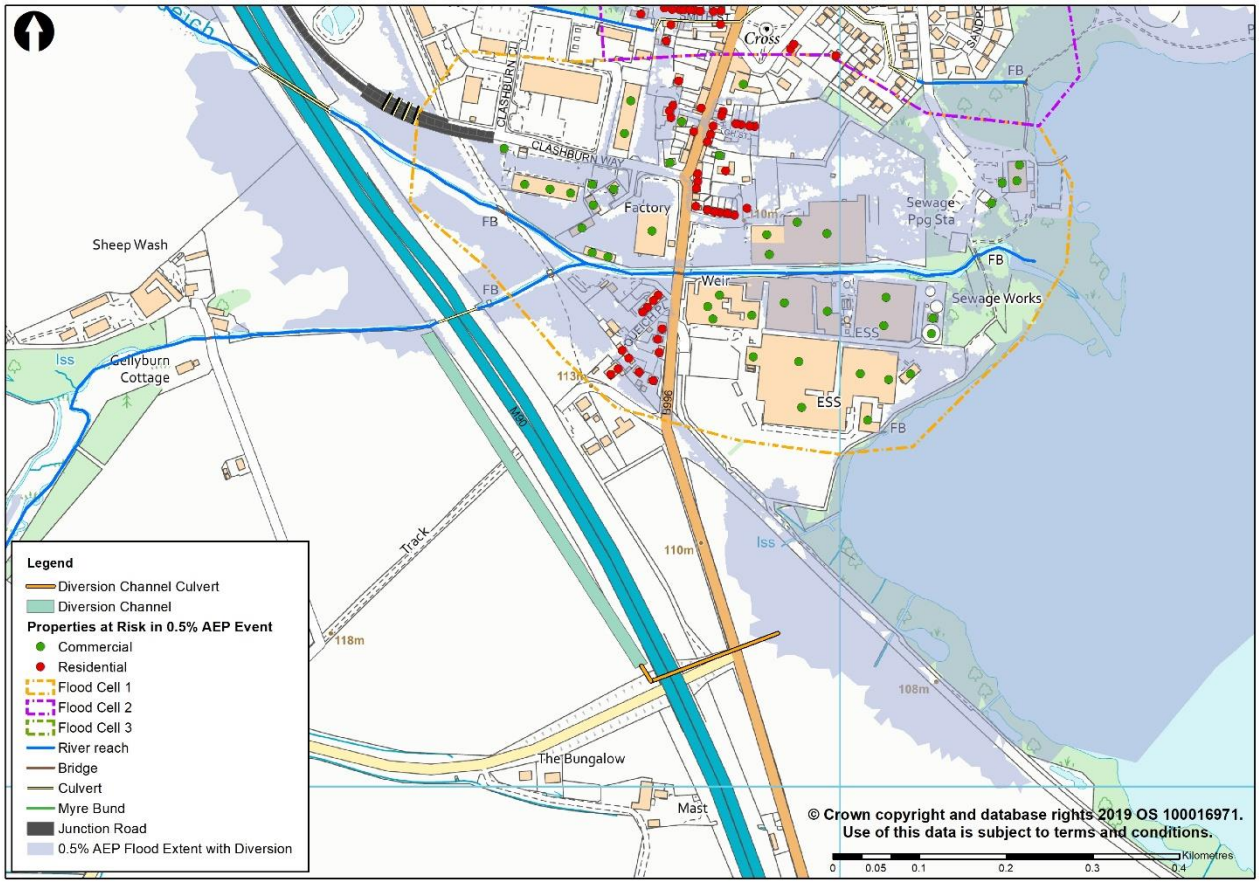


Figure 4-9: Flood Cell 1 Gelly Burn Diversion Solution

This option was unable to provide the required level of flood protection. The flows diverted from the Gelly Burn were not sufficient to prevent flooding from the South Queich, which poses the most risk to the properties within Flood Cell 1. Furthermore, this option would require excavation of approximately 18,000m³ of earth and technically would be difficult to achieve. It would be essential to ensure that no instability to the M90 banks would occur as a result of this diversion channel. This action, due to its inability to remove a significant portion of flood risk and the technical limitations associated, means this option was not carried forward.

Direct Defences

A direct defence option was assessed due to the ability of flood walls and embankments to prevent water reaching flood risk areas by containing water within river channels. The direct defences option included a mix of retaining walls, sheet pile walls and embankments for a total length of 1,372m. These defences included the following:

- Embankment – 287m length, 1.22m average height; and
- Sheet Pile Wall – 1,085m length, 1.7m average height.

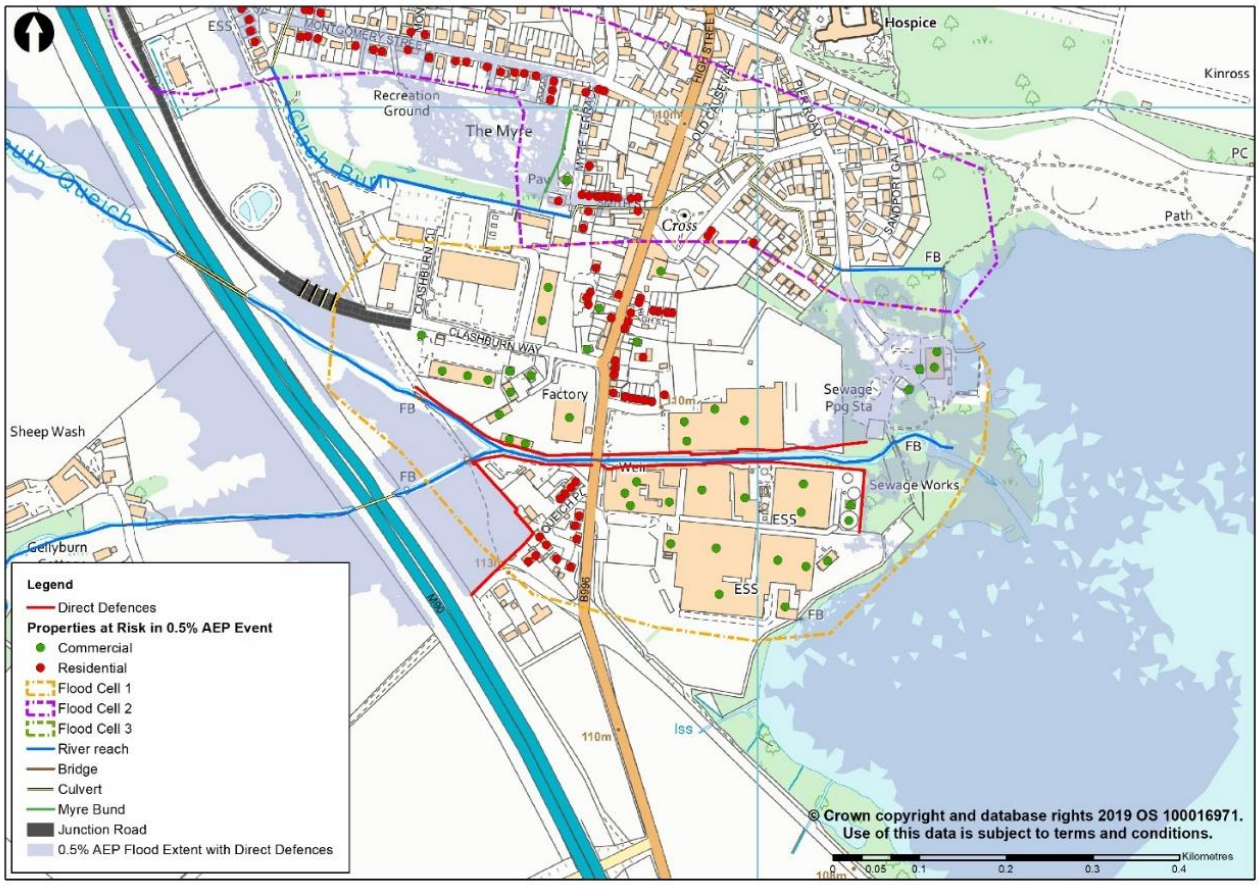


Figure 4-10: Flood Cell 1 Direct Defence Option

This option was able to provide protection to Flood Cell 1 and reduce flooding in Flood Cell 2. An amended version of this option was taken forward as the preferred option following further technical assessment of site constraints.

Storage

For storage to be a feasible action, buildable storage features would be required that can store enough water/attenuate flows to suitably reduce the risk to downstream receptors. The potential areas assessed are highlighted in Figure 4-11.

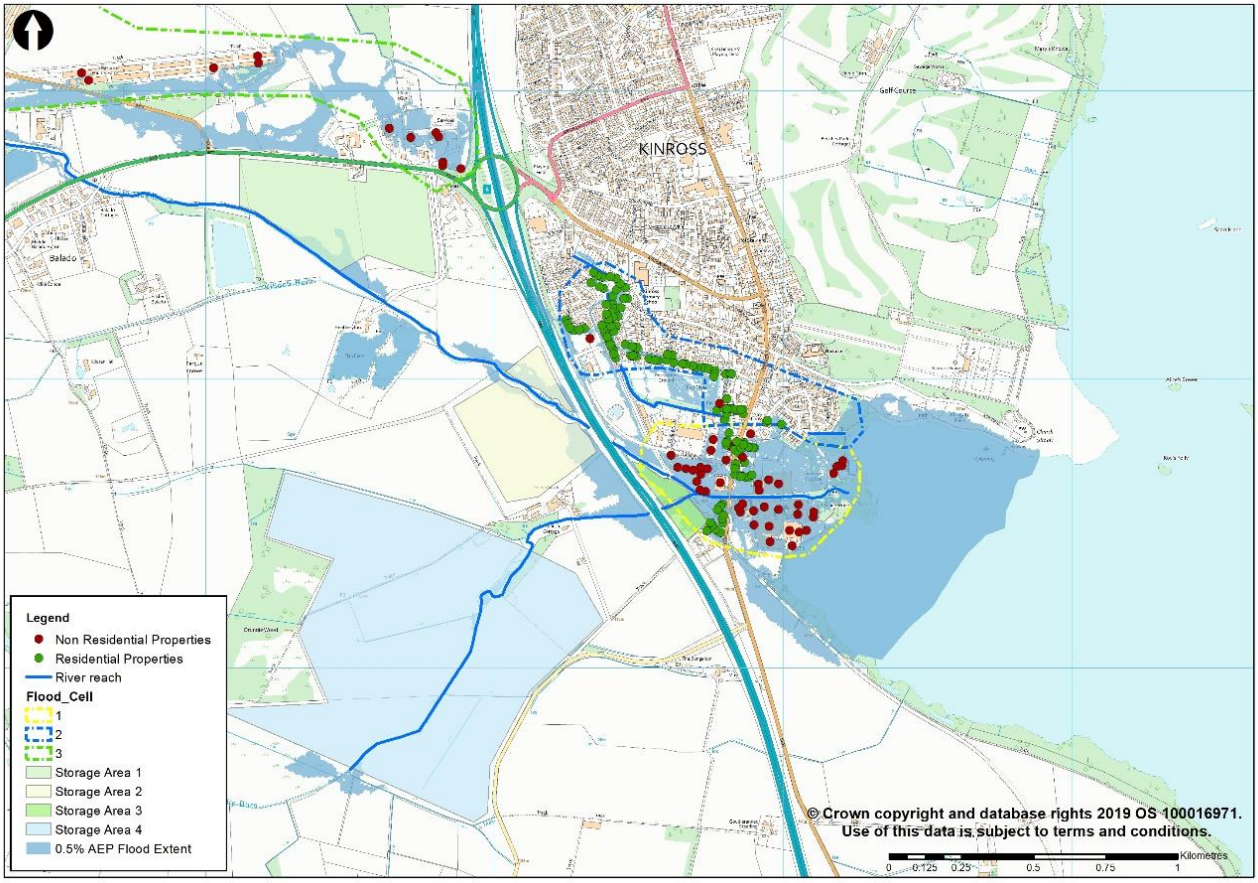


Figure 4-11: Potential Storage Areas for Flood Cell 1

Each of the storage areas assessed provided some reduction in flooding within Kinross, although these areas were unable to reduce the flood flows to the 50% AEP fluvial event. An example of a storage area that was modelled is included in Figure 4-12. As can be seen, despite storing water across a large area there remained significant flood risk in Kinross from the South Queich.

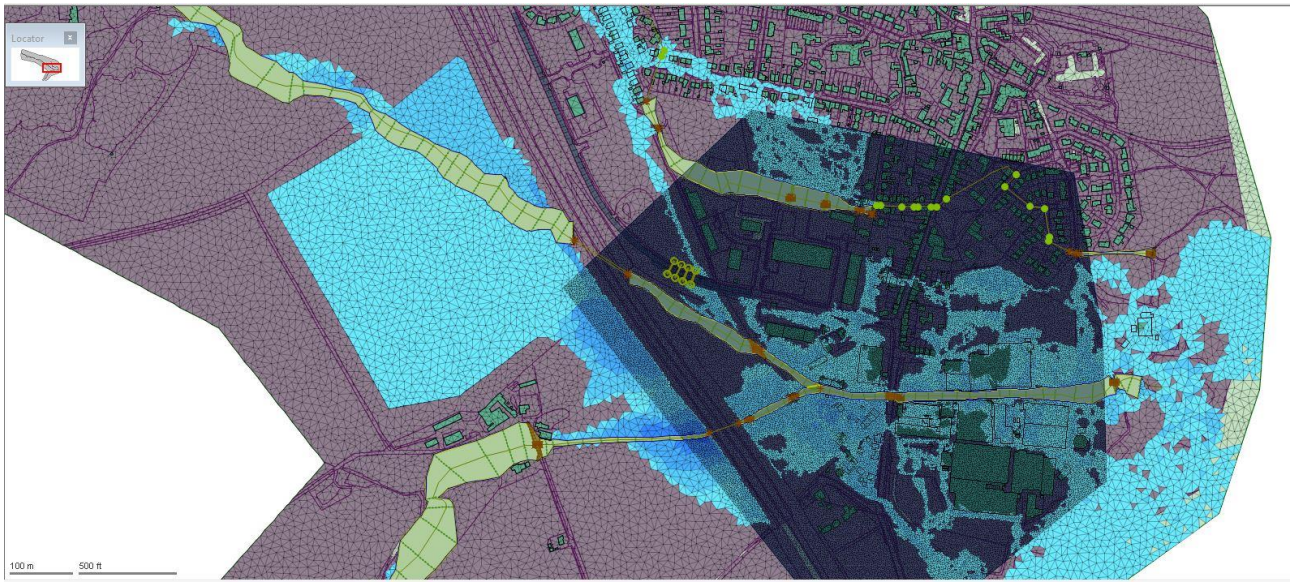


Figure 4-12: Modelling results of a flood storage area assessed on the South Queich, upstream of M90 motorway (0.5% AEP Fluvial event)

PLP / PFR

It was found that PLP and PFR, while not providing a traditional engineering solution, would be effective in reducing flood risk and was therefore considered as feasible. PLP / PFR is suitable for operation up to the 0.5%AEP event though is reliant on suitable deployment/ maintenance to achieve this SoP. However, given the large number of receptors at risk in Flood Cell 1, adopting PLP / PFR for all properties at risk is unlikely to be appropriate, given the lower SoP that would be afforded.

It was concluded that this option should not be considered to reduce flooding throughout Flood Cell 1, although it may be applicable for a small number of properties where there are no other viable solutions due to technical, economic, environmental or social reasons. It was reasoned that this option should considered as an addition to another solution where the target SoP is unable to be met through structural or non-structural methods.

Relocation

Relocation considers single or groups of receptors that can be relocated out of the risk area to a suitable location. When considering which receptors would be suitable for relocation the social, technical and economic factors were considered. Such factors included:

- Would removing properties have a detrimental impact on the local community?
- Are there other suitable areas zoned to accommodate the relocation?
- Would the cost be disproportionate to the present-day damage from flooding?
- Public safety - especially in areas where there may be deep fast flowing water during a flood event.
- Potential to ease restrictions on development of other options (e.g. to make space for defences or flood storage / conveyance improvements as part of structural solutions).

When assessing which properties may be suitable for relocation, the market value of the property was considered against the damage which the property may incur through flooding. Properties were considered suitable for relocation if the damage which they may incur through flooding was greater than their market value. Single isolated properties or isolated groups of properties are commonly only considered suitable.

In Flood Cell 1, there were no isolated properties identified where relocation may be preferred. Based on the 81 properties at risk within Flood Cell 1, the combined market value and estimate of relocation of these properties was calculated to be over £40m. This demonstrates that not only would such an option be socially unacceptable but would also be economically unviable.

4.3.2.2 Flood Cell 2 – Clash Burn/ Loch Leven

Diversion

The Clash Burn is located within a predominantly urban setting. This poses challenges in regard to diversion solutions, where the options for potential routes are heavily constrained by existing structures. Following a review of relevant existing information and discussion with PKC, RPS investigated two diversion options; diversion of flow from the Clash Burn to the South Queich, and diversion of the existing culvert to follow more easily accessed locations regarding construction and maintenance, which avoided buildings and other receptors. Ultimately, the diversion of the existing culvert to follow more easily accessed locations regarding construction and maintenance, which avoided buildings and other receptors was selected as the preferred option.

Diversion of flow from the Clash Burn to the South Queich was the other alternative route explored in the development of options for the Proposed Development. At Hopefield Place there are three small culverts that would need to be upgraded to larger 500mm culverts to prevent these flooding out of their manholes. The main diversion to the South Queich considered a 1000mm diameter circular culvert, located between Hopefield Place and the old railway bridge on the South Queich. This would require the construction of a new culvert below Junction Road. Two manholes on Montgomery Street would also need sealed to prevent these smaller culverts from overflowing during the 0.5% AEP flood event. The results of the Clash Burn diversion to the South Queich are shown in Figure 4-13. With this option there would still be some flooding out of the culverts along Smith Street. Therefore, this option would need to be combined with another option to provide additional flood protection. In the simulation, it was apparent that the present day 0.5% AEP fluvial flooding from the South Queich increase as a result of this diversion. It is assumed, however, that an action for Flood Cell 1 may be able to address this increase in flooding.

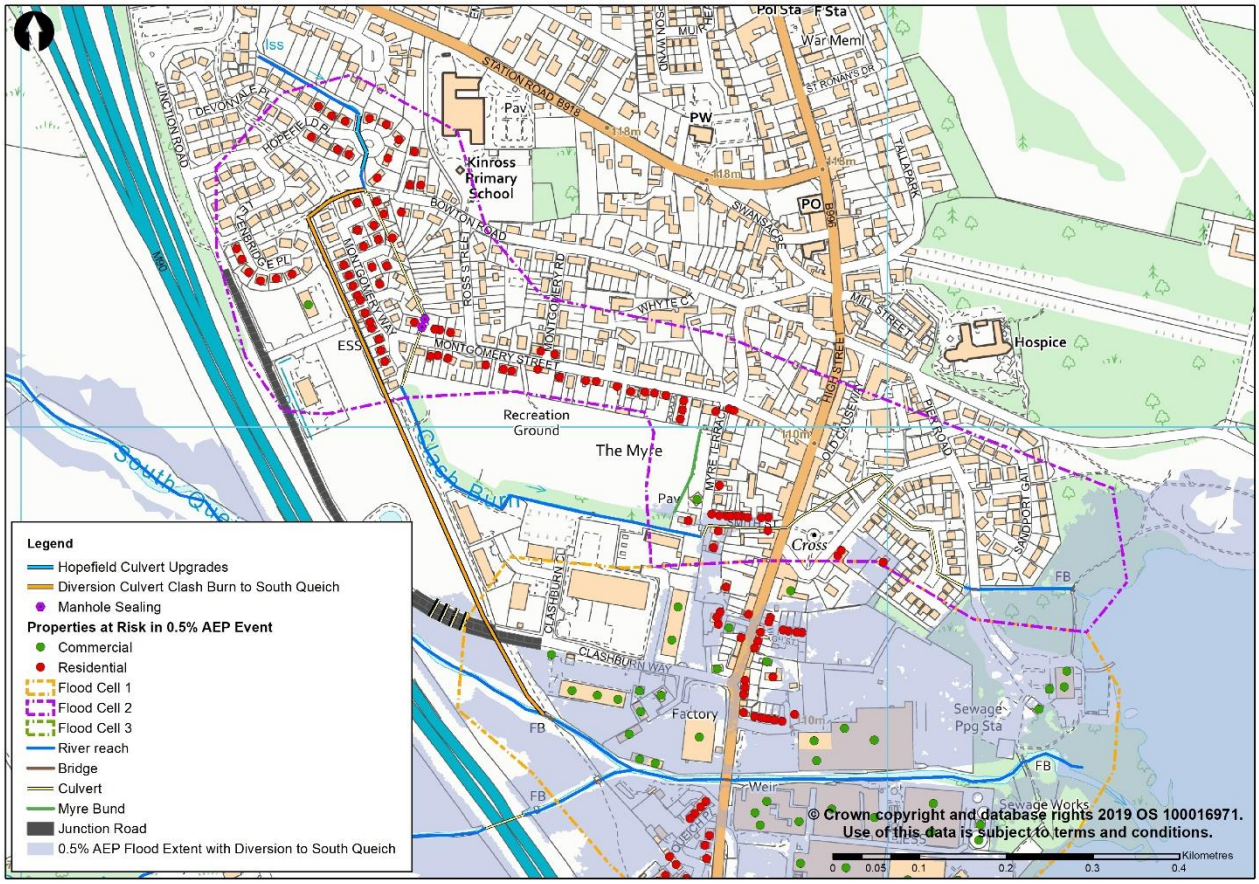


Figure 4-13: Flood Cell 2 Diversion to South Queich Solution

PLP / PFR

There are a total of 87 residential properties and 2 commercial properties at risk of a 0.5% AEP fluvial flood event within Flood Cell 2. It is not guaranteed that these properties would be protected to the standard required if they were all to be given PLP or PFR. Therefore, this action is not one that was considered to reduce flooding throughout Flood Cell 2 but was considered to potentially be applicable to a small number of properties where there are no other viable solutions.

Storage

Within Flood Cell 2, a potential for a storage area at The Myre playing fields was identified. Assuming that the ground level could be reduced by 1m below existing ground levels, this would provide the required storage volume to reduce flood risk downstream. However, this would not be able to provide protection to properties upstream as flooding occurs in these locations due to out of channel flooding and a limited capacity within culverted sections. The potential storage area assessed is highlighted in Figure 4-14.

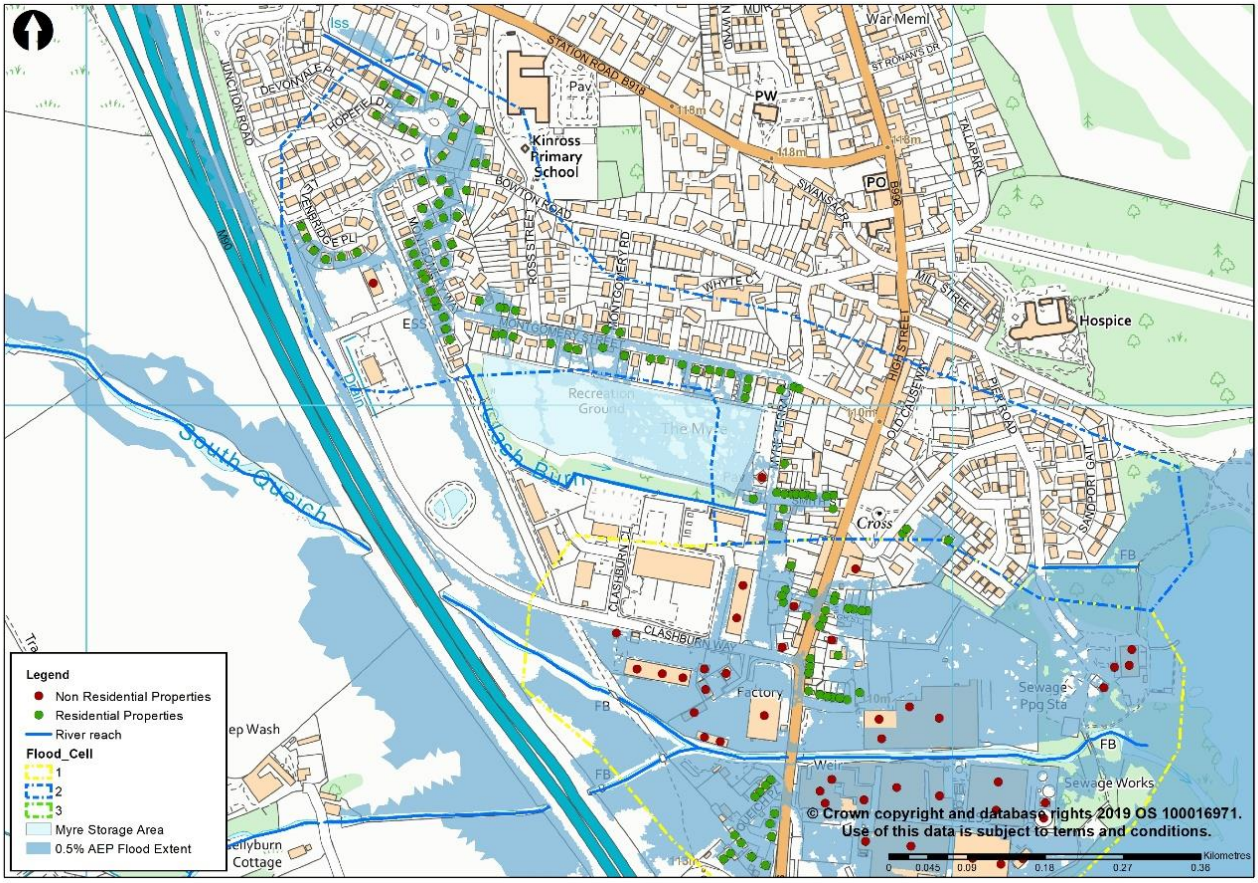


Figure 4-14: Potential Storage Area in Flood Cell 2

This option was partially adopted as the final preferred option, as a small storage pond was selected at 0.4 m below ground level. Please refer to Figure 3-2 in Section 3.2 of this report for a representation of this.

4.3.2.3 Flood Cell 3 – South Queich

Storage

A storage option was also explored for Flood Cell 3 (South Queich) in order to protect the M90 services and M90 motorway from flooding. The option involved a flood embankment with a length of 455m and an average height of 1.18m. The flood potential storage area would be located 0.5km away from the South Queich, next to the Ury Burn, into which the stored water would be discharged through a control structure.

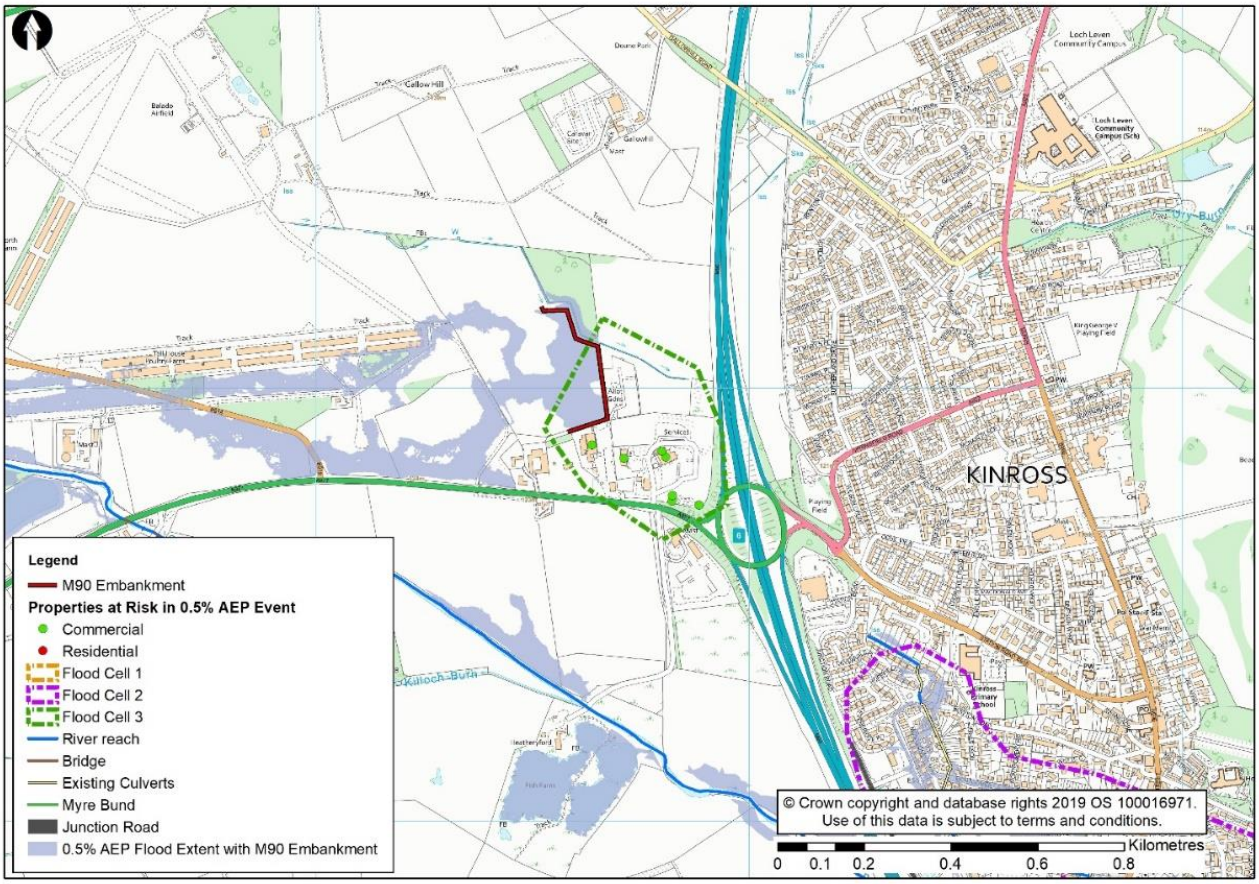


Figure 4-15: Flood Cell 3 Storage Solution

This option was found to provide protection to the M90 services and M90 motorway and reduce flooding in Flood Cell 2. While this option did not provide flood protection to Balado Poultry Farm, it was found that flood risk would not increase.

It should be noted that an amended version of this option was taken forward as the preferred option.

4.4 Summary of Consideration of Alternative Options

At a strategic level the Perth & Kinross LDP, as well as TayPlan, outlines a number of key goals surrounding future resilience of developments and settlements to allow the objectives of each of the plans to be met. These documents are key in informing the way development should be undertaken and highlight the importance of robust and climate adaptable flood protection as part of the planning process.

At the project level, the South Kinross Flood Study undertaken by Mouchel presented a number of options. The study involved an option appraisal of various options as well as a CBA and environmental feasibility and constraints assessment of each of the outlined options that were deemed to be feasible. This Flood Study provided the basis for RPS to develop options from and was useful in informing of the issues and benefits of various approaches to flood protection in South Kinross.

The RPS Option Review Report aimed to develop an outline design for a preferred scheme, as identified in the South Kinross Flood Study undertaken by Mouchel in 2010. The report aimed to build on the work carried

out as part of the South Kinross Flood Study. A number of actions were shortlisted for further assessment utilising a hydraulic model which was developed for the Proposed Development. Further to this a CBA and MCA was undertaken for each of the options. From this, a preferred option was selected and then updated. For more information on the final preferred option selected see Section 3.

5 PROJECT SCOPING AND CONSULTATION

5.1 Introduction

The process of consultation has enabled PKC to solicit opinions on general development options and facilitated differing perspectives to be taken into account in the initial stages of the project.

The EIA Directive provides for a scoping process, where requested by a developer. Scoping for the Proposed Development was undertaken in accordance with the European Commission's 2017 "Environmental Impact Assessment of Projects Guidance on Scoping", which states:

> "*It is good practice to carry out Scoping even if it is not required by legislation: Developers should endeavour to include a Scoping stage in their work programme for EIA, so that all of the concerns can be identified and addressed during the Scoping stage*."

The purpose of the EIAR scoping process is to identify the issues which are likely to be important during the EIA and to eliminate those that are not relevant. The scoping process identifies the sources or causes of potential environmental effects, the pathways by which the effects can happen, and the sensitive receptors, which are likely to be affected. It defines the appropriate level of detail for the information to be provided in the EIAR. The primary focus of scoping is to define the most appropriate assessment of significant effects related to the Proposed Development.

In relation to consultation, the EIA Directive, implementing legislation and guidance documentation make clear that there are specific requirements regarding the use of the EIAR, both as a tool to inform concerned stakeholders and the public, as well as to make decisions regarding development consent for projects. Accordingly, this EIAR provides evidence of effective consultations which have already taken place and provides the basis for effective consultations to come.

The scoping and consultation process to date has resulted in an iterative design procedure, such that the project has been modified to address the issues raised by statutory consultees, stakeholders and the public.

5.2 Consultation

5.2.1 Pre-application Consultation with Statutory and Non-Statutory Bodies

PKC and RPS have endeavoured to consult at every stage of the South Kinross FPS with relevant statutory and non-statutory bodies. Consultation to date has included Scoping consultation with various organisations (see Section 5.3), as well as engagement with SEPA during the modelling and PKC during the development of the outline design of the scheme.

5.2.2 Public Consultation

Public consultation for the Proposed Development has taken the form of quarterly newsletters updating the community of Kinross on the FPS. Two public consultation events were held in September 2023 to update the community on the progress of the scheme and gain feedback on the proposed outline design. A draft of this EIA and Design Proposals were presented to the public.

Feedback from the consultation events was generally positive, with the vast majority of the community being supportive of the Proposed Development. Some concerns were raised which have been addressed within the South Kinross FPS Public Consultation Report.

PKC will continue to consult with the local community and particularly with landowners who may be directly affected by the Proposed Development.

5.3 Scoping

5.3.1 Scoping Approach

Detailed scoping has been undertaken in respect to the Proposed Development. PKC 'informally' or voluntarily scoped the contents of an EIAR by engaging in consultations with prescribed and other austerities, bodies and stakeholders and through public consultation, in accordance with the European Commission's 2017 'Environmental Impact Assessment of Projects Guidance on Scoping', the Scottish Government's Planning Circular 1/2017: Environmental Impact Assessment Regulations – Guidance on the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 as well as the Planning Advice Note 1/2013: Environmental Impact Assessment – Guidance on the integration of Environmental Impact Assessment (EIA) procedures into the overall development management process.

In conducting the scoping process, and in preparing this EIAR, consideration has been given to publications including advice noted and various other documents including:

- The Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Amendment Regulations 2017;
- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017;
- Flood Risk Management (Scotland) Act 2009;
- The Town and Country Planning (Scotland) Act 1997;
- European Commission Environmental Impact Assessment of Projects Guidance on Scoping (Directive 2011/92/EU as amended by 2014/52/EU), (2017);
- Planning Circular 1/2017: Environmental Impact Assessment Regulations – Guidance on the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- Planning Advice Note 1/2013: Environmental Impact Assessment – Guidance on the integration of Environmental Impact Assessment (EIA) procedures into the overall development management process.

5.3.2 Scoping Responses

Upon completion of the EIA Scoping Report, it was sent to PKC who then distributed it internally to the relevant departments within the council as well to a variety of statutory consultees for a Scoping Opinion. RPS also distributed the report on behalf of PKC to the following statutory bodies:

- Forth District Salmon Fishery Board;

- Forth Rivers Trust;
- Historic Environment Scotland (HES);
- NatureScot;
- Scottish Water; and
- Scottish Environmental Protection Agency (SEPA).

Each of the listed bodies provided a scoping response to PKC and RPS which outlined whether they agreed or disagreed with the scoping in or out of the various chapters and provided any feedback to help improve each of the chapters. From this there were a number of actions and things to consider moving forward with the EIAR. Table 5-2 shows a summary of the scoping responses received and the actions required while progressing with the EIAR.

The scoping process / report identified the issues that are likely to be important to consider in the environmental impact assessment of the Proposed Development. The scoping process identified the sources or causes of potential environmental effects, the pathways by which the effects can occur, and the sensitive receptors which are likely to be affected. It also defined the appropriate level of detail for the information to be provided in the EIAR. Certain environmental topics were scoped out as part of this formal scoping process. The topics proposed to be scoped out at the scoping stage and the rationale for this are set out in Table 5-1.

Table 5-1: Topics screened out during the scoping process (as further detailed in the full Scoping Report)

Topic	Reasons for scoping topic out
Population & Human Health	No significant adverse effects are anticipated to population and human health as a result of the construction and operation of the Proposed Development. Its goal is to improve flood protection which will be a benefit to local population health and wellbeing, and the flood risk reduction benefits will be set out fully in the application documents including Flood Risk Assessment.
Traffic & Transport	The scheme is considered to have a low impact on the road network during the construction phase it is anticipated that a traffic and transport chapter is not required as part of this EIAR and therefore can be scoped out.
Risk of Major Accidents & Disasters	The primary reason for this decision is that the Proposed Development is not located within the vicinity of any establishments that fall within the scope of the Control of Major Accident Hazards Involving Dangerous Substances Regulations, 2015 (the COMAH Regulations). Furthermore, a number of assessments will be included within the EIAR which will address potential impacts associated with different aspects of potential major accidents or disasters.

The Scoping Opinion also provided comments regarding the contents and detail to be included in the EIAR. From these, RPS set out the actions required to ensure that the Scoping Opinion would be fully considered in the EIAR, as shown in Table 5-2.

Table 5-2: Summary of scoping responses received, and actions required

Organisation	Date Consultation Issued	Date Consultation Received	Comments	Action Required
Forth District Salmon Fishery Board	29/03/2022	05/04/2022	Although fish populations found are not designated, they are currently protected under the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003 and the Board would highlight that when considering impact, trout and other freshwater fish species should be considered throughout.	RPS to check the Freshwater Fisheries (Consolidation) (Scotland) Act 2003
			More detail on the impact of the flood scheme on habitat loss or damage to species within the EIA is required at this stage.	RPS to include more detail on habitat loss / damage to species
Forth Rivers Trust	05/04/2022	05/04/2022	Overall happy with content of Scoping Report. However, need outline methodology to make further detailed comments	RPS to work on outline construction methodology and communicate this to Forth Rivers Trust
HES	23/02/2022	14/03/2022	No heritage assets in our remit will be directly impacted by the Flood Protection Scheme proposals. While we note that the Kinross House Category A listed building and Inventory Designed Landscape are located in the vicinity of the proposals, we consider that significant impacts on their settings are unlikely. We are therefore content with the proposal of the draft EIA Scoping Report to scope out heritage assets in our remit from the EIA to be undertaken in support of the proposals.	Comment noted and passed on to chapter lead author(s)
NatureScot	23/02/2022	16/03/2022	Potential impacts for construction on Loch Leven SPA, Ramsar and SSSI that could impact on water quality should be addressed in the EIAR	Comment noted and passed on to chapter lead author(s)
			During construction sediments must be prevented from entering the loch to ensure no net increase in nutrients from the proposal and no additional impacts on water clarity for example from any pollution events.	Comment noted and passed on to chapter lead author(s)
Scottish Water	23/02/2022	25/03/2022	Scottish Water records indicate that there is live infrastructure in the proximity of development area that may impact on existing Scottish Water	Comment noted and passed on to chapter lead author(s)

Organisation	Date Consultation Issued	Date Consultation Received	Comments	Action Required
			assets. Must identify any potential conflicts with Scottish Water assets and contact our Asset Impact Team via our Customer Portal for an appraisal of the proposals. Should be aware that any conflict with assets identified will be subject to restrictions on proximity of construction. Written permission must be obtained before any works are started within the area of our apparatus.	
			There are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the proposed activity.	Comment noted and passed on to chapter lead author(s)
			Scottish Water will not accept any surface water connections into our combined sewer system. There may be limited exceptional circumstances where we would allow such a connection for brownfield sites only, however this will require significant justification from the customer taking account of various factors including legal, physical, and technical challenges. The developer should contact Scottish Water at the earliest opportunity with strong evidence to support the intended drainage plan prior to making a connection request. We will assess this evidence in a robust manner and provide a decision that reflects the best option from environmental and customer perspectives.	Comment noted and passed on to chapter lead author(s)
SEPA	23/02/2022	09/03/2022	Recommend a list of groundwater abstractions within and out with the site boundary in line with SEPA guidance. If groundwater abstractions are identified in the 100m radius of trenches or 250m radius from foundations than either the applicant should ensure the route/location of works avoid these areas or further investigations will be required to show that any impacts are acceptable.	RPS to check guidance and ensure it is followed for the EIAR

Organisation	Date Consultation Issued	Date Consultation Received	Comments	Action Required
			Assessment should characterise the nature and volumes of waste to be generated and describe how this will be managed/reused in line with zero waste principles. Any waste removed must be disposed of at a suitably licenced or exempt waste management facility in accordance with the Waste Management Licencing (Scotland) Regulations 2011.	RPS to check regulations and ensure it is followed for the EIAR
			Assessment should demonstrate the Proposed Development provides clear benefits without increasing the flood risk to nearby areas.	RPS to ensure that any increased flood risk will be addressed as part of the scheme design.
			It is unclear if the storage pond is to be a wet pond (rather than a dry basin), if so, we recommend the FRA demonstrate enough storage capacity when the design peak arrives.	RPS to confirm is pond is to be wet or dry
			With regards to construction effects, consideration will also need to be given to the potential for a flood event to coincide with construction as well as proposed phasing of the works.	RPS to develop construction methodology taking this into account
			Climate change values (for rainfall and river uplifts) are being updated now and new figures will be published in April 2022. This may require re-running of hydraulic models with larger flows in order to assess the standard of protection and the impacts this will have.	RPS to check new figures and update where appropriate
			Construction Phase - The EIA should identify all aspects of site work that might have an impact on the environment, potential pollution risks and identify the principles of preventative measures and mitigation. A draft Schedule of Mitigation should be produced covering all the environmental sensitivities, pollution prevention and mitigation measures identified.	RPS to ensure a draft Schedule of Mitigation is produced
			A construction run off licence under CAR may also be required for the management of surface water runoff during construction.	RPS to ensure work is in line with CAR regulations

Organisation	Date Consultation Issued	Date Consultation Received	Comments	Action Required
			Operational Phase - There may be water quality issues (via increased suspended loading) in Loch Leven, given that out-of-bank storage will be lost in upstream locations. We assume this will be addressed in the Water Quality Section.	RPS to ensure that water quality issues (especially with regard to Loch Leven) are addressed in the water quality section of the EIAR
			It is unclear whether the proposed scheme will include measures to manage surface water drainage. Please note that any discharge of surface water to the environment from drainage associated with the works must be in accordance with principles of the SUDS Manual (C753) and comply with CAR.	
Perth & Kinross Council	23/02/2022	15/03/2022	Agree to scope out Population & Human Health. Able to be addressed via site specific assessments, reports and/or comments as part of application	Comment noted and passed on to chapter lead author(s)
			Agree to scope out Major Accidents and Disasters. Able to be addressed via site specific assessments, reports and/or comments as part of application.	Comment noted and passed on to chapter lead author(s)
			Satisfied that Traffic & Transport can be scoped out. Transport statement & traffic management plan will need to be included as part of the application.	Comment noted and passed on to chapter lead author(s)
			Scoping in the impacts on designated sites and on salmonids on a stretch of the South Queich from High Street to Loch Leven is welcomed	N/A
			An Appropriate Assessment in line with the Habitats Regulations Appraisal is required	Comment noted and passed on to chapter lead author(s)
			Scoping in water quality is appropriate	N/A
			Risk of Major Accidents & Disasters may need to be scoped in due to the importance of water quality and biodiversity (i.e., a pollution event could lead to significant impacts).	RPS to review and establish if this comment can be covered by other chapters

Organisation	Date Consultation Issued	Date Consultation Received	Comments	Action Required
				Previous PKC comment agreed with scoping out of Risk of Major Accidents & Disasters chapter
			Unclear how many trees from a nearby ancient woodland will be required to be removed to build the Proposed Project Clarification is required.	RPS to clarify how many trees are affected by the project and if policy is relevant for South Kinross
			In line with the Scottish Government's Policy on Control of Woodland Removal, compensatory tree planting is required for loss of any trees and woodland.	
			Compensatory tree planting may present opportunities to connect areas of existing trees and habitats and I would be keen to explore this.	
			Trees may be protected by a Tree Preservation Order and/or being within a Conservation Area.	
			The Phase 1 Habitat Survey identified a list of habitat types, and the impacts of this proposed project on all habitats such as broadleaved woodland, scrub and grassland needs to be assessed and explained.	Comment noted and passed on to chapter lead author(s)
			PKC would like to review the Ecology Technical Appendix of the EIAR.	RPS to provide appendix to PKC
			It would be beneficial to know whether natural flood management measures are being used within the project area and in the upper catchment to store water and reduce flow rates. In addition, this would reduce associated run off and sediment entering Loch Leven which has a long history of algal blooms.	RPS to confirm whether nature-based solutions have been explored with this project.

Following the receipt of this feedback, RPS shared the various Scoping Opinions with each of the chapter lead authors to ensure all feedback was incorporated into the EIAR and all relevant guidance and legislation was adhered to.

6 AIR QUALITY & CLIMATE

This chapter of the EIAR sets out the proposed methodology for assessing the impact on air quality and climate arising from the proposed South Kinross FPS. It considers air quality and climate features within the Proposed Development and provides information on the key receptors that have the potential to be subject to likely significant effects resulting from the Proposed Development, and how that assessment is to be conducted.

This chapter will comprise two sub-topics:

- **Air Quality** - which relates to pollutants with potential to affect human health and ecosystems at a local level (this includes a construction phase dust and emissions assessment); and
- **Climate Change** - which is related to emissions of greenhouse gases (GHGs). Climate change will continue to cause impacts on the environment. In this regard, it is appropriate to assess the impact of projects on climate (for example greenhouse gas emissions) and their vulnerability to climate change.

Potential effects to air quality may arise during the construction and demolition phase, such as from the generation of dusts and combustion emissions from traffic. The construction and demolition activities have been examined to identify those that have the potential for air emissions. Each of these potential sources has been identified and emissions have been evaluated using standard procedures. This chapter has also considered the requirements of the EIA Directive in relation to climate change and has provided:

- A description of the factors in relation to climate (for example greenhouse gas emissions, impacts relevant to adaptation) likely to be significantly affected by the project; and
- A description of the likely significant effects of the project on the environment resulting from, inter alia, the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change.

Annex IV to the 2014 EIA Directive includes direct reference to climate and climate change in two provisions. The emphasis is placed on two distinct aspects of the climate change issue:

- **Climate change mitigation:** this considers the impact the Project will have on climate change, through greenhouse gas emissions primarily; and
- **Climate change adaptation:** this considers the vulnerability of the Project to future changes in the climate, and its capacity to adapt to the impacts of climate change, which may be uncertain.

6.1 Assessment Methodology

6.1.1 Study Area

The Proposed Development considers flooding from the South Queich, the Clash Burn and the Gelly Burn. Perth & Kinross Council recommended that the scheme be based on Option A (flood walls and embankments) established in Mouchel's 2010 draft study report. Chapter 1 of this EIAR details the Project in full. For air quality the study area is within the immediate environs of the proposed works adhering to the distance banding as set

out in the IEMA guidance for assessment. For climate the study area is reflective of the entire red line boundary and examines GHGs in terms of national emissions.

6.1.2 Assessment Methodology – Air Quality

6.1.2.1 Land Use Planning & Development Control: Planning for Air Quality (IAQM)

This IAQM document sets out indicative criteria for requiring an air quality assessment. These points are set out in Table 6-1 below.

Table 6-1: IAQM Indicative Criteria for Requiring an Air Quality Assessment

The development will:	Indicative Criteria to Proceed to an Air Quality Assessment	Does this Proposed Development satisfy the criteria?
1. Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5 t gross vehicle weight)	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA - more than 500 AADT elsewhere	**No**
2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5 t gross vehicle weight).	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.	**No**
3. Realign roads, i.e., changing the proximity of receptors to traffic lanes.	Where the change is 5m or more and the road is within an AQMA.	**No**
4. Introduce a new junction or remove an existing junction near to relevant receptors	Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate, e.g., traffic lights, or roundabouts.	**No**
5. Introduce or change a bus station.	Where bus flows will change by: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere	**No**
6. Have an underground car park with extraction system.	The ventilation extract for the car park will be within 20 m of a relevant receptor. Coupled with the car park having more than 100 movements per day (total in and out).	**No**
7. Have one or more substantial combustion processes, where there is a risk of impacts at relevant receptors. *NB. this includes combustion plant associated with standby emergency generators (typically associated with centralised energy centres) and shipping*	Typically, any combustion plant where the single or combined emission rate is less than 5 mg/sec* is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates. Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable.	**No**

**As a guide, the 5 mg/s criterion equates to a 450 kW ultra-low NOx gas boiler or a 30 kW CHP unit operating at <95mg/Nm3.*

The Proposed Development does not satisfy any of the criteria from the IAQM guidance. An assessment is therefore not required.

6.1.2.2 Design Manual for Roads and Bridges (DMRB) – Environmental & Sustainability

The following traffic scoping criteria shall be used to determine whether the air quality impacts of a project can be scoped out or require an assessment based on the changes between the do something traffic (with the Proposed Development) compared to the do minimum traffic (without the Proposed Development) in the opening year:

- Annual average daily traffic (AADT) >=1,000; or
- Heavy duty vehicle (HDV) AADT >=200; or
- A change in speed band; or
- A change in carriageway alignment by >=5 m.

For this Proposed Development none of the four criteria are met. There is not predicted to be any significant change in traffic volumes when the Proposed Development is operational compared to the existing baseline scenario. In addition to this, in terms of designated ecological sites, the Proposed Development site is not located within or in close proximity to relevant ecological features pertaining to considering impacts from air quality. Designated sites that should be considered for assessment are those at which the designated features are sensitive to air pollutants, either directly or indirectly, and which could be adversely affected by the effect of local air quality on vegetation with the following nature conservation sites: SACs (SCIs or SACs), SPAs, pSPAs, ASSIs and Ramsar sites.

6.1.2.3 IAQM Guidance on the Assessment of Dust from Demolition and Construction, 2023.

There is the potential for dust to be released into the atmosphere as a result of construction. These fugitive dust emissions have been assessed on a qualitative basis in accordance with the methodology outlined within the 2023 IAQM guidance document - 'Guidance on the assessment of dust from demolition and construction'.

The effect of construction phase activities has been assessed in accordance with IAQM guidance. The guidance is structured to determine the risk of dust effects arising from four types of construction phase activities. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (the transport of dust and dirt from the construction / demolition site onto the public road network).

A site is allocated to a risk category for dust emissions for each of the activities above based on two factors- dust emission magnitude, and the sensitivity of the area. These factors are combined to give the risk of dust impacts.

The highest risk category identified is used to define appropriate, site-specific, mitigation measures. The final stage is to determine whether significant effects are likely. For almost all construction phase activities, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience has shown that this is normally possible.

6.1.3 Assessment Methodology - Climate

6.1.3.1 Design Manual for Roads and Bridges (DMRB)

Design Manual for Roads and Bridges (DMRB) guidance on climate change was published on 31 October 2019 under the heading; *LA 114 – Climate*. This guidance aligns the DMRB assessment process more closely with the 2017 EIA Regulations. Although specifically related to highway schemes it can be referenced in this assessment with regard to emissions and also is aligned with guidance as presented in the *Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Assessing Greenhouse Gas (GHG) Emissions and Evaluating their Significance.*

The LA 114 document was created to set out the requirements for assessing and reporting the effects of climate on highways (climate change resilience and adaptation), and the effect on climate of greenhouse gas from construction, operation and maintenance of road/highway[2] projects.

LA 114 advises to report on the likely additional and avoided GHG emissions at each life cycle stage of the project, in comparison with current and future baseline GHG emissions. The nature and scale of GHG emissions (positive, neutral or negative) and the likelihood of significant effects should be reported in accordance with the LA 114 guidance document. Two main questions are posed in order to gain an understanding of the need to undertake further assessment, those are:

- Are construction GHG emissions (or GHG-emitting activity), compared to the baseline scenario (i.e., when compared to GHG emissions and energy use associated with existing maintenance activities), increasing by >1%; and,
- During operation, will roads meet or exceed any of the following criteria:

  a) a change of more than 10% in AADT;

  b) a change of more than 10% to the number of heavy-duty vehicles; and,

  c) a change in daily average speed of more than 20 km/hr.

If the answer is ‘yes’ to either of these questions, then further assessment is recommended. In terms of the Proposed Development the answer is ‘no’ to the construction GHG emissions increases and ‘no’ to the operational criteria. Therefore, the construction and operational phase DMRB road assessment can be screened out as impacts are not deemed to be significant.

[2] Although specific to road schemes, the criteria for assessment is a useful gauge in determining whether an assessment is required for construction and operational phases of this Proposed Developments.

6.1.3.2 Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance

IEMA published this guidance to assist practitioners with addressing greenhouse gas (GHG) emissions assessment and mitigation in statutory and non–statutory EIA. The guidance indicates that a 'good practice' approach is advocated where GHG emissions are always considered and reported but at varying degrees of detail depending on the project.

The guidance sets out there are a number of different assessment methods available for measuring and quantifying the GHG emissions associated with the built environment, ranging from general guidance to form standards for the use of an EIA. The Guidance recognising that:

> *'Qualitative assessments are acceptable, for example: where data is unavailable or where mitigation measures are agreed early on in the design phase with design and engineering teams.'*

The assessment in this Chapter presents a qualitative assessments and discussion in terms of GHG emissions.

6.1.3.3 Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation

The Guide to Climate Change Resilience and Adaptation (June 2020) provides an updated framework for the effective consideration of climate change resilience and adaption in the EIA process. This document is a revision of the 2015 IEMA guidance on Climate Change Resilience and Adaption in EIA and reflects lessons learnt from emerging practice. A step-by-step method presented within this guidance is set out below and has been given due cognizant within this Chapter:

- Step 0 – Building climate resilience into the project by incorporating resilience during the designs stage and by identifying appropriate mitigation measures;
- Step 1 – Scoping for the EIA; e.g. identify the climate change projections for use in the assessment and identify key climatic variables relevant to the project;
- Step 2 – Defining the future (climate) baseline; define future conditions using selected climate change projections (i.e., increase in rainfall, increase in mean summer temperature and wind strength);
- Step 3 – Identifying and determining sensitivity of receptors;
- Step 4 – Reviewing and determining magnitude of the effect; consider probability and consequence to determine the magnitude of the effect;
- Step 5 – Determination of significance;
- Step 6 – Developing additional adaptation/EIA mitigation measures;

- Step 7 (Development permitted) – Monitoring and adaptive management by implementing mitigation measures.

EIA Reports produced in line with this guidance are to be proportionate in their approach and not include superfluous assessment that does not address likely material issues.

In lieu of a prescribed methodology, IEMA guidance on Climate Change Resilience and Adaptation (2020) has been prepared to assist practitioners with the effective consideration *"of both climate change resilience and adaptation in the EIA process"*.

The guidance stresses that climate change should be an integrated consideration within the EIA, by undertaking an assessment that is *"proportional to the evidence base available to support any assessment"* and focusses on impacts *"specific to project".*

6.2 Baseline Scenario

6.2.1 Baseline Air Quality

The Air Quality Strategy establishes a framework for the improvement of air quality and focusses on measures agreed at a national and international level. However, it was recognised, that despite such strategic measures, areas of poor air quality would likely remain, and that these will best be dealt with using local measures implemented through the Local Air Quality Management (LAQM) regime. Part IV of The Environment Act 1995 sets provisions for protecting air quality in the UK and for local air quality management.

The system of LAQM has been in place in the UK since 1997. The role of the LAQM review and assessment process is to review local air quality and identify all relevant locations where the air quality objectives are being or are likely to be exceeded. Where an area of exceedance is identified, the local authority is required to declare an Air Quality Management Area (AQMA) and implement an Air Quality Action Plan to improve air quality within the areas.

A set of air quality standards and objectives has been developed for several pollutants of concern for human health. Standards are concentrations of pollutants that are considered safe for humans and the environment. Objectives are derived from the standards and are a compromise between what is desirable purely on health grounds and what is practical in terms of feasibility and costs. Each objective has a date by when it must be achieved.

The objectives adopted in Scotland for the purpose of LAQM are set out in the Air Quality (Scotland) Regulations 2000, the Air Quality (Scotland) Amendment Regulations 2002 and the Air Quality (Scotland) Amendment Regulations 2016. Similar targets are set at EU level, where there are called limit or target values. These are set out in the European 2008 Ambient Air Quality Directive (2008/50/EC) and transposed into Scottish legislation by the Air Quality Standards (Scotland) Regulations 2010.

6.2.1.1 Relevant Directives

Assessment of the significance of emissions to air is made with reference to limit values established in the latest EU legislation, the Clean Air for Europe (CAFE) Directive (2008/50/EC) (European Parliament, 2008)

which was transposed into Scottish law in 2010 through the Air Quality Standards (Scotland) Regulations 2010. The Regulations also incorporates the 4th air quality daughter directive (2004/107/EC) that sets targets for levels in ambient air of specific heavy metals and polycyclic aromatic hydrocarbons. These regulations are currently being amended to include changes required following EU exit. The Air Quality Standards (AQS) set out in Air Quality Directive (2008/50/EC) and Air Quality Standards (Scotland) Regulations 2010 are shown in Table 6-2. The AQS are based on the effects of pollutants on human health, although other factors such as effects on vegetation and ecosystems are also considered.

Table 6-2: Limits as Specified in Air Quality Standards (Scotland) Regulations 2010

Pollutant	Criteria	Value
Nitrogen Dioxide	Hourly limit for protection of human health – not to be exceeded more than 18 times/year	200 µg/m^3
	Annual protection of human health	40 µg/m^3
	Annual limit for protection of vegetation	30 µg/m^3
Benzene	Annual limit for protection of human health	3.25 µg/m^3
1,3 Butadiene	Annual protection of human health	2.25 µg/m^3
Carbon Monoxide	Minimum daily 8-hour running system	10 µg/m^3
Lead	Annual limit for protection of human health	0.5 µg/m^3
Sulphur Dioxide	Hourly limit for protection of human health – not to be exceeded more than 24 times/year	350 µg/m^3
	Daily limit for protection – not to be exceeded more than 3 times/year	125 µg/m3
	Annual limit for protection of vegetation	20 µg/m^3
Particulate Matter PM_{10}	Hourly limit for protection of human health – not to be exceeded more than 7 times/year	50 µg/m^3
	Annual limit for protection of human health	18 µg/m^3
Particulate Matter $PM_{2.5}$	Annual target value for the protection of human health	10 µg/m^3

In addition to the statutory limits for the protection of human health listed in Air Quality Standards (Scotland) Regulations 2010, the World Health Organisation (WHO) has published a set of air quality guidelines for the protection of human health.

The key publication is the ‘WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide, Global update 2005 Summary of risk assessment’. The WHO guidelines are based on reducing the risk to human health and in some cases the levels differ from the EU statutory limits as these limits are based on balancing health risks with technological feasibility, economic considerations and various other political and social factors in the EU.

The 2005 WHO guidelines are presented in Table 6-3 and illustrate that while the NO_2 levels are analogous to those in S.I. 180 of 2011 (excluding the tolerance levels for the 1-hour averages), the annual average PM_{10} and $PM_{2.5}$ levels specified by the WHO are half those specified in the legislation. The WHO note that these are the lowest levels at which total, cardiopulmonary and lung cancer mortality have been shown to increase with more than 95% confidence in response to long-term exposure to $PM_{2.5}$.

Table 6-3: WHO 2005 Air Quality Guidelines

Pollutant	Criteria	Value
Nitrogen Dioxide (NO_2)	Hourly limit for protection of human health	200 µg/m^3
	Annual protection of human health	40 µg/m^3
Sulphur Dioxide (SO_2)	10-minute level for protection of human health	500 µg/m^3
	Daily level for protection of human health	20 µg/m^3
Particulate Matter (PM_{10})	24-hour level for protection of human health	50 µg/m^3
	Annual level for protection of human health	20 µg/m^3
Particulate Matter ($PM_{2.5}$)	24-hour level for protection of human health	25 µg/m^3
	Annual level for protection of human health	10 µg/m^3

6.2.1.2 Air Quality Annual Progress Report (APR) for Perth & Kinross Council (2021)

The air quality within Perth and Kinross is generally good; however, there are a few known hotspots within Perth city centre and Crieff. The main pollutants of concern are Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10}) from vehicle emissions, which cannot escape due to the canyoning effect of high buildings within the effected streets. At the Proposed Development in the South Kinross area, the air quality is described as good and is not part of an Air Quality Management Area (AQMA). Perth & Kinross Council has declared two air quality management areas (AQMA), one covering the whole of Perth City (2006) and another encompassing the high street corridor running through Crieff (2014).

A review of the existing Perth Air Quality Action Plan (AQAP) is currently underway, however has been delayed due to the COVID-19 pandemic. The Crieff AQAP was approved in mid-2019 and implementation of the agreed measures will be progressed through consultation with the local community and internal and external stakeholders.

Summary of Monitoring Undertaken

Automatic Monitoring Sites

Perth and Kinross Council undertook automatic (continuous) monitoring at 4 sites during 2020. The Proposed Development area does not contain an automatic monitoring site, with the closest monitoring station located at Atholl Street, Perth approximately 28.3km away. The monitoring station is classified as roadside with the

nearest road approximately 1m from the site. This station has a band index rating of Low (1) and monitors particulate matter ($PM_{2.5}$ & PM_{10}) and Nitrogen dioxide (NO_2). Figure 6-1 below displays the concentration levels for particulate matter and nitrogen dioxide from 08/12/2021 – 07/01/2022, at Perth Atholl Street monitoring station.

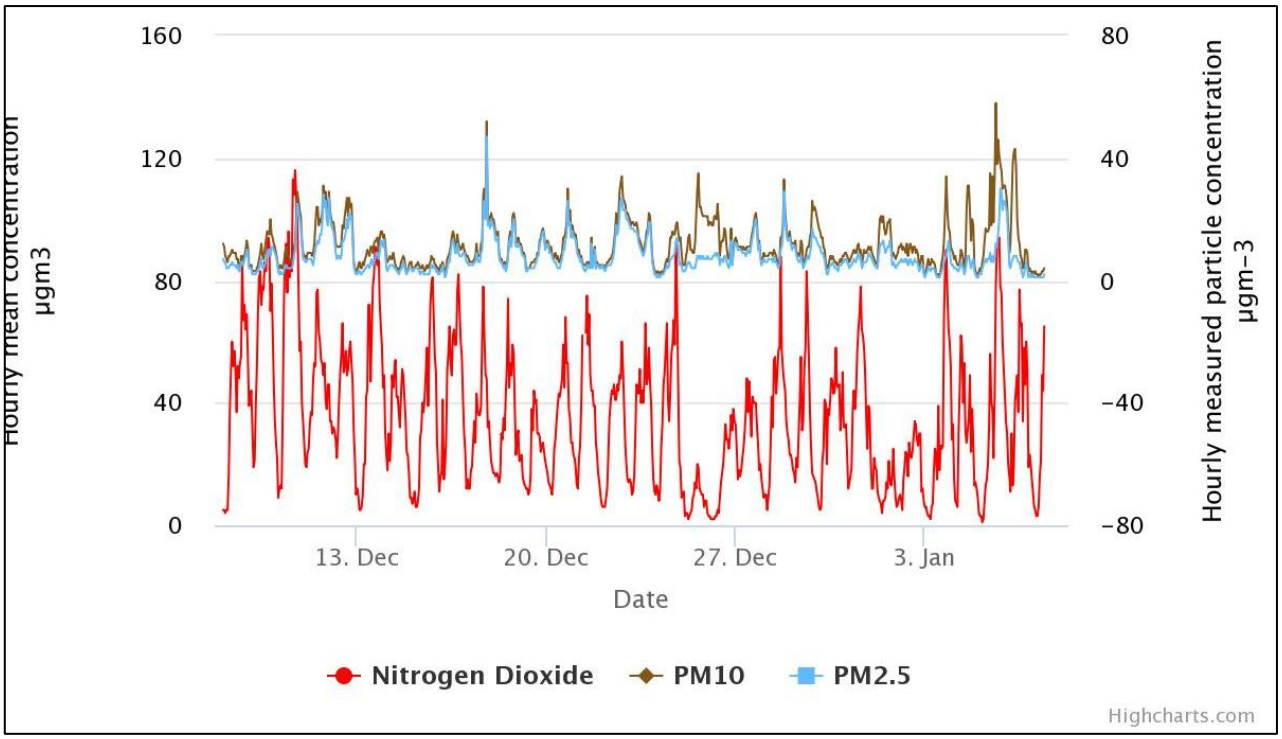


Figure 6-1: Particulate Matter and Nitrogen Dioxide Concentrations Atholl Street from the Previous 30 Days

Non-Automatic Monitoring Sites

Perth and Kinross Council undertook non- automatic (passive) monitoring of NO_2 at 79 sites during 2020. Two of these monitoring locations are located in Kinross, and therefore in the Proposed Development area, at 76 High Street and Springfield Road. Concentration levels at both of these locations are classed as Low (1). A map displaying these non-automatic monitoring sites is represented below in Figure 6-2.

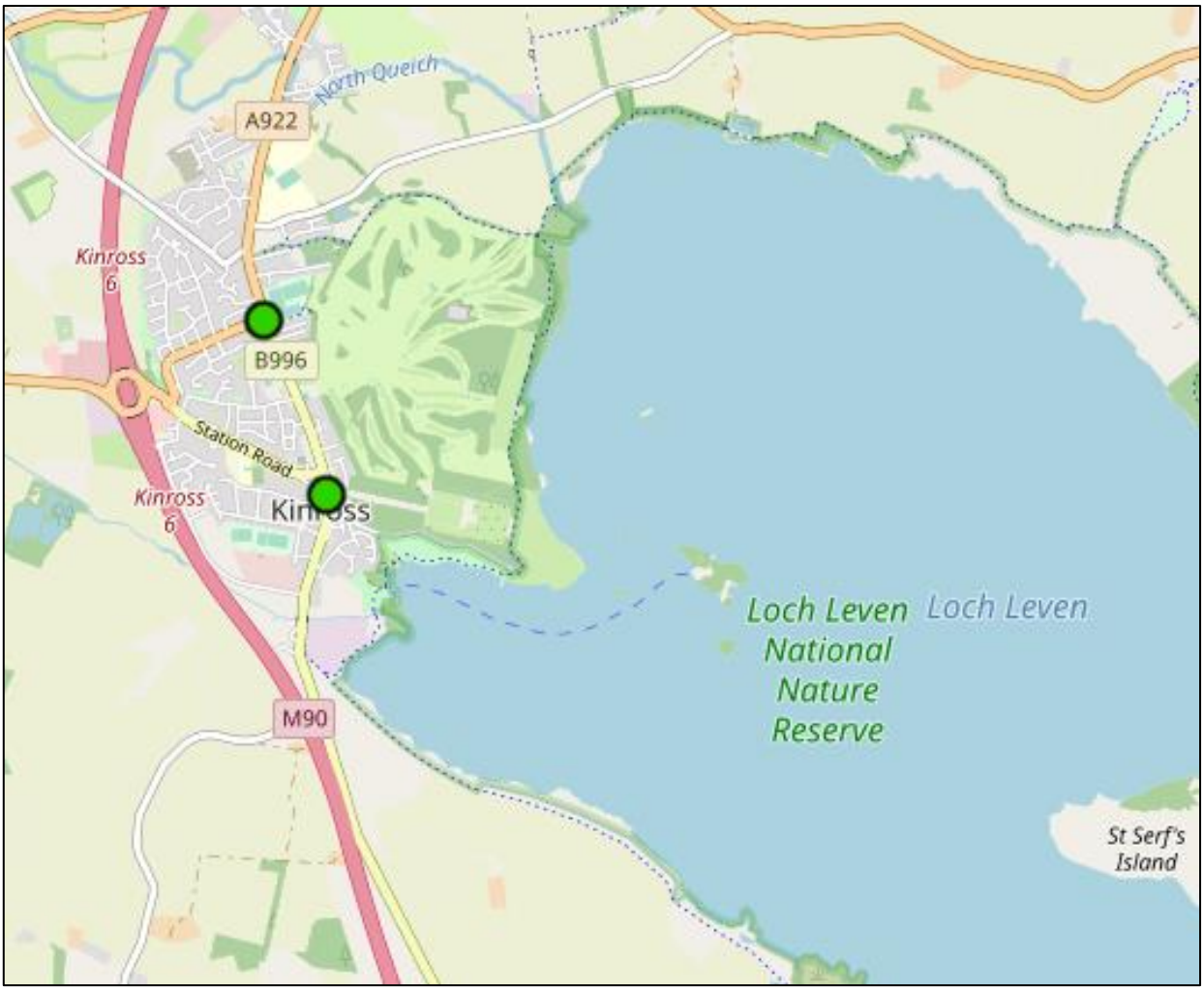


Figure 6-2: Map Displaying the NO_2 Diffusion Tube Sites Located in Kinross

The Air Quality Annual Progress Report for Perth & Kinross County Council provided annual mean NO_2 monitoring results from 2016 to 2020 for each of the diffusion tube monitoring locations, with the results for Kinross presented in Table 6-4 below.

Table 6-4: Annual Mean NO_2 Monitoring Results (µg/m^3)

Site ID	Site Location	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3)				
						2016	2017	2018	2019	2020
P81	76 High Street, Kinross	R	Diffusion	N/A	17	23	22	18	19	N/A
P118	Springfield Road, Kinross	R	Diffusion	N/A	50	N/A	N/A	N/A	N/A	9

Notes:
Exceedances of the NO_2 annual mean objective of 40 µg/m^3 are shown in bold.
Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG(16) if valid data capture for the full calendar year is less than 75%.
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
(2) Data capture for the full calendar year (e.g., if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Neither of the two diffusion tube monitoring stations located in Kinross exceeded the NO_2 annual mean objective of 40 µg/m^3 from 2016 to 2020.

Sources of Pollution

In the pursuit of comprehensively understanding the sources of pollution in Perth & Kinross, a review of the most recent Air Quality Annual Progress Report (APR) for Perth & Kinross Council indicated that sources of pollution mainly emanated from road traffic, other transport, industrial and commercial/ domestic sources. Each pollution source has been summarised below.

Road Traffic Sources

Perth & Kinross County Council have stated that dualling works on the A9 have continued through 2020. Final approval was granted for the Cross Tay Link Road in 2020, however work on the project has not yet started.

Other Transport Sources

Perth & Kinross County Council have confirmed that no new sources within Perth and Kinross have been identified.

Industrial Sources

Perth and Kinross Council are not aware of any new sources however due to a cyberattack, SEPA have been unable to provide information in this regard. A planning application was submitted for the erection of four poultry rearing sheds near Murthly (ref 20/01173/FLM). This application was subsequently withdrawn with the expectation that it will be resubmitted. However, an air quality assessment was completed. This determined that the PM_{10} levels from dust would not exceed the annual mean objective of 18 ug/m^3 at any of the 13 identified sensitive receptors. The location of the Proposed Development is out with either of the AQMAs.

Commercial and Domestic Sources

Biomass boilers for projects in the Council area were the subject of an assessment at the planning stage to determine the potential impact on sensitive receptors. The planning applications were approved. Using the

guidance provided in LAQM.TG16 it has been concluded that most of the areas were not considered to be at risk of objectives being exceeded due to cumulative impacts of multiple biomass/domestic combustion installations.

The application at Wharlawhill Farm was made in retrospect. An air quality impact assessment report concluded that the existing flue heights would be insufficient, and that emission target levels for NO_2 and PM_{10} and $PM_{2.5}$ would be exceeded. A condition was therefore applied to the planning application requiring that the flue height be increased within two months.

Conclusions

No exceedances of either the annual mean objective level or the hourly mean objective level were observed during 2020 at any of the three automatic monitoring sites where NO_2 and PM_{10} levels are monitored. This follows on from no exceedances at these locations in 2018 and 2019. The continuing downward trend for the nearest monitoring station at Atholl Street is shown in Figure 6-3 and Figure 6-4.

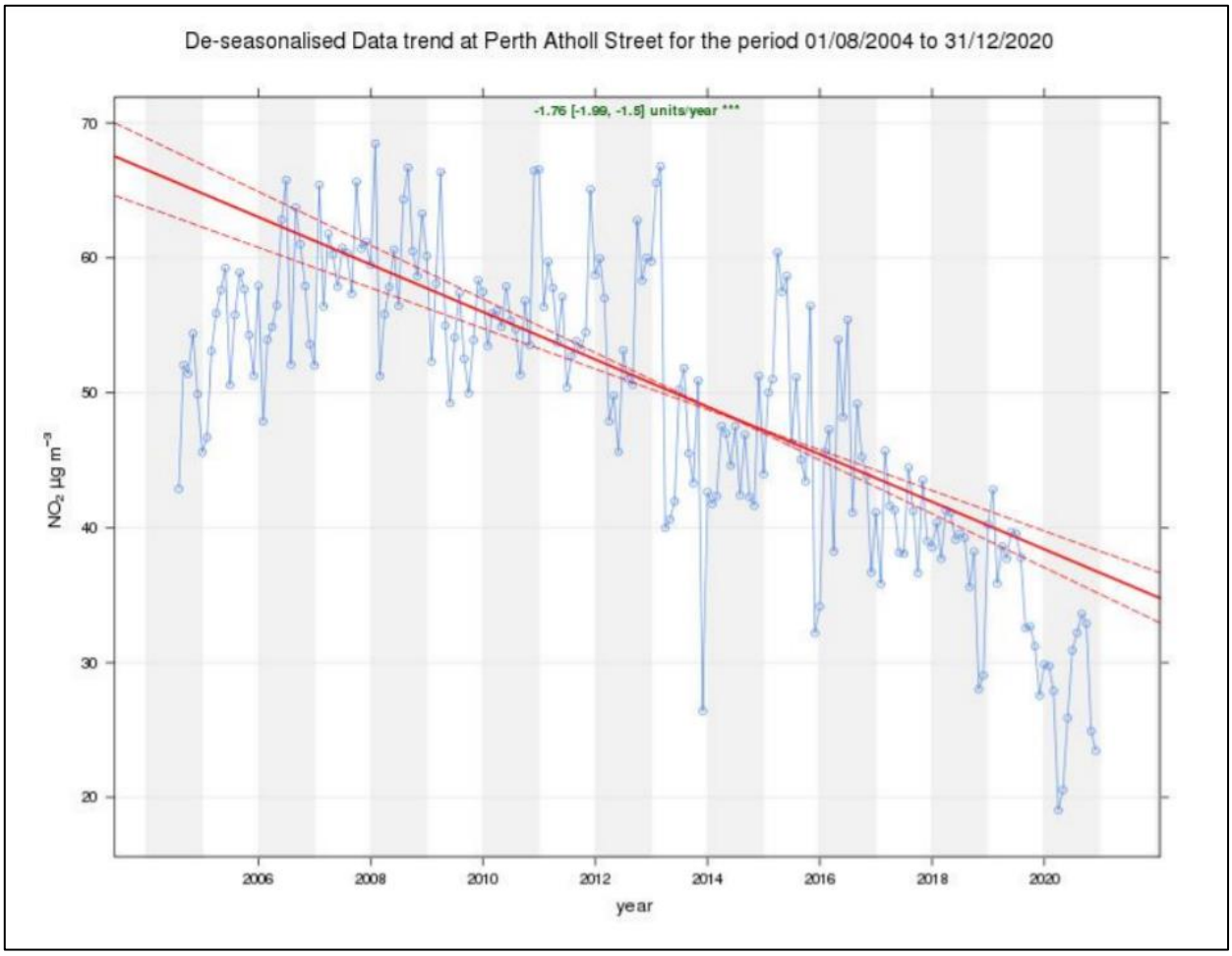


Figure 6-3: Annual Mean Trend for NO2 at Atholl Street (Source Air Quality Annual Progress Report 2021)

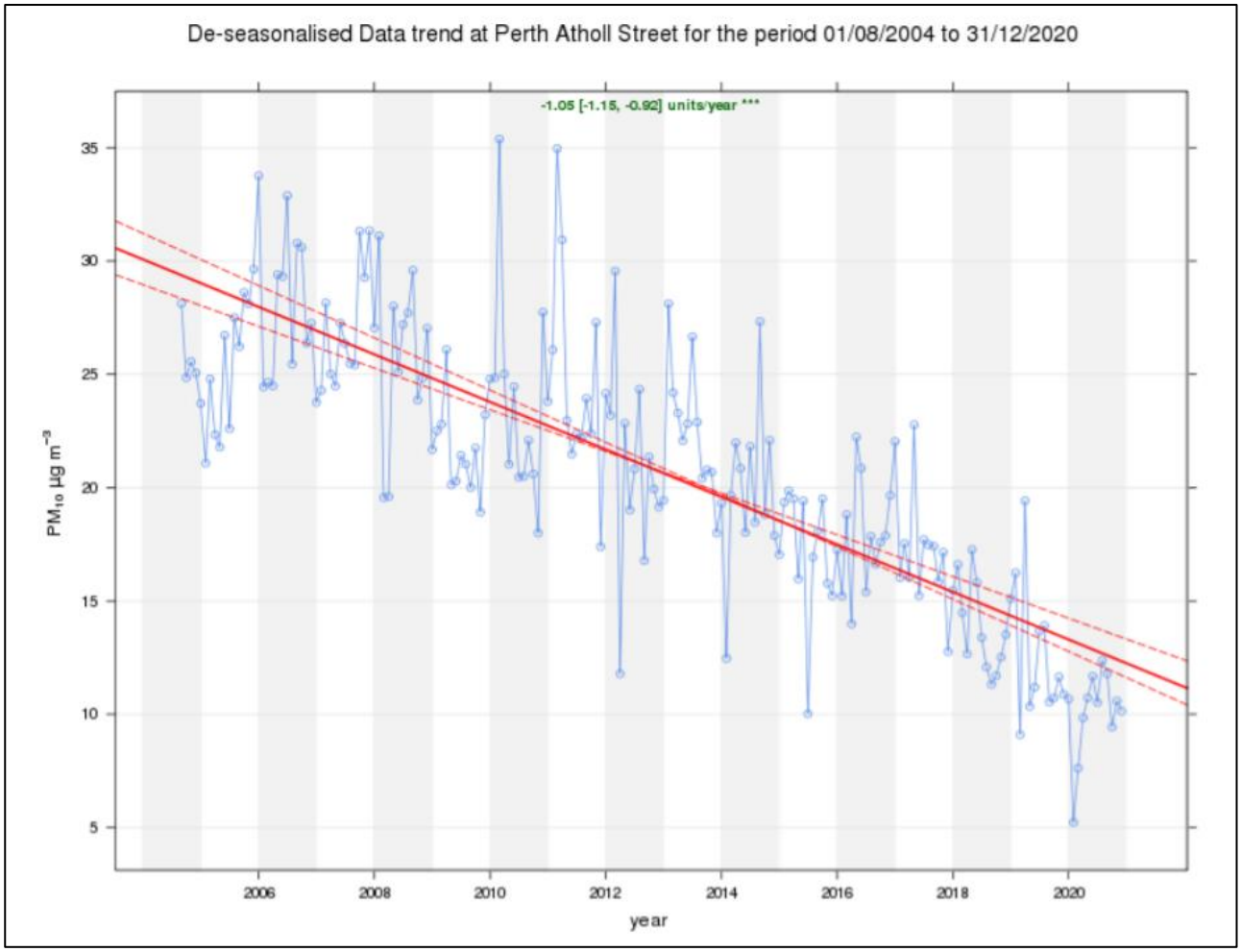


Figure 6-4: PM_{10} Trend for Atholl Street (Source Air Quality Annual Progress Report 2021)

6.2.2 Baseline Climate

6.2.2.1 Climate & Emissions

Climate is described as the average weather prevailing in an area over a period of time. The climate in Scotland is primarily oceanic, meaning it is often cool, rainy, and windy, with temperatures a few degrees lower than the rest of the UK. Rain is common throughout Scotland, with the west side (including the Highlands) wetter and warmer than the east, due to the warm air from the Gulf Stream.

Carbon Dioxide (CO_2) emissions have a global climate warming effect. This is regardless of their rate of release, location or the weather when they are released into the atmosphere. This is unlike pollutants that affect local air quality where the rate of release, location and prevailing weather, as well as the amount of pollutant, determines the local concentrations and the impact.

Local ambient concentrations of CO_2 are not relevant and there are no limits or thresholds that can be applied to particular sources of carbon emissions – any amount of CO_2 released into the atmosphere will contribute to

climate warming, the extent of which is determined by the magnitude of the release. Although CO_2 emissions are typically expressed as kilogrammes or tonnes per year, there is a cumulative effect of these emissions because CO_2 emissions have a warming effect which lasts for 100 years or more.

To counteract the effects of climate change, climate adaptation has been identified as a vital strategy. The Intergovernmental Panel on Climate Change (IPCC) defined climate adaptation as “the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.” Measurements show that 2020 tied with 2016 as the hottest year on record, that each of the last three decades have been hotter than the previous one, and 17 of the 18 warmest years on record have occurred in the 21st century. A recent IPCC Special Report on the Ocean and Cryosphere notes that it is virtually certain that the global ocean has warmed unabated since 1970 and has taken up more than 90% of the excess heat in the climate system. (The Scottish Parliament 2021).

The EU Climate Change and Energy Framework (European Commission, 2014) has set ambitious targets for 2030, which include:

- At least a 40% reduction in domestic greenhouse gas (GHG) emissions compared to 1990; and,
- A reduction in the Emissions Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30% by 2030, compared to 2005, respectively.

The Scottish Government's draft Update to the Climate Change Plan 2018 - 2032 sets out Scotland's path, across eight key sectors, to achieving a 75% reduction in greenhouse gas emissions by 2030, and ultimately net-zero emissions by 2045. The draft update is a crucial staging post in Scotland's trajectory to net-zero, as it encompasses the interim 2030 target, which independent advisers the Climate Change Committee consider to be *"extremely challenging".*

The Climate Change (Scotland) Act 2009 was amended by the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019, increasing the ambition of Scotland’s emissions reduction targets to net zero by 2045 and revising interim and annual emissions reduction targets. The amendments also update arrangements for Climate Change Plans to meet the targets and includes new measures, such as creation of a Citizens Assembly and a Scottish Nitrogen Balance Sheet.

6.2.2.2 Adaption Scotland

The Climate Change (Scotland) Act 2019 required the Scottish Government to use the findings of the UK Climate Change Risk Assessment (UKCCRA) to develop a statutory Scottish Climate Change Adaptation Programme (SCCAP). In September 2019, the Scottish Government published its second 5-yearly statutory adaptation programme. SCCAP2 sets out how the Scottish Government is responding to the main climate risks for Scotland – as identified in the UKCCRA and covering a range of global warming scenarios. In total, there are around 170 policies and proposals across Scotland. Adaptation Scotland (2022) is one of these funded programmes, which provides advice and support to adapt to climate change impacts, and their key statistics include:

- Average temperatures in Scotland are now around 0.7 °C higher than they were a century ago (this is in line with global trends);
- The average temperature in the first decade of the twenty first century in Scotland was 0.9 °C warmer than the average for the thirty-year period 1961-1990 and it was warmer than any other decade since records began in 1910;
- Scotland's warmest year on record was 2014;
- In 2016 the average temperature was 0.8 °C higher than the average for 1961-1990;
- Scotland's annual rainfall has increased since the 1970s and is now 13% above the average for the early decades of the twentieth century. All seasons have contributed to this increase; and
- Long-term monitoring of sea level at stations around the UK including Aberdeen shows the mean sea level for 2006 - 2008 was more than 10cm higher than during the 1920s.

The Programme is aligned with the UN Sustainable Development Goals and Scotland's National Performance Framework. The Scottish Government champions climate justice, and promotes a people centred, human-rights approach to climate change adaptation. This programmes vision and key objectives is illustrated in Figure 6-5.

Figure 6-5: Climate Change Adaptation Outcomes (Source: Adaption Scotland)

6.2.2.3 COP26 Glasgow 31st October – 12 November 2021

The COP26 summit brought parties together to accelerate action towards the goals of the Paris Agreement and the UN Framework Convention on Climate Change. In recognition of the need to strengthen action on adaptation, parties have agreed to launch the 2-year Glasgow-Sharm el Sheikh Work Programme on the Global Goal on Adaptation (The GlaSS). This is a significant step forward which will deliver action to reduce vulnerability, strengthen resilience and increase the capacity of people and the planet to adapt to the impacts of climate change.

6.2.2.4 Climate Ready Scotland: Climate Change Adaptation Programme 2019-2024

This document uses an outcomes-based approach, derived from both the UN Sustainable Development Goals and aligned to Scotland's National Performance Framework. This approach ensures that actions over the next five years to increase the capacity of Scotland's people, communities, businesses and public sector to adapt

to climate change will also complement our international ambitions and integrate action on adaptation into wider Scottish Government policy development and service delivery. The Evidence Report used the concept of urgency to summarise the findings of the analysis, variously identifying 'more action needed', 'research priority', 'sustain current action' and 'watching brief' categories. For Scotland, it highlighted:

- The need for more action to address flood risks;
- The potential for water scarcity;
- Heat related impacts on health and wellbeing;
- Risks to the natural environment;
- Risks of food price volatility; and
- New and emerging pest and disease risks, especially for Scotland's forestry.

6.2.2.5 Perth & Kinross Council Interim Climate Emergency Report and Action Plan (2019)

Perth & Kinross Council states that they need to take early action to adapt, increase resilience and reduce risks. Early adaptation actions can contribute towards the enhancement of both the natural and built environment, and to raise the quality of life of people within Perth and Kinross. The most evident and frequent sign of extreme weather in Perth and Kinross is flooding, with several communities having experienced the devastating impact of flooding in recent years. To respond to this challenge, Perth & Kinross County Council have taken the following actions:

- In June 2016, the Council published its first local flood risk management plans setting out a range of actions it will be taking along with other responsible authorities to manage and, where achievable, reduce flood risk.
- Flood protection schemes had already been implemented in Perth, Comrie, Weem, Bridge of Earn and Milnathort. A new scheme at Almondbank has recently been completed, and the Council is promoting new flood protection schemes in Comrie, Milnathort, Kinross and Scone.
- In October 2019, Committee approval was given to develop flood protection schemes for Pitlochry and Aberfeldy. Further flood studies are on-going for Perth and Blackford and will shortly commence for Dunkeld and Invergowrie, with other areas to follow.
- The Council promotes the use of property flood protection products by private householders in co-operation with the Housing Service and businesses.

Many policy measures are in place for assessing risk, including supplementary planning guidance for: Flood Risk and Flood Risk Assessments; Forest & Woodland Strategy; Zero Carbon and Sustainable Construction; Green Infrastructure and Zero Waste.

6.2.2.6 Rainfall and Temperature

As previously stated, Scotland has a wet temperature and primarily oceanic climate. The Met Office (2022) provides annual temperature and rainfall data for the Proposed Development area and historic climate data throughout Scotland. The nearest residential weather station which has been correlated to provide monthly averages for temperature and precipitation from years 1991 to 2020 is located in Kinross. The monthly averages throughout this time period are set out in Table 6-5. The nearest historic climate station is located in Leuchars and is approximately 44km northeast of the Proposed Development area. The annual temperatures and precipitation amounts from 2016 to 2021 are presented in

Table 6-6 and Figure 6-6. From Figure 6-6, there is evidence of a slight increasing trend in annual temperature from 2016 – 2020 particularly within the minimum temperature recordings.

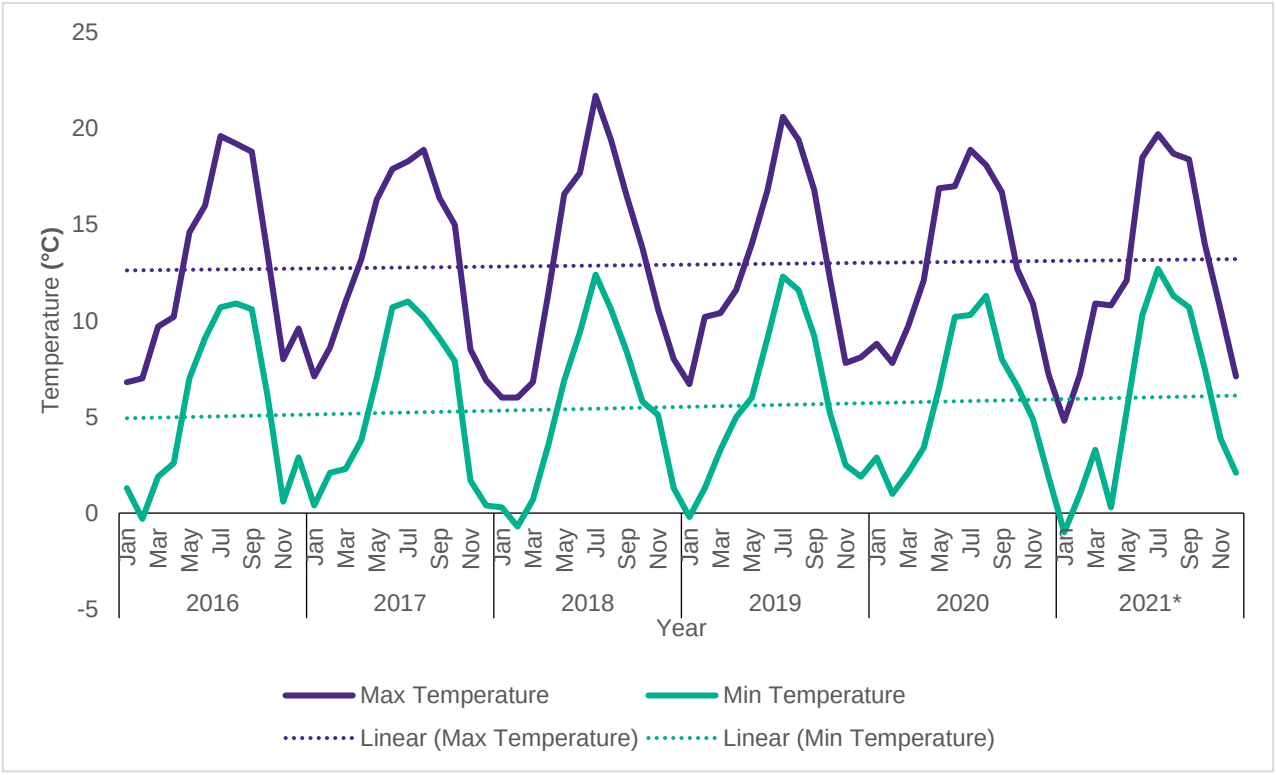
Table 6-5: Kinross Station Climate Averages Recorded from 1991 – 2020

Month	Maximum Temperature (°C)	Minimum Temperature (°C)	Days of Air Frost (days)	Sunshine (hours)	Rainfall (mm)	Days of Rainfall ≥1 mm (days)
January	6.11	0.02	13.83	31.94	122.86	16.80
February	6.87	0.06	13.23	66.85	95.65	14.00
March	8.87	1.10	10.87	110.13	81.42	13.77
April	11.73	2.73	5.27	156.35	60.73	10.90
May	14.94	5.15	2.17	188.85	61.42	11.30
June	17.50	8.19	0.07	151.17	73.15	12.47
July	19.31	9.85	0.00	161.86	83.05	13.00
August	18.93	9.46	0.00	157.77	92.28	13.47
September	16.41	7.35	0.60	121.79	80.09	12.63
October	12.44	4.62	3.60	80.72	110.43	15.77
November	8.74	1.88	9.67	45.99	109.62	15.93
December	6.23	-0.07	14.33	22.00	111.34	15.67
Annual	12.37	4.22	73.64	1295.42	1082.04	165.71

Table 6-6: Total Rainfall Data in mm for Leuchars Station 2016 – 2021

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	157.6	35.4	23.6	83.0	19.0	89.8	57.2	32.0	40.0	51.2	34.6	44.6
2017	22.8	60.0	42.6	6.2	39.6	148.4	50.2	72.4	63.8	41.4	37.8	30.4
2018	66.0	34.6	104.3	48.4	24.6	30.8	41.0	57.6	36.8	49.4	85.2	71.6
2019	9.8	22.8	74.6	27.6	77.2	66.4	69.2	131.0	48.6	74.2	128.0	44.8
2020	34.2	121.6	20.4	7.4	18.2	64.6	74.2	105.8	31.6	160.2	41.8	88.8
2021*	72.0	94.4	28.2	2.6	143.0	18.8	47.8	84.8	45.8	117.0	34.6	77.8

***Provisional**



***Provisional**

Figure 6-6: Mean Temperature in Degrees Celsius for Leuchars Station 2016 – 2021

6.2.2.7 Dust and Particulates

Dust is the generic term used to describe particulate matter in the size range 1-75 µm in diameter. Particles greater than 75 µm in diameter are termed grit rather than dust. Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.

The effects of dust are linked to particle size and two main categories are usually considered:

- PM_{10} particles, those up to 10 µm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and
- Dust, generally considered to be particles larger than 10 µm which fall out of the air quite quickly and can soil surfaces (e.g. a car, windowsill, laundry). Additionally, dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.

The IAQM Guidance on the assessment of dust from demolition and construction sets out 350m as the distance from the site boundary and 50m from the site traffic route(s) up to 500m of the entrance, within which there

could potentially be nuisance dust and PM_{10} effects on human receptors. For sensitive ecological receptors, the corresponding distances are 50m in both cases. These distances are set to be deliberately conservative.

Human Receptors Definition

A 'human receptor' refers to any location where a person or property may experience the adverse effects of airborne dust or dust soiling, or exposure to particulates over a time period relevant to the air quality objectives, as defined in the Government's technical guidance for Local Air Quality Management. In terms of annoyance effects, this will most commonly relate to dwellings, but may also refer to other premises such as buildings housing cultural heritage collections (e.g. museums and galleries), vehicle showrooms, food manufacturers, electronics manufacturers, amenity areas and horticultural operations (e.g. salad or soft-fruit production).

Sensitivities of People and Property Receptors to Dust

High Sensitivity

Principles: Users can reasonably expect enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land.

Indicative Examples: Dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms.

Medium Sensitivity

Principles: Users would expect to enjoy a reasonable level of amenity but would not reasonably expect to enjoy the same level of amenity as in their home; or the appearance, aesthetics or value of their property could be diminished by soiling; or the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.

Indicative Examples: Parks, places of work.

Low Sensitivity

Principles: The enjoyment of amenity would not reasonably be expected; or there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.

Indicative Examples: Playing fields, farmland (unless commercially sensitive horticultural), footpaths and roads, short-term car parks.

Sensitivities of People and Property Receptors to PM_{10}

High Sensitivity

Principles: Locations where members of the public are exposed over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM10, a relevant location would be one where individuals may be exposed for eight hours or more in a day).

Indicative Examples: Residential properties, schools, hospitals and residential care homes.

Medium Sensitivity

Principles: Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM_{10}, a relevant location would be one where individuals may be exposed for eight hours or more in a day).

Indicative Examples: Office and shop workers (but generally excludes workers occupationally exposed to PM_{10} as protection is covered by Health and Safety at Work legislation).

Low Sensitivity

Principles: Locations where human exposure is transient exposure.

Indicative Examples: Public footpaths, playing fields, parks, shopping streets.

6.2.2.8 Source Pathway Receptor

Concentration-based limit values and objectives have been set for the PM_{10} suspended particle fraction, but no statutory or official numerical air quality criterion for dust annoyance has been set at a UK, European or World Health Organisation (WHO) level. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.

Consistent with the recommendations in the IAQM dust guidance, a risk-based assessment has been undertaken for the development, using the well-established source-pathway-receptor approach:

The dust impact (the change in dust levels attributable to the development activity) at a particular receptor will depend on the magnitude of the dust source and the effectiveness of the pathway (i.e., the route through the air) from source to receptor.

The effects of the dust are the results of these changes in dust levels on the exposed receptors, for example annoyance or adverse health effects. The effect experienced for a given exposure depends on the sensitivity of the particular receptor to dust. An assessment of the overall dust effect for the area as a whole has been made using professional judgement taking into account both the change in dust levels (as indicated by the Dust Impact Risk for individual receptors) and the absolute dust levels, together with the sensitivities of local receptors and other relevant factors for the area.

The dust risk categories that have been determined for each of the four activities (demolition, earthworks, construction and trackout – these activities are set out in the IAQM guidance and are not always applicable to a specific project, they are listed here for completeness) have been used to define the appropriate site-specific

mitigation measures based on those described in the IAQM dust guidance. Section 6.4.1.3 details the IAQM risk assessment in full.

6.3 Likelihood of Significant Effects

6.3.1 Assessment Criteria and Assignment of Significance

6.3.1.1 Air Quality

Table 6-7 describes the sensitivity of receptor and may be used in an EIA to ensure a standardised approach. In this instance the construction phase assessment presented in this chapter employs standards and criteria set out in the IAQM guidance document (IAQM Guidance on the Assessment of Dust from Demolition and Construction, 2023). The standard approach in Table 6-7 and Table 6-8 are presented for completeness.

Table 6-7: Definitions of Sensitivity or Value

Sensitivity	Example Descriptor
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Low	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

Table 6-8: Definitions of Magnitude

Sensitivity	Example Descriptor
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse). Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Medium	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse). Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Low	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse). Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Both sensitivity/value and magnitude are considered in determining the significance of effect.

6.4 Description of Likely Significant Effects

6.4.1 Assessment of Construction Effects

The main air quality impacts that may arise during demolition and construction activities are:

1. Dust deposition, resulting in the soiling of surfaces;
2. Visible dust plumes, which are evidence of dust emissions;
3. Elevated PM_{10} concentrations, as a result of dust generating activities on site; and
4. An increase in concentrations of airborne particles and nitrogen dioxide due to exhaust emissions from diesel powered vehicles and equipment used on site (non-road mobile machinery) and vehicles accessing the site.

The most common impacts are dust soiling and increased ambient PM_{10} concentrations due to dust arising from activities on the site. Dust soiling will arise from the deposition of dust in all size fractions. The ambient dust relevant to health outcomes will be that measured as PM_{10}, although most of this will be in the coarse ($PM_{2.5-10}$) fraction, rather than the $PM_{2.5}$ fraction. Research undertaken in the USA suggests that 85% to 90% by weight of the fugitive dust emissions of PM_{10} from construction sites are $PM_{2.5-10}$ and 10% to 15% are in the $PM_{2.5}$ fraction.

There are other potential impacts, such as the release of heavy metals, asbestos fibres or other pollutants during the demolition of certain buildings, such as former chemical works, or the removal of contaminated soils. The release of certain fungal spores during the demolition of old buildings can also give rise to specific concerns if immune-compromised people are likely to be exposed, for example close to an oncology unit of a hospital. These issues need to be considered on a site-by-site basis and are not covered by this Guidance.

Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur. For site traffic on the public highway, if it cannot be scoped out (for example by using the EPUK's criteria), then it should be assessed using the same methodology and significance criteria as operational traffic impacts. The impacts of exhaust emissions from on-site plant and site traffic are not considered further in this Guidance.

6.4.1.1 Receptors

Human Receptor

A 'human receptor' refers to any location where a person or property may experience the adverse effects of airborne dust or dust soiling, or exposure to PM over a time period relevant to the air quality objectives, as defined in the Government's technical guidance for Local Air Quality Management. In terms of annoyance effects, this will most commonly relate to dwellings, but may also refer to other premises such as buildings housing cultural heritage collections (e.g., museums and galleries), vehicle showrooms, food manufacturers, electronics manufacturers, amenity areas and horticultural operations (e.g., salad or soft-fruit production). Care should be taken to ensure that the assessment takes into account whether exposure will arise in practice (e.g., computer chip manufacture is sensitive to dust and so premises are likely to have extensive dust filtering equipment and exposure may therefore not be increased).

Ecological Receptor

An ‘ecological receptor’ refers to any sensitive habitat affected by dust soiling. This includes the direct impacts on vegetation or aquatic ecosystems of dust deposition, and the indirect impacts on fauna (e.g., on foraging habitats). For locations with a statutory designation, e.g. Special Areas of Conservation (SACs) and Areas of Special Scientific Interest (ASSIs), consideration should be given as to whether the particular site is sensitive to dust, and this will depend on why it has been designated. Some non-statutory sites (i.e. local wildlife sites) and/ or locations with very specific sensitivities may also be considered if appropriate. The inclusion or exclusion of sites should be justified in the assessment.

Dust from construction sites deposited on vegetation may create ecological stress within the local plant community. During long dry periods dust can coat plant foliage adversely affecting photosynthesis and other biological functions. Rainfall removes the deposited dust from foliage and can rapidly leach chemicals into the soil. Plant communities near short-term works are likely to recover within a year of the dust soiling stress ceasing. However, large scale construction sites may give rise to dust deposition over an extended period of time and adversely affect vascular plants. For example, cement dust deposited on leaves can increase the surface alkalinity, which in turn can hydrolyse lipid and wax components, penetrate the cuticle, and denature proteins, finally causing the leaf to wilt.

Limestone dust coating of lichen has been shown to damage its photosynthetic apparatus. These types of damage over a long period have the potential to change plant community structure and function. Noticeable effects include the increase in ruderal and pioneer plant communities.

6.4.1.2 Risk of Dust Emissions

The risk of dust emissions from a demolition/ construction site causing loss of amenity and/ or health or ecological impacts is related to:

1. The activities being undertaken (demolition, number of vehicles and plant etc.);
2. The duration of these activities;
3. The size of the site;
4. The meteorological conditions (wind speed, direction and rainfall);
5. The proximity of receptors to the activities;
6. The adequacy of the mitigation measures applied to reduce or eliminate dust; and
7. The sensitivity of the receptors to dust.

The quantity of dust emitted from construction operations will be related to the area of land being worked, and the level of construction activity (nature, magnitude and duration). Emissions from construction vehicles passing over unpaved ground can be particularly important. These will be related to the silt content of the soil (defined by the US Environmental Protection Agency as particles smaller than 75 micrometres [µm] in diameter), as well as the speed and weight of the vehicle, the soil moisture content, the distance covered and the frequency of vehicle movements.

Weather

Although not specifically required as part of the IAQM dust assessment method, analysis of the local climatic conditions was also undertaken to provide additional context to the risk assessment and assist in the determination of the sensitivity of the area.

The wind direction, wind speed and rainfall, at the time when a construction activity is taking place, will also influence whether there is likely to be a dust impact. Due to the variability of the weather, it is impossible to predict what the weather conditions will be when specific construction activities are being undertaken.

Local wind speed and direction influences the dispersion of dust. This will depend on the frequency that the receptor is downwind and the distance of the receptors from the construction activities. Higher wind speeds will result in the highest potential release of dust from a site. Buildings, structures and trees can also influence dispersion.

Adverse impacts can occur in any direction from a site. They are, however, more likely to occur downwind of the prevailing wind direction and/ or close to the site. It should be noted that the 'prevailing' wind direction is usually the most frequent direction over a long period such as a year; whereas construction activity may occur over a period of weeks or months during which the most frequent wind direction might be quite different. The most frequent wind direction may also not be the direction from which the wind speeds are highest. The use of the prevailing wind direction in the assessment of risk is most useful, therefore, for construction projects of long duration.

Dust impacts are more likely to occur during drier periods, as rainfall acts as a natural dust suppressant.

Seasonal

Impacts during the summer and winter months are generally different, and if it can be guaranteed that the construction will take place during a particular season (with this enforced through a planning condition, for example), consideration could be given to using seasonal wind and rainfall data. This type of guarantee is not usual because the start of construction depends on many factors.

Topography & Natural Barriers

Local conditions also need to be accounted for. Topography and natural barriers (e.g. woodland) will reduce airborne concentrations due to impaction. In addition, if the locality has a history of dust generating activities, such as quarrying, a given level of additional dust may be more acceptable, i.e. more readily tolerated, than in a suburban residential area. Alternatively, impacts may be less acceptable, where nearby residents have become sensitised to dust, have a history of complaining and may therefore be more likely to complain about a new dust source. Similarly, in rural areas agricultural activities may generate dust and this should be taken into account in the assessment of risk.

6.4.1.3 Assessment Procedure

This guidance provides a framework for the assessment of risk. Every site is different and therefore this guidance cannot be too prescriptive and professional judgement is required. Any judgements must be fully

auditable in the dust assessment report, with the source(s) defined and choice of dust risk category justified for each activity (see below). Where justification cannot be given, a precautionary approach must be taken, and the highest level of mitigation recommended.

Activities on construction sites have been divided into four types to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

The potential for dust emissions is assessed for each activity that is likely to take place. Obviously, if an activity is not taking place, e.g., demolition, then it does not need to be assessed.

The assessment methodology considers three separate dust impacts:

1. Annoyance due to dust soiling;
2. The risk of health effects due to an increase in exposure to PM_{10}; and
3. Harm to ecological receptors with account being taken of the sensitivity of the area that may experience these effects.

The assessment is used to define appropriate mitigation measures to ensure that there will be no significant effect.

The assessment steps are summarised in Volume III, Appendix Q.

6.4.1.4 Construction Greenhouse Gases

Emissions of construction generated GHG will arise from embodied emissions in site materials, direct emissions from plant machinery/ equipment as well as emissions vehicles delivering material and personnel to the construction site.

The below definitions of the terms effect and impact are drawn from the glossary of the Highways Agency Design Manual for Roads and Bridges, which provides general guidance:

- **Impact:** Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact);
- **Effect:** Term used to express the consequence of an impact (expressed as the ‘significance of effect’), which is determined by correlating the magnitude of the impact to the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria. For example, land clearing during construction results in habitat loss (impact), the effect of which is the significance of the habitat loss on the ecological resource.

The term impact is used when discussing impact magnitude – the original impact on a receptor. The term effect is used when talking about significance (as this is the result of the impact and the sensitivity of the receptor). The following are set out:

- Magnitude of impact;
- Sensitivity of receptor;
- Significance of effect.

In terms of the Proposed Development the following key aspects are summarised:

- Increased frequency of extreme weather - Damage, delay, health and safety impact, increased costs. The sensitivity of construction phase receptors is considered to be high. The magnitude of change is considered to be negligible. Therefore, there is likely to be a direct, temporary, short-term, adverse effect which is considered to be **Minor**.
- Increased temperatures, prolonged periods of hot weather - Warm and dry conditions exacerbate dust generation and dispersions, health risks to construction workers. Appropriate dust control measures, which will be outlined in the CEMP, will be put in place during the construction phase of the Proposed Development to aid in protection from fugitive dust dispersion and potential health impact on construction workers.
- Increased precipitation, and intense periods of rainfall. 1) Flooding of works and soil erosion; 2) Increased risk of contamination of waterbodies; 3) Disruption to supply of materials and goods; 4) Landslides. Appropriate assessment has been undertaken in relation to future flooding. Please refer to Chapter 15 for full assessment details of future flood risk.

The sensitivity of construction phase receptors is considered to be high. The magnitude of change is considered to be negligible. Therefore, there is likely to be a direct, temporary, short-term, adverse effect which is considered to be **Negligible**.

6.4.1.5 Climate Change Resilience

During the construction process, receptors may be vulnerable to a range of climate risks. Potential impacts during the construction phase could include:

- Inaccessible construction site due to severe weather events (flooding, snow and ice, storms) restricting working hours and delaying construction;
- Health and safety risks to the workforce during severe weather events;
- Unsuitable conditions (due to very hot weather or very wet weather, for example) for certain construction activities; and
- Damage to construction materials, plant and equipment, including damage, material storage areas and worksites, for example from stormy weather.

With regard to climate change risks to the Proposed Development during the construction period, it is considered reasonable that construction contractors would be able to adapt working methods if necessary.

For example, warmer winter conditions may extend the time certain construction activities such as concrete pouring can be carried out, while a greater chance of summer heatwave conditions may require adaptations such as shading work areas or increased attention to construction dust control measures. Effects are considered to be **Negligible** and not significant. A flood risk assessment, including climate change influenced flooding, is presented in Chapter 15.

6.4.2 Assessment of Operational Effects

Operational traffic movements are not anticipated to change traffic flows on the road network; therefore, air quality and climate effects from this source are deemed not significant. Consequently, operational traffic air quality and climate has been scoped out of the assessment of the Proposed Development.

6.5 Inter-relationships

All environmental factors are inter-related to some extent. Interactions within the study area can be one-way interactions, two-way interactions and multiple-phase interactions may be influenced by the Proposed Development.

An assessment of the interaction between environmental factors are required under Article 3(1)(e) of the EIA Directive –1. The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

- *Population and human health;*
- *Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;*
- *Land, soil, water, air and climate;*
- *Material assets, cultural heritage and the landscape;*
- *The interaction between the factors referred to in points (a) to (d).*

The interactions between impacts on different environmental factors are considered, addressed and outlined as relevant throughout the EIAR.

Air quality is most likely to have an inter relationship with traffic and geology and soils and climate is mostly likely to have an inter relationship with flooding.

6.6 Mitigation Measures

6.6.1 Construction Phase

A dust and emissions management plan shall be developed for construction phase dust control and mitigation measures to be employed by the construction contractor. The series of mitigation and control measures will

help prevent significant air quality and dust impacts during the construction phase. The following are general good practice measures that will be implemented onsite to control dust and vehicle emissions.

The IAQM guidance outlines a number of mitigation measures for reducing impacts of fugitive dust from construction sites. Adoption of a number of these measures at the project site will reduce dust impacts to both personnel working at the site and off-site receptors. The mitigation measures are broken down in the following sections.

6.6.1.1 Communications

With respect to communications, the following will be implemented:

a. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary; and

b. Appropriate training will be provided to all staff to ensure that they are aware of and understand the dust control and other environmental control measures.

6.6.1.2 Site Management

With respect to site management, the following will be implemented:

a. Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;

b. Make the complaints record available to the relevant regulatory authorities when asked;

c. Record any exceptional incidents that cause dust and/or air emissions, either on or offsite, and the action taken to resolve the situation in an environmental log book;

d. Avoid site runoff of water or mud;

e. Use covered skips; and

f. No bonfires and burning of waste materials on site.

To be implemented during works as required by the appointed contractor.

6.6.1.3 Earthworks

With respect to earthworks, the following will be implemented:

a. Minimise drop heights from loading or handling equipment/materials; and

b. Methods and equipment will be in place for immediate clean-up of spillages of dusty or potentially dusty materials.

To be implemented during works as required by the appointed contractor.

6.6.1.4 Construction

With respect to construction, the following will be implemented:

a. Ensure bulk cement and other fine powder materials are delivered in enclosed containers;

b. For smaller supplies of fine power materials will be ensured that bags are sealed after use and stored appropriately to prevent dust; and

c. Cleaning of hard stand areas by personnel only or if required mechanical road sweepers (with water suppressant fitted) to clean any site hard stand area.

To be implemented during works as required by the appointed contractor.

6.6.1.5 Vehicle Movement and Vehicle Emissions

As with any construction site, there are associated vehicle movement, emissions and plant use. With respect to vehicle movement and vehicle emissions, the following will be implemented:

a. Transportation of aggregates and fine materials will be conducted in enclosed or sheeted vehicles;

b. Ensure all vehicles switch off engines when stationary and not in immediate use - no idling vehicles (emissions to air controlled);

c. All plant utilised should be inspected weekly (emissions to air controlled);

d. Visual monitoring of plant will include: Ensuring no black smoke is emitted other than during ignition (emissions to air controlled);

e. Ensuring exhaust emissions are maintained to comply with the appropriate manufacturers' limits (emissions to air controlled); and

f. Vehicle exhausts will be directed away from the ground and other surfaces and preferably upwards to avoid road dust being re-suspended to the air.

To be implemented during works as required by the appointed contractor.

6.6.2 Operation Phase

No measures are required as the operational phase is scoped out of the assessment. No likely significant effects are predicted as a result of the Proposed Development and therefore an assessment on air quality and climate change is proposed to be scoped out of the EIA Report in its entirety.

6.6.2.1 Greenhouse Gases

The operation of the Proposed Development will not present a significant change from baseline conditions in South Kinross. Therefore, no mitigation measures have been recommended.

6.6.2.2 Climate Change Resilience

With the design and mitigation measures proposed, the Proposed Development is considered to be resilient to projected climate change. The resilience of the Proposed Development to climate change impacts is qualitatively assessed, based on professional expertise and judgement.

6.6.3 Monitoring

Due to the nature and scale of the scheme, no future monitoring is required in relation to air quality and climate.

6.7 Residual Impacts

6.7.1 Construction Effects

On implementation of the dust and emissions management plan, included in the oCEMP, and the mitigation measures detailed in Section 6.6.1 above, the impact of construction dust from the Proposed Development on nearby receptors is considered **Negligible.**

As the construction traffic volumes predicted with the Proposed Development are not considered significant, the resultant air quality impact from construction traffic is **Negligible.**

The greenhouse gas emissions associated with the proposed construction of the development is considered to be is **Negligible.**

6.7.2 Operational Effects

Operational effects were scoped out of the assessment as operational traffic movements are not anticipated to change traffic flows on the road network. Therefore, operational effects on air quality and climate are considered to be **Negligible.**

6.8 Potential Cumulative Effects

Cumulative effects have been considered in respect of impacts resulting from the accumulation of impacts generated by the Proposed Development on the same receptors and the impacts potentially arising from adjacent or nearby developments together with those predicted for the Proposed Development. Cumulative projects are stated in Chapter 18 and are not repeated here.

6.9 Conclusions

This Chapter considers the impacts on air quality and climate change from the Proposed Development. In undertaking this assessment, RPS experts have exercised professional skills and judgement to the best of their abilities and have given professional opinions that are objective, reliable and backed with scientific rigour.

In relation to air quality, for the construction phase, an important consideration is dust. In the absence of mitigation there is the potential for significant, negative, short-term impacts to nearby sensitive receptors as a result of dust emissions from the Proposed Development. The mitigation measures provided within this assessment will ensure that the risk of adverse dust effects is reduced to a level categorised as **Negligible**. Another important issue during the construction phase is construction traffic but due to the nature and scale of the project the construction traffic volumes will not be significant and the resultant air quality impact from construction traffic is **Negligible**.

In terms of climate change, the effects of greenhouse gases and climate change resilience were considered. There is likely to be a direct, temporary, short-term, adverse effect on nearby receptors with regards to

greenhouse gases which is considered to be **Negligible** as a result of the Proposed Development. Effects are considered to be **Negligible** and not significant in terms of climate change resilience.

In relation to both air quality and climate change for the operational phase, operational traffic movements were not anticipated to change traffic flows on the road network. Therefore, operational effects on air quality and climate are considered to be **Negligible.**

7 BIODIVERSITY - ORNITHOLOGY

This assessment evaluates the likely significant environmental effects on the ornithological receptors associated with the construction and operation of the Proposed Development. The chapter is supported by Volume III, Appendices D and E.

Where relevant, all figures and Technical Appendices are referenced within the text. The naming structure used in this chapter follows common names except where no common name is typically used. Full scientific names and comprehensive species lists are provided in the Technical Appendices.

All staff who have contributed to fieldwork and this chapter have an undergraduate or higher postgraduate degree in relevant subjects and hold professional membership of the Chartered Institute of Ecology and Environmental Management (CIEEM).

7.1 Assessment Methodology

7.1.1 Planning Policy Context

Table 7-1 below summarises the planning policy relevant to this assessment.

Table 7-1: Summary of National and Local Planning Policies

Document	Brief description
National Planning Policy	
NPF4 (Scottish Government, 2023)	The fourth National Planning Framework (NPF4) (Scottish Government, 2023) sets out how the Scottish Government's approach to planning and development will help to achieve a net zero, sustainable Scotland by 2045. Specifically, in relation to the Project, Policy 1 states that when considering all development proposals significant weight will be given to the global climate and nature crises. Policy 3 states that Development proposals will contribute to the enhancement of biodiversity, including where relevant, restoring degraded habitats and building and strengthening nature networks and the connections between them. Policy 11 states that Development proposals for all forms of renewable, low-carbon and zero emissions technologies will be supported.
Scottish Biodiversity List (NatureScot, 2020)	The Scottish Biodiversity List is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland. The list helps public bodies carry out their biodiversity duty by identifying the species and habitats that are of the highest priority for biodiversity conservation, based on criteria such as rarity or restricted distribution, and, for species, significant population declines.
Local Planning Policy	
Perth and Kinross Local Development Plan, adopted November 2019	The Perth and Kinross Local Development Plan (Perth and Kinross Council, 2019) sets out a framework for pursuing the continued growth of the Perth and Kinross area by seeking sustainable development in an improved urban and rural environment. Through Policies 38 to 58, the council will seek to protect important natural and historic sites and features from adverse impacts resulting from development, including cumulative impacts. Policies 32 to 37 aim to ensure that development and land use make a positive contribution to helping to minimise the causes of climate change and adapting to its impacts.

7.1.2 Relevant Legislation and Guidance

Table 7-2 below sets out the key legislation and guidance relevant to this assessment.

Table 7-2: Summary of Relevant Legislation and Guidance

Document	Brief description
Legislation	
Conservation of Habitats and Species (Amendment) (EU Exit) regulations 2019	European Protected Species are defined under the European Commission (EC) Habitats and Species Directive 92/43/EEC and include species such as otter, and all species of bat. The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) translates this European legislation into UK law. This was updated to the Conservation of Habitats and Species (Amendment) (EU Exit) regulations 2019 following the UK's exit from the European Union. This legislation makes it an offence to deliberately or recklessly disturb European Protected Species (EPS). Their places of shelter are fully protected, and it is an offence to damage, destroy or obstruct access to or otherwise deny the animal use of a breeding site or resting site, whether deliberately or not. It is also an offence to disturb in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species, disturb in a manner, or circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young. Any activity which is likely to affect these species requires prior consultation with the relevant statutory nature conservation organisation (i.e., NatureScot) and may require a licence to be issued before they can be carried out.
The Wildlife and Countryside Act (1981, as amended).	The Wildlife and Countryside Act 1981 provides protection to a range of habitats and species, including bats. The Nature Conservation (Scotland) Act 2004 and Wildlife and Natural Environment (Scotland) Act 2011 amend the Wildlife and Countryside Act in Scotland.
Nature Conservation (Scotland) Act 2004 (as amended)	The act places duties on public bodies to conserve biodiversity, increase the protection for Sites of Special Scientific Interest (SSSIs), and strengthens the legal protection for threatened species.
The UK Biodiversity Action Plan (UKBAP) 1994	Produced in response to the Convention on Biological Diversity through the development and enforcement of national strategies and associated action plans for biological diversity.
Scottish Biodiversity List (NatureScot 2020)	The Scottish Biodiversity List is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland. The list helps public bodies carry out their biodiversity duty by identifying the species and habitats that are of the highest priority for biodiversity conservation, based on criteria such as rarity or restricted distribution, and, for species, significant population declines.
Tayside Local Biodiversity Action Plan, 2nd Edition 2016-2026	The Nature Conservation (Scotland) Act 2004 places a biodiversity duty on all public bodies to further the conservation of biodiversity. The purpose of this 2nd Edition, which is a 10-year action plan, is to report on short- and medium-term actions for the 2020 Challenge, which is to account for the international goals and targets agreed by the UN General Assembly. It comprises action for key species, ecosystems and landscapes.
Guidance	
Guidelines for Ecological Impact Assessment in the United Kingdom (Chartered Institute of Ecology and Environmental Management (2018)	This document updates the previous iterations of the guidance detailing the methods for implementing Ecological Impact Assessment and a focus on the hierarchy of avoidance, mitigation and compensation. The table-based approach of assessment has been removed from the original (2006) version of the guidance used in the previous assessment with the emphasis switched to professional judgement.
Birds of Conservation Concern 5	Birds of Conservation Concern (BoCC) is a regular review of the status of all regularly occurring birds in the UK (including the Channel Islands and Isle of Man), compiled by a coalition of the UK's leading bird conservation and monitoring organisation. The fifth BoCC review was published in late 2021, with the first having

Document	Brief description
	been published in 1996. At each review, the bird species that breed or overwinter in the UK are assessed against a set of objective criteria and placed on the Green, Amber or Red lists to indicate an increasing level of conservation concern. The green, amber and red listings are made within Stanbury *et al* (2021) and inform the assessment methodology, as outlined below.

7.1.3 Study Area

The study area for the purposes of the assessment is a set of buffers from the Proposed Development site dependent on the potential receptor. These include:

- Records of notable and protected bird species within 5km;
- Statutory and non-statutory sites within 5km;
- Breeding bird surveys within 500m; and
- Special Protection Area (SPA) connectivity of 20km.

7.1.4 Desk Study

A request was made to the Fife Nature Records Centre (FNRC) for all records of Notable and Protected Species within 5km of the site within the last 10 years. A buffer of 5km was used as it is considered unlikely the Proposed Development would affect specific interests of such sites over and above this distance. FNRC returned a report dated 30 April 2021 detailing the protected and notable species within 5km of the site and within the last 10 years.

In addition, a search was made for all sites with a European, National or Local Authority designation with an ecological or aquatic interest, including Special Areas of Conservation (SACs), Special Protection Areas (SPAs), SSSIs, National Nature Reserves (NNRs) and Local Nature Reserves (LNRs) that could be affected by the Proposed Development.

The following resources were also used to complete the search:

- NatureScot Sitelink database[3]
- Scotland's Environment Web[4]

7.1.5 Field Study

Aerial imagery was studied in the process of this desk-based assessment to ascertain the likely habitats within and surrounding the Proposed Development site, and the species these may be likely to support.

[3] https://sitelink.nature.scot/home

[4] https://www.environment.gov.scot/

Following a review of consultation responses (see Table 7-4), the surveys identified in Table 7-3 were carried out to complete the baseline assessment of ornithological features present within the site and surrounding area. The findings of the field surveys are detailed in Volume III, Appendix D.

Table 7-3: Ornithological Receptor Surveys Completed for the Proposed Development

Survey	Date of Survey
Breeding Bird Surveys (BBS)	22 April, 15 May, 10 June, and 29 July 2021
Winter walkovers and vantage point surveys for geese and wading birds	October 2021 – May 2022

7.1.6 Breeding Bird Surveys

Breeding bird surveys were undertaken to assess the utilisation of the site and surrounding area by protected bird species on 25 April, 15 May, 10 June and 29 July 2021. All surveys were completed within the optimal survey period and undertaken under favourable weather conditions between the hours of 06:00 and 17:00. The methods for the breeding bird survey followed those outlined in Bibby *et al*. (2000). All bird sightings were recorded and mapped using the standard two-letter BTO code, including birds flying over the site and any behaviour such as calling/ singing/ territorial disputes noted. All other birds are noted with just their code and direction of flight where applicable. A transect route was walked around the area within site boundaries and a 500 m buffer surrounding the site where access was possible.

Once surveys were completed all records and behaviour were entered into Arc Geographical Information System (GIS) for analysis. Analysis of data involved assigning territories based on clusters of records across the three visits. The criteria set out in Bibby *et al*. (2000) was used to distinguish clusters and assign territories. Territory analysis was limited to species that are listed as Red or Amber Birds of Conservation Concern (BoCC) (Stanbury *et al*., 2021) and those on the Scottish Biodiversity List (SBL).

The results of the territory analysis for Red and Amber-listed Birds are shown in Figure 7-1 and Figure 7-2, respectively.

7.1.7 Winter Walkover Surveys

Field surveys followed guidance set out in NatureScot's survey guidance for onshore wind farms (2017). Surveys were undertaken on a fortnightly basis between October 2021 and April 2022 inclusive to record the presence of wintering waterfowl foraging within 500 m of the development site. Over the seven months, fourteen surveys were undertaken. The time frame for the surveys was agreed with NatureScot. Full survey timings and weather conditions are presented in Volume III, Appendix D.

All waterfowl species present within this area during the survey visits were recorded, as well the presence of any goose droppings indicative of recent foraging activity. The survey area was divided

into existing field boundaries and each group of wintering wildfowl mapped in the appropriate field number to show foraging distribution across the survey area. The results, with corresponding field numbers, are illustrated in Figure 7-3.

7.1.8 Vantage Point Surveys

Vantage Point (VP) surveys followed NatureScot's survey guidance for onshore wind farms (2017). VP surveys are designed to quantify the level of flight activity and its distribution over the survey area. Its primary purpose is to provide input data for the Collision Risk Model (Band *et al*. 2007), which predicts mortalities from collision with turbines, but the data can also be used to provide an overview of bird usage of a non-wind farm site, which may help to inform an overview of potential disturbance and displacement. For sites which may potentially affect birds flying to and from roost sites, observations should be conducted one hour before dawn to one hour after dawn (or until the roost is vacated if necessary), and one hour before dusk to one hour after dusk. Count birds as required twice per month at roosts and/or feeding areas depending on site between August-May.

A 2km viewarc with four 500m bands looking out east over Loch Leven was chosen. This provided a viewarc that could determine distribution and abundance roosting and transiting waterfowl on the Loch Leven.

NatureScot (2017) recommends a minimum of 72 hours per VP location divided between seasons (36 hours breeding and 36 hours non-breeding) per year, as a standard for species where vantage point survey is required. They would expect that VP survey effort would be greater than this if the site is particularly sensitive. Where a high level of migration movements is considered likely, or are known to occur, sampling within this period should be stratified to ensure adequate data collection across the spring and autumn periods. Additional survey is not always necessary but may be required to cover this adequately in large areas or areas of high activity. Note that some areas may be more heavily used in either spring or autumn and this must be taken into account when designing the VP work. Where proposed effort is less than 72 hours, this should be fully justified and agreed with SNH prior to the survey commencing.

Further details of the survey methods are given in Volume III, Appendix D and the results are presented in Volume III, Appendix E.

7.1.9 Consultation

To ensure comprehensive coverage of ornithological issues, key Statutory Nature Conservation Bodies (SNCBs), Environment(al) Protection Agencies (EPAs), and non-governmental organisations (NGOs) relevant to ornithology were consulted with during the development's Scoping process and their responses have been considered during the preparation of this chapter. A summary of the relevant consultation responses is presented in Table 7-4.

Table 7-4: Consultation Responses Relevant to Ornithology Chapter

Date	Consultee	Issue Raised	How/Where Addressed
16 March 2022	NatureScot	The proposal could affect the Loch Leven SPA, Ramsar, SSSI and NNR which is adjacent to the site. The protected interests of Loch Leven include eutrophic loch, overwintering geese, swans and waterfowl, and breeding ducks. As identified in the Scoping Report there is the potential for sediments from construction to enter Loch Leven SPA, Ramsar, SSSI and NNR. The loch is highly sensitive to nutrient enrichment, having suffered historically and more recently from algal blooms. During construction sediments must be prevented from entering the loch to ensure no net increase in nutrients from the proposal and no additional impacts on water clarity for example from any pollution events.	Chapter 7 Section: Mitigation and Chapter 16: Water Quality.
		As is also noted in the scoping report, geese from Loch Leven SPA forage in fields surrounding the South Queich and some of these foraging fields may be lost by the proposal. Greylag and pink-footed geese are known to forage between 15-20 km from SPAs. Therefore, we agree that the Habitats Regulation Appraisal (HRA) should include the other Special Protection Areas within 20 km of the development site. We are happy to advise further once the HRA is in preparation.	Chapter 7: Biodiversity - Ornithology

7.2 Baseline Scenario

7.2.1 Desk Study

Located within the survey boundary to the southeast, one statutory designated site was identified- Loch Leven, which is a National Nature Reserve (NNR), Ramsar Site, Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI) (Table 7-5).

Table 7-5: Designated and Qualifying Features for Loch Leven NNR

Feature	Protected Area
Breeding bird assemblage	Loch Leven SSSI
Cormorant, non-breeding	Loch Leven SPA Loch Leven SSSI
Gadwall, breeding	Loch Leven SSSI
Gadwall, non-breeding	Loch Leven SPA Loch Leven SSSI
Goldeneye, non-breeding	Loch Leven SPA Loch Leven SSSI
Greylag goose, non-breeding	Loch Leven SSSI
Pink-footed goose, non- breeding	Loch Leven Ramsar Loch Leven SPA Loch Leven SSSI
Pochard, non-breeding	Loch Leven SPA Loch Leven SSSI
Shoveler, non-breeding	Loch Leven Ramsar Loch Leven SPA Loch Leven SSSI
Teal, non-breeding	Loch Leven SPA Loch Leven SSSI
Tufted duck, breeding	Loch Leven SSSI
Tufted duck, non-breeding	Loch Leven SSSI Loch Leven SPA
Waterfowl assemblage, non-breeding	Loch Leven Ramsar Loch Leven SPA
Whooper swan, non-breeding	Loch Leven SPA Loch Leven SSSI

The area is designated a SSSI for its assemblage of breeding and non-breeding waterfowl. As an SPA, it supports a population of whooper swan, shoveler as well as wintering populations of cormorant, gadwall, teal, pochard, tufted duck and goldeneye.

One statutory designated site was identified within 5km of the development site- Loch Leven NNR, Ramsar Site, SPA and SSSI. No non-statutory designated sites were identified within 5 km of the development site.

Loch Leven qualifies under Ramsar Criterion 2 by supporting:

- Whooper swan (1993/1994 to 1997/1998, winter peak mean of 97 individuals, 2% of the GB population).

The site also qualifies under Ramsar Criterion 4 by supporting the following waterbird species at a critical stage in their life cycles:

- Cormorant (391 individuals, 3% of the GB population)
- Gadwall (245 individuals, 3% of the GB population)
- Goldeneye (339 individuals, 2% of the GB population)
- Pochard (1,095 individuals, 2% of the GB population)
- Teal (2,771 individuals, 2% of the GB population)
- Tufted duck (3,636 individuals, 6% of the GB population).

Loch Leven qualifies under Ramsar Criterion 5 by regularly supporting waterbirds in numbers of 20,000 individuals or more. In the five-year period 1993/94-1997/98 a winter peak mean of approximately 34,280 individual waterbirds was recorded.

Loch Leven further qualifies under Ramsar Criterion 6 by regularly supporting 1% or more of the individuals in a population of waterbirds (1993/1994 to 1997/1998):

- Pink-footed goose (winter peak mean of 17,163 individuals, 8% the Eastern Greenland/Iceland/UK biogeographic population)
- Shoveler (winter peak mean of 509 individuals, 1% of northwestern & Central Europe biogeographic population).

Pink-footed goose, shoveler and whooper swan are also components of the waterbird assemblage.

An assessment of the effects to the statutory designated sites within 20km with ornithological receptors was undertaken (Loch Leven SPA, Firth of Forth SPA, Firth of Tay and Eden Estuary SPA and South Tayside Goose Roosts SPA). The assessment considers the extent of the impact, the magnitude, duration and timing of the impact and the impact's frequency and ease of reversibility. The assessment similarly includes the consideration of any proposed mitigation to avoid or minimise the effect of any potential impact to the relevant IOFs and seeks to identify any potential cumulative impacts from surrounding developments prior to determining the residual significance of any effect, be this negligible, minor, moderate or major.

Fife Nature Records Centre (FNRC) returned a report dated 30 April 2021 detailing the protected and notable species within 5km of the site and within the last 10 years. The key species are noted in Table 7-6.

Table 7-6: Protected/Notable Bird Species within 5 km of the site

Species	Most recent record	Total number of records	Conservation Status
Bewick's swan	12/02/2012	1	Schedule 1 of the WCA; SBL; Red
Common reed bunting	01/01/2018	132	Schedule 3 of the WCA; UK BAP; Amber
Fieldfare	14/01/2017	1	Schedule 1 of the WCA; Red
Goldeneye	24/03/2018	11	Schedule 1 part ii of the WCA; Red
Golden plover	11/10/2013	4	Schedule 2 of the WCA; SBL
Greenfinch	11/08/2018	189	Schedule 3 of the WCA; Red
Greenshank	06/11/2015	30	Schedule 1 of the WCA; Amber
Kingfisher	06/12/2015	27	Schedule 1 of the WCA; SBL
Lesser redpoll	09/11/2014	48	Schedule 3 of the WCA; UK BAP; SBL; Red
Long-tailed duck	18/06/2014	7	Schedule 1 of the WCA; Red
Merlin	06/12/2015	8	Schedule 1 of the WCA; SBL; Red
Quail	13/07/2010	3	Schedule 1 of the WCA; Amber
Ruff	04/09/2015	7	Schedule 1 of the WCA; SBL; Red
Scaup	26/10/2013	9	Schedule 1 of the WCA; UK BAP; SBL; Red
Western barn owl	29/11/2015	5	Schedule 1 of the WCA; SBL
Whooper swan	20/10/2018	10	Schedule 1 of the WCA; SBL; Amber
Yellowhammer	09/06/2019	158	Schedule 3 of the WCA; UK BAP; SBL; Red

Notes: If a protected species is not present in the above table, this does not necessarily indicate absence from the search area during this period.

WCA - Wildlife and Countryside Act 1981 (as amended); UK BAP – UK Biodiversity Action Plan; SBL – Scottish Biodiversity List; Amber – The Birds of Conservation Concern 5 Amber List; Red - The Birds of Conservation Concern 5 Red List

7.2.2 Field Surveys

7.2.2.1 Protected Species

Methodology and detailed results of the protected species surveys carried out in support of the Proposed Development are presented in Volume III, Appendix D.

7.2.2.2 Wintering Birds

The site comprises two locations- an arable field to the west of Kinross, on the west side of the M90 (Area A); and an area within south Kinross on the banks of Loch Leven (Area B). Both Area A and B are assessed as having high potential for foraging, commuting and roosting bird species. Winter waterfowl surveys (focusing on geese) were performed to assess their use of the site, as Loch Leven, the arable/ pasture fields in Area A and the wetland habitats in Area B, offer foraging and roosting grounds.

Winter wader surveys and a combination of vantage point and walkover surveys have been conducted to ascertain the use of the Proposed Development site by resident bird species along with foraging and

roosting geese. The survey area was divided into 42 fields to record geese utilisation and a vantage point on the western bank of Loch Leven was used in order to overlook Loch Leven. Birds roosting and flying to and from Loch Leven were recorded.

7.2.2.3 Breeding Bird Surveys

There is potential for nesting birds in the open areas of grassland, hedgerows and the woodland found on the site. Breeding bird surveys were undertaken in the spring/ summer of 2021 with a total of four survey visits taking place. The survey dates and times are presented in Table 7-7.

Table 7-7: Breeding Bird Survey Dates and Times

Month	Date	Start Time	End Time	Duration (hh:mm)
April	25/04/2021	06.00	11.55	5:55
May	15/05/2021	05:45	12:00	6:15
June	10/06/2021	05:05	11:20	6:15
June	29/06/2021	05:00	11:20	6:20

Table 7-8 summarises the minimum number of breeding territories identified for each species along with their legal protection and/or conservation status. The full list of species recorded (including non-breeding records) and their assumed breeding status within the survey area is presented in Volume III, Appendix D.

Table 7-8: Breeding Territories and Conservation Status

Species	Protection and Conservation Concern				Minimum No. of Territories Within the Survey Buffer
	Annex 1 of the EU Birds Directive	Schedule 1 of WCA	SBL	Birds of Conservation Concern 5	
Black-headed gull	-	-	✓	Amber	2
Bullfinch	-	-	✓	Amber	3
Common gull	-	-	-	Amber	2
Dunnock	-	-	-	Amber	13
Gadwall	-	-	-	Amber	1
House sparrow	-	-	✓	Red	17
Lapwing	-	-	✓	Red	1
Mallard	-	-	-	Amber	1
Mute swan	-	-	-	Amber	4
Oystercatcher	-	-	-	Amber	2
Reed bunting	-	-	✓	Amber	4
Skylark	-	-	✓	Red	8
Song thrush	-	-	✓	Red	8
Starling	-	-	✓	Red	5
Tree sparrow	-	-	✓	Red	8
Willow warbler	-	-	-	Amber	19

Yellowhammer	-	-	✓	Red	6

During the breeding bird survey, a total of 41 species were recorded during the breeding bird surveys, of which 17 were recorded as breeding. The 17 species totalled 53 breeding territories across the survey area.

Seven Red-listed species were recorded as breeding- house sparrow, tree sparrow, lapwing, skylark, starling, yellowhammer and song thrush. Ten Amber-listed species were recorded as breeding- bullfinch, reed bunting, willow warbler, dunnock, black-headed gull, common gull, gadwall, mallard, mute swan and oystercatcher.

All breeding species and approximate territory locations for Red and Amber-listed Birds are shown in Figure 7-1 and Figure 7-2, respectively.

During the survey a number of woodland birds were observed/ heard including chaffinch, wren, chiffchaff, robin, blackbird, and woodpigeon. They were not confirmed as breeding. The habitats within the site and surrounding areas have been assessed as having high potential for nesting birds.

Figure 7-1: Breeding Bird Territories (Red Listed)

Figure 7-2: Breeding Bird Territories (Amber Listed)

7.2.2.4 Goose Surveys

Targeted goose surveys were undertaken between October 2021 to April 2022 inclusive with a combination of winter walkovers (Figure 7-3) and Vantage Point (VP) surveys (Volume III, Appendix E). A total of fourteen winter walkover survey visits and seven VP surveys taking place. The survey dates and times are presented in Table 7-9 and the results of the field surveys are presented in Table 7-10.

Table 7-9: Goose Survey Dates and Times

Month	Date	Start Time	End Time	Duration (hh:mm)
October	01/10/2021	09:00	15:00	6:00
October	25/10/2021	09:15	14:15	5:00
November	08/11/2021	09:20	14:00	7:50
November	23/11/2021	10:00	15:00	5:00
December	06/12/2021	10:15	14:15	4:00
December	20/12/2021	10:30	15:30	5:00
January	08/01/2022	10:25	14:10	3:45
January	21/01/2022	10:15	15:00	4:45
February	04/02/2022	09:50	12:50	3:00
February	21/02/2022	09:10	12:10	3:00
March	02/03/2022	08:50	14:00	5:10
March	21/03/2022	08:00	13:25	5:25
April	05/04/2022	08:20	13:35	5:15
April	27/04/2022	07:30	13:40	6:10

Goose activity was recorded in seven of the 42 fields within the site (Figure 7-3). Five fields were found to have goose droppings present, but no geese were recorded in the field during the visit to allow confirmation of species present. Pink-footed geese were recorded in fields on ten of the fourteen visits (feeding on all occasions), on the two occasions unidentified geese droppings were found but no geese were present. Peak numbers were recorded of 490 pink-footed geese foraging in the fields on Loch Leven on 23 March 2022, with the majority on this occasion relating to a single flock of 460 geese feeding in short grass in field no. 24 in the west of the site. Excluding this single count of 460, peak counts for individual fields for the remaining surveys ranged from 10 to 340 within the site boundary. A flock of 31 greylag geese were recorded once feeding in Field 33 in the survey area on 20 December 2021.

Table 7-10: Goose Field Use Survey Results

Date	Species	Total Count	Field Numbers	On Site or in Wider 500 m Survey Area	Goose Droppings Present (inc. field numbers)
01/10/2021	Pink-footed goose	187	10	On site	No
	Lapwing	65	28	On site	
25/10/2021	Pink-footed goose	42	25	On site	Yes (10)
	Lapwing	155	33	Both	
	Curlew	96	33	Both	
08/11/2021	Pink-footed goose	340	5	On site	No
23/11/2021	Pink-footed goose	220	24	On site	Yes (40)
06/12/2021				Wider survey area	Yes (33)
20/12/2021	Pink-footed goose	83	28	On site	No
	Greylag goose	31	33	Both	
21/01/2022	Pink-footed goose	72	25	On site	Yes (24)
04/02/2022				On site	Yes (28)
21/02/2022	Pink-footed goose	226	24.28	On site	No
02/03/2022	Pink-footed goose	190	24.28,30	Both	No
21/03/2022	Pink-footed goose	490	24.28	On site	No
05/04/2022	Pink-footed goose	62	24	On site	No

Vantage point surveys (Volume III, Appendix E) confirmed that pink-footed geese were roosting on Loch Leven during hours of darkness and commuting to the adjacent fields to the west and northwest to forage during daylight hours. Peak numbers were recorded of 3,200 pink-footed geese roosting on 25 October 2021 and 3,300 pink-footed geese roosting on Loch Leven on 23 November 2021.

Incidental sightings of note during these surveys are 2,300 common gulls were roosting on Loch Leven on 2 March 2022 and 96 Curlew and 65 Lapwings were in ploughed field 28 on1 October 2021.

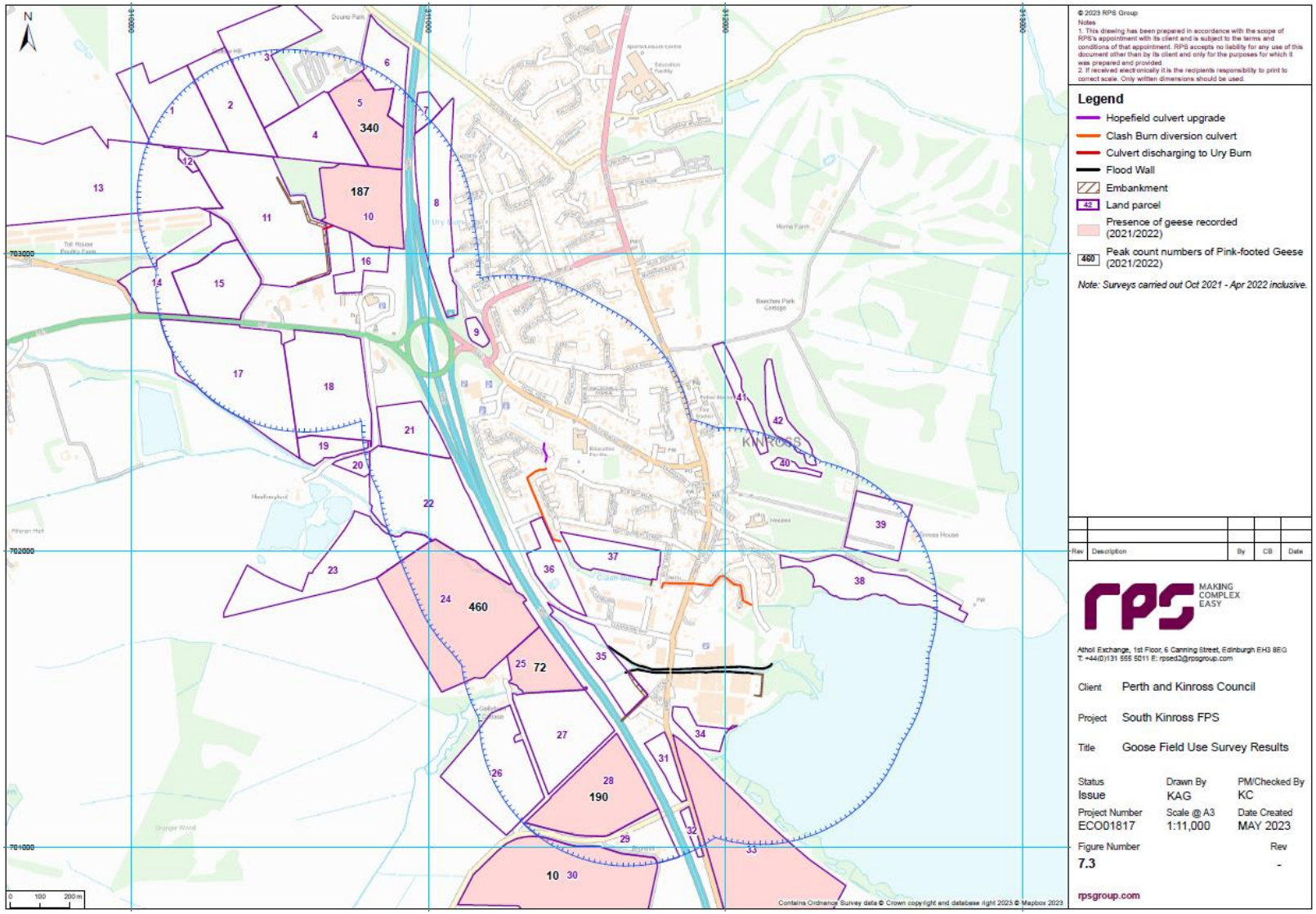


Figure 7-3: Geese Field Use Survey Results

7.2.3 Future Baseline Conditions

The UKCP18 climate change projections (Met Office, 2018) indicate that in general, warmer, wetter winters and hotter, drier summers are predicted, though of course still with natural variations in that pattern from year to year. No clear trend in wind speeds or storms is predicted, though the data currently published cannot make projections for local conditions and wind gusts.

In the absence of the development the Proposed Development site would continue to be influenced by anthropogenic management with little or no change to species composition within the initial lifespan of the development.

Recent research has concluded over the last decades, the pink-footed goose has expanded its use of farmland areas due to a combination of increased protection from hunting, warmer winters, better winter food supplies as well as improved breeding conditions due to a warmer climate (Jensen *et al*., 2016). As a result of this combination of factors adult bird survival and breeding success have increased, leading to a large population increase for this species. The current increasing trend may continue, despite concerns from farmers on the effects of increased goose grazing on winter crops (Summers, 1990; Gill, 1996). The immediate future appears positive for this species therefore, due to these higher levels of breeding success, adult survival and increasing temperatures.

7.3 Likelihood of Significant Effects

The method of assessment for this chapter follows that of CIEEM (2018) guidance. The term Important Ornithological Features (IOFs) is used for those species and habitats identified in the assessment. For each impact with the potential to affect the relevant IOFs, the assessment considers the following parameters:

- The value and importance of the IOF taking into account its national and regional conservation status;
- The extent of the impact and whether this is positive or negative in its influence;
- The magnitude, duration and timing of the impact; and
- The impact's frequency and ease of reversibility.

The assessment similarly includes consideration of any proposed mitigation to avoid or minimise the effect of any potential impact to the relevant IOFs. The CIEEM guidelines also require the identification of potential cumulative impacts from other developments, be this negligible, minor, moderate or major. Effects can be either adverse or beneficial.

7.3.1 Value/ Importance

The approach to the assessment of the sensitivity and importance of IOFs is to consider its conservation status and the importance of the feature present on the Proposed Development site.

The national conservation status of IOFs in the UK can be divided into five categories[5]:

1. Species and habitats given special protection under Conservation of Habitats and Species (Amendment) (EU Exit) regulations 2019;
2. Species and habitats given special protection under UK legislation;
3. Species and habitats of serious conservation concern: Scottish Biodiversity List (SBL) Priority species;
4. Species and habitats of some conservation concern listed on Local Biodiversity Action Plan (LBAP);
5. Species and habitats for which there is little or no conservation concern: species common and widespread throughout the UK;

The regional conservation status of IOFs can be divided into three categories:

1. Rare in the region and/or LBAP Priority Species: species for which a Species Action Plan recommends safeguarding of all sites and species with a need to protect all populations above a certain size
2. Uncommon or patchily distributed in the region
3. Common and/or widespread in the region.

The resultant conservation value of IOFs on the Proposed Development site will depend on the interaction between its National conservation status and its Regional conservation status in central Scotland. Table 7-11 sets out the resultant conservation status of a bird species. Note that the categories shown may be modified according to the national or regional circumstances of a particular species. In Table 7-11, 'National' refers to the whole of the U; 'Regional' refers to central Scotland and 'Local' refers to the Proposed Development site and immediate environs. The five conservation status categories are considered to be the most appropriate for bird species, since population data can be obtained for the four geographical areas concerned.

Table 7-11: Conservation Value of IOFs

National Conservation Status	Regional Conservation Status		
	Rare	Uncommon	Common
EU Legislative Protection/Annex 1	International	National	Regional
UK Legislative Protection/Schedule 1	National	National	Regional
SBL/Red Listed	National	National/Regional	Regional/Local
LBAP/Amber Listed	Regional	Regional	Local
Common/widespread/Green Listed	Regional	Local	Local

[5] Species or habitats in a sixth category, International Union for Conservation of Nature (IUCN) globally - threatened species, are unlikely to occur on any proposed UK development site, but if they did would be considered to be of International status irrespective of their regional status.

The sensitivity of an IOF to a particular impact should also be considered. Sensitivity criteria is variable across the taxonomic groups, and behavioural sensitivity can also vary across individuals of the same species. Sensitivity can also be dependent on species' activity, for example, species are more likely to be susceptible to disturbance during the breeding season (CIEEM, 2018). As such, professional judgement is used when assigning sensitivity to an ornithological receptor. Level of sensitivity is outlined using the criteria in Table 7-12.

Table 7-12: Level of Sensitivity

Level of Sensitivity	Definition
High	Species in remote areas, away from human disturbance which would result in a long-lasting reaction to a disturbance event.
Medium	Species which are considered to have a slow recovery time and could not re-establish quickly.
Low	Species which are tolerant to human activity which result in a short-term reaction to a disturbance event.

7.3.2 Magnitude of Impact

The criteria used for assessing the magnitude of impacts/effects on birds are:

- **High**: Impact that would cause major loss of population on the Proposed Development site and have a sufficient effect to alter the nature of the population in the short to long-term affecting the long-term viability. For example, more than 20% loss of a species' population, with a large permanent reduction in numbers or species-richness or change in species assemblage likely.
- **Medium**: Impact that is detectable in the short to medium term (up to 15 years), but which should not alter the long-term viability of the population. For example, between 10-20% reduction of a species population. but temporary reduction in numbers or species, or change in species assemblage likely; small permanent reduction in numbers or species-richness, or change in species assemblage likely;
- **Low**: Impact of small scale or short duration (5 years) that results in no long-term harm to the populations viability. For example, no reduction in numbers or change in species richness likely, but population made more vulnerable to further impacts; temporary reduction in numbers or species richness, or change in species assemblage likely; and
- **Negligible**: No loss or alteration of characteristics, features, or elements; no observable impact in either direction.

The duration of an impact is hard to quantify across all IOFs due to inherent differences in life histories. For example, there could be a temporary reduction in the numbers or species but over a short-term (5 years) therefore meeting criteria assigned to both low and medium magnitude. In such cases professional judgement is applied and the magnitude assigned accordingly. Therefore, the duration of

each impact on receptors will be assessed on an individual basis considering species ecological characteristics.

7.3.3 Significance of Effect

The significance of each effect upon each IOF is assessed. An ornithologically significant effect is defined as an impact on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species (CIEEM, 2018). The effect is assessed within a specific geographic context i.e. at the scale at which the ecological feature was valued (e.g. local/ national/ international). Effects are considered to be significant under the EIA Regulations where the effect is classified as being 'major' or 'moderate', while effects assessed as 'minor' are not significant. Table 7-13 shows the Assessment Matrix used to guide the assessment of significance.

Table 7-13: Assessment Matrix

Value/Importance	Magnitude of Impact			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible or minor	Negligible or minor	Minor
Low	Negligible or minor	Negligible or minor	Minor	Minor or moderate
Medium	Negligible or minor	Minor	Moderate	Moderate or major
High	Minor	Minor or moderate	Moderate or major	Major

Using the above matrix, further consideration is then given to the following:

- **Major**: effects are likely to be important considerations at a regional or district scale but which, if adverse, are potential concerns to the project, depending upon the relative importance attached to the issue during the decision-making process.
- **Moderate**: effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.
- **Minor**: effects may be raised as local issues, but which are unlikely to be of importance in the decision-making process. Nevertheless, they are of relevance in the detailed design of the project.
- **Negligible**: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

The final assessment of whether a significant effect is likely is completed by taking the mitigation measures that are adopted as part of the Proposed Development into account, including both the mitigation incorporated into the design of the Proposed Development and mitigation required to address residual impacts. This requires an assessment on the likelihood of successful mitigation being achieved and the mitigation proposed needs to be qualified in terms of the probability of success. The assessment

of the likely success of any mitigation and hence the significance of any effects is based on both professional judgement and experience of other mitigation schemes. In general, a precautionary approach is advisable in determining the outcome, however a realistic rather than worst-case scenario assessment is used. In relation to determining likely significant effects on protected sites a precautionary approach is always adopted.

7.3.4 Limitations of the Assessment

Restrictions on access to the land out with the Proposed Development survey boundary to the east meant that in places a number of the surveys had to be completed from public access points. This included breeding bird surveys as the survey buffers took in land out with the Proposed Development site boundary. However, an assessment of the potential for the habitats to support legally protected species was possible as the land that could not be surveyed was visible from public areas. The lack of access was deemed not to affect the robustness of the survey effort completed.

7.4 Significance of Effects

Chapter 3 details the design of the Proposed Development. This is used to assess the likely significant environmental effects as a result of the Proposed Development.

The assessment of ornithological effects associated with the Proposed Development is undertaken in accordance with the Ecological Impact Assessment (EcIA) guidelines published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018).

In accordance with the CIEEM guidance, the purpose of the assessment will be to focus on the IOFs that are either protected or are of sufficient value to merit consideration in the assessment process (as set out above), rather than to consider effects upon every feature that may be present, many of which will be common and widespread species.

The likely impacts of the Proposed Development are identified, including likely beneficial and adverse impacts on the IOFs present.

The potential negative effects of the Proposed Development on birds are habitat loss, disturbance and nest destruction during the construction phase and disturbance during the operational phase. The assessment of the magnitude and significance of these potential effects follows the methodology laid out in Section 7.5. Most emphasis will be placed on resident birds of at least regional conservation status and on raptors and geese recorded flying over the survey area. However, it is also important to assess potential negative effects on nesting birds, irrespective of their conservation status.

7.4.1 Identification of Important Ornithological Features

A total of 23 bird species met at least one of the criteria identified (Stanbury *et al*., 2021) and therefore considered in the preliminary list of IOFs. A summary of their presence within the survey area and their

legislative protection is given in Table 7-14, along with clarification of whether they are scoped in or out of further assessment.

Potential ornithological receptors identified during the desk studies and field work include:

- wintering Icelandic/Greenlandic pink-footed geese;
- Icelandic whooper swan; and
- a wintering waterfowl assemblage of European importance including large populations of cormorant, gadwall, teal, pochard, tufted duck and goldeneye.

Statutory designated site Loch Leven (NNR, Ramsar Site and SSSI) has also been scoped into the assessment.

7.4.1.1 Qualifying Interests

- Loch Leven SPA qualifies under Article 4.1 by supporting a population of European importance of wintering Icelandic whooper swan (1993/94-97/98 winter peak mean of 97, 2% of British population).
- Loch Leven SPA qualifies under Article 4.2 by regularly supporting populations of European importance of wintering Icelandic/Greenlandic pink-footed geese (1993/94-97/98 winter peak mean of 17,163, 8% of total population, all of which winters in Britain) and shoveler (509, 1% of NW European and 5% of British population).
- Loch Leven SPA further qualifies under Article 4.2 by regularly supporting a wintering waterfowl assemblage of European importance (1993/94-1997/98 winter peak mean of 34,280) which includes large populations of cormorant (391, 3% of GB population), gadwall (245, 3% of GB population), teal (2,771, 2% of GB population), pochard (1,095, 2% of GB population), tufted duck (3,636, 6% of GB population) and goldeneye (339, 2% of GB population).

The majority of the receptors for the Proposed Development are only likely be impacted (ecologically) at site or regional level. This is because the impacts on the potential receptors are only within, or adjacent to, the site itself. Notable exceptions to this are migratory species such as wintering Icelandic / Greenlandic pink-footed geese and wintering Icelandic whooper swan.

Europe's wintering whooper swans breed in the sub-arctic region with the majority of the Icelandic population choosing Britain as their over-wintering destination.

In recent years, Loch Leven has had a significant increase in whooper swan numbers. The long-term trend at Loch Leven had fluctuated from year to year but always at lower levels. In recent years (since 2008), peak numbers of whooper swans have risen dramatically. The peak in November 2013 was 804, the fourth successive record count for the site. Counts have exceeded the threshold for international importance. These peaks are usually short lived as birds then disperse elsewhere. Numbers wintering in the UK have been increasing with the recent high counts at Loch Leven serving to emphasise the sites importance as a migratory stopover.

Whooper swans have been scoped out of further assessment as they were not recorded during any of the baseline surveys. Desk study confirms presence within 500m of site, but in low numbers and rarely. The survey area is therefore not considered to be a key resource for this species.

Greylag goose returned no desk study records within 500m of the site and a single flock of 31 birds foraging on site on one occasion during all of the field survey visits, and none in the wider survey area. It is considered the site and surrounding area is not a key foraging resource for this species and it has been scoped out of the assessment.

Therefore, as summarised in Table 7-14 below, the only IOF that has been identified for the Proposed Development site (scoped in) and is considered further in the assessment are wintering Icelandic/Greenlandic pink-footed geese.

Table 7-14: Identification of IOFs

Receptors	Designation	Conservation Status and Level of Protection	Scoped in/out of assessment
House Sparrow Tree Sparrow Lapwing Yellowhammer Starling Skylark Greenfinch	Red-listed BoCC and/or SBL and/or LBAP species	Regional – present and breeding on Site, but in low numbers.	Out
Greylag goose	Amber-listed BoCC and/or SBL and/or LBAP species	Regional - recorded in or around the Site, but very low activity.	Out
Pink-footed Goose	UK population of international importance and LBAP species	International – 3,300 individuals recorded roosting at Site, comprising 0.6% of UK population (Musgrove *et al*., 2013)	In
Whooper swan	Amber-listed BoCC and LBAP species	International – no individuals recorded flying across or foraging at Site.	Out
Grey wagtail Song Thrush Bullfinch Dunnock Wren Woodpigeon Reed bunting Willow warbler Black-headed gull Common gull Gadwall Mallard Mute swan Oystercatcher	Amber-listed BoCC and/or SBL and/or LBAP species	Regional – present and breeding on Site, but in low numbers.	Out

7.4.2 Assessment of Construction Effects

7.4.2.1 Designated Sites

The pasture / arable fields within the northern area of the development site provide foraging habitat for waterfowl associated with the Loch Leven SPA. There is a likelihood that some of this habitat will be lost due to the Proposed Development. The South Queich river connects the development to the loch, therefore there exists a pathway for water contamination should an accidental release of pollutants occur.

Control measures to ensure that there would no potential for effects on the designated site as a result of runoff or pollution are set out in Chapter 16. These measures have been developed to ensure that effects on the designated site would not be significant.

The magnitude of the impact has been assessed as low. The conservation value of the receptor would be high sensitivity. Considering the mitigation measures proposed, the overall effect to the designated site during the construction phase of the development (in relation to birds) is assessed as Minor Adverse (not significant).

7.4.2.2 Habitats

It is not foreseen that a significant amount of habitat will be lost to the Proposed Development, due to the nature of the flood defence features to be installed. There will be a loss of a portion of low ecological value arable field to the north of the development, which may reduce foraging grounds for over-wintering geese. Habitat loss has been assessed within Chapter 8.

Construction activities could lead to an increase in ground disturbance, sediment scour and surface water runoff from the works area. This in turn could lead to an increase in sediment laden runoff discharging into Clash Burn, the South Queich river and ultimately Loch Leven.

The construction methodologies detailed in a CEMP would ensure that no increase in uncontrolled off-site flows would occur during the construction phase. All construction compounds would be contained and positioned away from the watercourses and Loch Leven.

Designed-in mitigation measures would be implemented which would reduce any potential increase in uncontrolled surface water runoff during the construction phase. All stockpiled material and potential contaminant sources would be positioned in the construction compounds. A suitable temporary drainage network, including oil/sediment interceptors, would be constructed.

With the above construction engineering methods adopted as part of the Proposed Development it is predicted that the impact would not affect surrounding local receptors directly. The magnitude is predicted to be low. The overall conservation value of the habitats that may be affected has been assessed of local value and predominately of a low sensitivity. Therefore, the significance of effects of any construction activities on the habitats within the site (in relation to birds), with the implementation of the construction measures, would be Minor Adverse, which is not significant.

7.4.2.3 Protected Species

Pink-footed Goose

Loch Leven SPA qualifies under Article 4.2 by regularly supporting populations of European importance of wintering Icelandic/ Greenlandic pink-footed geese (1993/94-97/98 winter peak mean of 17,163, 8% of total population, all of which winters in Britain) and shoveler (509, 1% of NW European population and 5% of British population).

The more recent assessment of the current population of pink-footed geese within Scotland is estimated to be 360,000 (Musgrove *et al.,* 2013) and the UK population estimate is 510,00 birds (Frost *et al*., 2019). The UK pink-footed goose population has increased by 67% in the last 10 years and 124% in the last 25 years (Frost *et al*., 2020). In 2007, the Scottish population was considered to be approximately 200,000 birds in October (c. 50% of the global population), with about 150,000 remaining through winter and spring (Forrester *et al*., 2007). This species is of international conservation value due to its abundance but will be assessed within a national context.

An annual census of pink-footed geese in the UK has been undertaken by the Wildfowl and Wetlands Trust (WWT) every year since 1960. The census indicates a favourable trend for this species, increasing from a UK wintering peak of 50,000 birds in the 1960s to its current level, and the population has continued to increase in recent years.

The UK population of pink-footed geese breed primarily in Iceland and overwinter on shores along the UK coastline, including in highly concentrated sites in eastern Scotland (Mitchell & Hearn, 2004).

Construction Effects

Pink-footed goose activity included flights passing over the site in the early morning as the birds left their roosting site on Loch Leven to travel to adjacent foraging sites. Additionally, birds were regularly recorded foraging in fields within the survey area. There were significant numbers recorded of this species roosting or feeding within the site or buffer areas and foraging activity was recorded during most baseline survey visits. There was a significant amount of flight activity recorded for this species in the airspace above the Proposed Development during spring and autumn, which coincides with migratory activity. If the works take place over winter, there is potential for disturbance of birds from fields around the works, resulting in a loss of foraging habitat, within the foraging range of this species for birds from the SPA.

The effect of disturbance by construction activities at the Proposed Development on birds is species, seasonal and site specific. There were significant numbers recorded of this species roosting or feeding within the site or buffer areas and therefore the impacts caused by construction are applicable. The magnitude of this effect is therefore medium. Construction in the fields to the north should occur during summer months when pink-footed geese will not be present in the survey area as they would have already migrated to their breeding grounds in Greenland and Iceland.

The potential impacts are assessed as being of low magnitude and low sensitivity and their effects as Minor Adverse (not significant) for pink-footed geese.

Predicted Ongoing and Operational Effect

Once construction has been completed there would be low predicted impact to the pink-footed geese. The magnitude of this effect is therefore assessed as being of low magnitude and low sensitivity and their effects as **Minor** adverse (not significant) for all bird species.

Disturbance/Displacement

There were significant numbers recorded of this species roosting or feeding within the site or buffer areas and therefore the impacts caused by construction are applicable. The magnitude of this effect and potential impacts are assessed as being of low magnitude and low sensitivity and their effects as **Minor** adverse (not significant) for all bird species.

Significance of Effect

Overall, the magnitude of effect on this species is considered to be Minor and Not Significant under the terms of the EIA Regulations. The Scottish wintering population of pink-footed geese is currently estimated to be stable at around 360,000 and they have a conservation status of least concern.

7.4.2.4 Compensation and Enhancement

In line with the NPF4 (Scottish Government, 2023), developments should not result in a loss of biodiversity and where possible should implement measures to increase the existing biodiversity on site. Chapter 8 details compensation and enhancement measures to account for habitat loss and to benefit bird species in regard to the Proposed Development.

7.4.3 Assessment of Operational Effects

It is assumed that any maintenance which would require construction activities at the Proposed Development will follow best practice and guidance from the CEMP and be treated as if this was still under the construction phase.

7.4.3.1 Designated Sites and Habitats

There is the potential for pollution incidents to occur during maintenance activities within the operational period of the Proposed Development. Potential contamination sources include fuels and oils associated with maintenance vehicles and plant. The potential for this is much reduced in comparison to potential pollution events during the construction period due to the likely small scale of maintenance activities and the reduced frequency of such potentially polluting activities. Due to the small likelihood of this occurring, the low sensitivity of the habitats which might be affected, and the limited reach of these possible impacts, these are assessed as of low magnitude and the potential effects of these to habitats as **Minor** adverse (not significant).

7.4.3.2 Birds

During the operational phase of the Proposed Development there is the potential for disturbance to protected species (birds) through human presence on the site during maintenance activities and the operation of the plant. This will be at a much-reduced frequency and degree compared to the construction phase and is most likely to be within daylight hours and therefore not a source of disturbance to nocturnal and crepuscular species of birds. The operation of the Proposed Development is likely to result in increased levels of noise and vibration however habituation of all IOFs to this is likely to occur. Due to the low likelihood of this work disturbing protected species (birds) these potential impacts are assessed as being of low magnitude and low sensitivity and their effects as **Minor** adverse (not significant) for all bird species.

7.5 Mitigation Measures

A CEMP will be produced to detail good practice measures relating to all elements of construction. The CEMP would also detail measures undertaken to conduct best working practices in relation to disturbance. A Traffic Disturbance Plan (TDP) would also be produced. The CEMP and TDP should detail a sufficient framework to be overseen by an Ecological Clerk of Works (ECoW).

7.5.1 Pre-Construction Mitigation

There will be a time lapse between the last baseline surveys and the commencement of construction. As such, there is the potential that the ecological conditions on site could change. Pre-construction survey to confirm that the habitats on site have not significantly altered from those identified in the baseline and checks for nesting birds will therefore be undertaken before construction begins.

Surveys will be undertaken within three months prior to commencement of the works in order to obtain an accurate representation of the baseline conditions. Should this period of time elapse between pre-construction surveys and the commencement of works then the need to repeat surveys will be assessed by an appropriately qualified ecologist.

Once the updated surveys are completed protection plans to be included in the CEMP will be prepared detailing any constraints, mitigation and/ or compensation requirements and emergency procedures in the unlikely event a protected species is encountered. These surveys will also inform the requirement for any licencing requirements for disturbance, damage or destruction of a resting site of a protected species.

7.5.2 Construction Mitigation

All relevant mitigation measures will be implemented through the project CEMP, which will be prepared in consultation with, and to the satisfaction of PKC, SEPA and NatureScot. This will detail measures such as:

- A minimum 50m buffer will be maintained, where possible, between working areas, machinery and watercourses and ditches;
- Timing of works to avoid bird breeding periods when the risk of disturbance is significantly increased;
- Timing of works to avoid periods when the risk of disturbance to overwintering wildfowl is significantly increased. Construction in the fields to the north should occur during summer months when pink-footed geese would have migrated to their breeding grounds in Greenland and Iceland.

Pollution incident response and drainage management measures will be prepared as a part of the CEMP to minimise potential pollution effects.

An ECoW will be available to oversee key elements of enabling works and construction. They will be a suitably experienced individual, whose role will ensure works are carried out in accordance with the CEMP to ensure compliance with international and national legislation and planning conditions. The ECoW will also review results of protected species surveys prior to commencement of works in different areas within the Proposed Development site. Once works are underway, the ECoW will provide ecological and pollution control advice and supervision for all relevant mitigation measures and monitoring. The ECoW will complete pre-construction checks for all protected species, including nesting birds during the construction phase of the development.

Best practice measures for minimising the potential for disturbance and injury to protected species will be employed and detailed in the CEMP. These will include:

- Directional lighting when required;
- Vehicle speeds will be restricted across site in order to minimise the risk of collision with birds; and
- If tree and/ or vegetation clearance is to be carried out between March and August inclusive, then checks for nesting birds should be undertaken by an experienced ecologist no more than 24 hours prior to any vegetation clearance being carried out. Any active nests identified should be left undisturbed until the chicks have fledged.

7.5.3 Operational Mitigation

Vehicles coming on site for maintenance works would be regularly checked for oil leaks to avoid risk of pollution. Spillage kits will be available. Best practice methodologies during any maintenance works will ensure the prevention of any pollution to habitats or watercourses, along with implementation of the site pollution incident response plan and drainage management plan.

7.6 Residual Impacts

Assuming best practice and mitigation is followed, no notable residual effects are expected on the ornithological features present either as a result of the construction or the operational phase of the Proposed Development.

7.7 Potential Cumulative Effects

This assessment considers the implications of the Proposed Development on IOFs in isolation. The CIEEM guidelines also require that the Proposed Development be assessed cumulatively, so any cumulative effects can be identified. Cumulative effects are defined as changes to the environment that are caused by an action in combination with other actions, arising from:

- the interaction between existing and/ or approved projects in the same area; as required by Schedule 4 and Section 5 of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- the interaction between the various impacts within a single project.

The potential interactions between the Proposed Development and other projects are listed in Chapter 18 for the Proposed Development. It is noted that developments that are built and operational at the time of submission are considered part of the existing baseline conditions.

A total of 10 projects located within 1km of the Proposed Development have been considered as potentially adding to a cumulative effect:

- One of these projects, entailing the erection of four units, formation parking, landscaping, and associated works 20m to the west of the Clash Burn Diversion Culvert appears to have been withdrawn and has not been considered further.
- Five projects have had planning permission approved. Each project has a limited footprint, ranging from the installation of a gas metre to the erection of a garden building and extension to a dwelling. The closest of these projects lies 160m southeast of the proposed storage embankment. Due to the small footprint and short time scale associated with each of these projects, it is unlikely that any cumulative effects in conjunction with the Proposed Development would be present.
- Four projects are currently awaiting a decision in relation to planning applications. Two of these projects involve the extension of residential dwellings and domestic changes involving a small footprint and short time scale. As such it is considered unlikely that they will add to any cumulative impact. One project involved the sitting of a modular building to an extension to an existing amenity area 145m southeast of the storage embankment. This project will also consist of a small footprint and short time scale, so it is considered unlikely to add to any cumulative impact. The remaining project is the proposed development of a residential area with play area, community facilities, landscaping, access, and associated works northwest of Davis Park, Springfield Road, Kinross. This proposed project is located approximately 300m northwest of the Hopefield Culvert upgrade. A combination of temporary increased habitat loss and added traffic during the construction phase of this project is likely to contribute to the cumulative effect alongside the Proposed Development however, due to the area holding no significance for scoped in species the cumulative effect is considered to be Negligible. The temporal overlap between these four projects and the Proposed Development is to be confirmed.

Overall, the cumulative impact of the South Kinross FPS and proposed projects within 1km of the site are deemed to be of negligible significance to IOFs.

7.8 Conclusion

A suite of desk and field-based assessments have been completed to provide a robust baseline against which potential construction, operational and cumulative effects of the Proposed Development can be assessed. Assessments included liaison with the Fife Nature Records Centre and field surveys for breeding and wintering birds.

Desk based assessments identified one designated site in proximity to the application boundary; Loch Leven NNR, Ramsar Site, SPA and SSSI, which supports a variety of bird species.

Surveys found the habitats and vegetation present to predominately be of low sensitivity, with only a limited area of arable field habitat likely to be lost to the Proposed Development.

The potential effects on IOFs from the Proposed Development have been assessed (Table 7-15), taking into account consultation feedback from stakeholders as summarised in Table 7-4.

Effects to Loch Leven from the construction of the Proposed Development have been assessed and all are found to be Not Significant, with the implementation of the proposed mitigation measures as outlined.

Effects to habitats from the construction and operation of the Proposed Development have been assessed and are found to be Not Significant.

Effects to protected species (birds) from the construction and operation of the Proposed Development have been assessed and all are found to be Not Significant, with the implementation of the proposed mitigation measures as outlined. Construction in the fields to the north should occur during summer months when pink-footed geese would have migrated to their breeding grounds in Greenland and Iceland.

The cumulative effects of the South Kinross FPS and proposed projects within 1km of the site have been assessed and deemed to hold Negligible significance for IOFs.

Overall, the effects of the Proposed Development are predicted to have no significant effects on designated sites, bird species or habitats. Following the implementation of good practice and adequate mitigation, no significant environmental effects are predicted as a result of the Proposed Development alone or in combination with other nearby developments.

A summary of predicted effects on Important Ornithological Features is provided in Table 7-15.

Table 7-15: Summary of Likely Environmental Effects on Ornithology

Receptor	Sensitivity of receptor	Mitigation Measures	Description of impact	Short/medium/long term	Magnitude of impact	Significance of effect	Significant / Not significant
Construction phase							
Overwintering birds	High		Temporary direct disturbance	Short term	Low	**Minor adverse**	**Not Significant**
Breeding birds	Low		Permanent direct loss of habitat during construction	Medium term	Low	**Minor adverse**	**Not Significant**
Designated Sites (Loch Leven NNR, SPA, Ramsar Site and SSSI)	High		Temporary direct impact from pollution	Short term	Medium	**Minor adverse**	**Not Significant**
Habitats	Low		Permanent direct habitat loss	Long term	Low	**Minor adverse**	**Not Significant**
Operational phase							
Overwintering birds	High		Temporary direct disturbance	Short term	Low	**Minor adverse**	**Not Significant**
Breeding birds	Low		Temporary direct disturbance	short term	Low	**Minor adverse**	**Not Significant**
Designated Sites (Loch Leven NNR, SPA, Ramsar Site and SSSI)	High		Temporary direct impact from pollution	Short term	Medium	**Minor adverse**	**Not Significant**
Habitats	Low		Temporary direct impact from pollution Temporary direct disturbance and/or loss of habitat	Short term	Low	**Minor adverse**	**Not Significant**

8 BIODIVERSITY – TERRESTRIAL & AQUATIC

This assessment evaluates the likely significant environmental effects on the ecological receptors associated with the construction and operation of the Proposed Development.

The chapter is supported by a number of Technical Appendices (see Volume III), comprising:

- Appendix F: Terrestrial & Aquatic Ecology Technical Report;
- Appendix G: Arboriculture Impact Assessment;
- Appendix H: Invasive Non-Native Species Management Plan.

Where relevant, all figures and Technical Appendices are referenced within the text. The naming structure used in this chapter follows common names except where no common name is typically used. Full scientific names and comprehensive species lists are provided in the Technical Appendices.

All staff who have contributed to fieldwork and this chapter have an undergraduate or higher postgraduate degree in relevant subjects and hold professional membership of CIEEM.

8.1 Assessment Methodology

8.1.1 Planning Policy Context

Table 8-1 below summarises the planning policy relevant to this assessment.

Table 8-1: Summary of National and Local Planning Policies

Document	Brief description
National Planning Policy	
The National Planning Framework (NPF) 4 (2023)	The National Planning Framework is prepared by the Scottish Government. It is the spatial expression of the Government's economic strategy and plans for infrastructure investment. It also provides a framework for the spatial development of Scotland as a whole. The current National Planning Framework is the fourth NPF and sets out the Scottish Government's strategic development priorities over the next 30 years. It has a focus on supporting sustainable economic growth which respects the quality of the environment, place and life in Scotland, the transition to a low carbon economy and emphasizes enhancing biodiversity during development.
Local Planning Policy	
Perth and Kinross Local Development Plan, adopted November 2019 (Perth and Kinross Council (PKC), 2019)	The Perth and Kinross Local Development Plan sets out a framework for pursuing the continued growth of the Perth and Kinross area by seeking sustainable development in an improved urban and rural environment. Through Policies 38 to 58, the council will seek to protect important natural and historic sites and features from adverse impacts resulting from development, including cumulative impacts. Policies 32 to 37 aim to ensure that development and land use make a positive contribution to helping to minimise the causes of climate change and adapting to its impacts.

8.1.2 Relevant Legislation and Guidance

Table 8-2 below sets out the key legislation and guidance relevant to this assessment.

Table 8-2: Summary of Relevant Legislation and Guidance

Document	Brief description
Legislation	
Conservation of Habitats and Species (Amendment) (EU Exit) regulations 2019	European Protected Species (EPS) are defined under Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive') and include species such as otter, and all species of bat. The Habitats Directive also includes the obligation to select, designate and protect Special Areas of Conservation (SACs) to protect those species and habitats listed within its annexes. The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) translates this European legislation into UK law. This was updated to the Conservation of Habitats and Species (Amendment) (EU Exit) regulations 2019 following the UK's exit from the European Union. This legislation makes it an offence to deliberately or recklessly disturb EPS. Their places of shelter are fully protected, and it is an offence to damage, destroy or obstruct access to or otherwise deny the animal use of a breeding site or resting site, whether deliberately or not. It is also an offence to disturb in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species, disturb in a manner, or circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young. Any activity which is likely to affect these species requires prior consultation with the relevant statutory nature conservation organisation (i.e., NatureScot) and may require a licence to be issued before they can be carried out.
The Wildlife and Countryside Act (1981, as amended).	The Wildlife and Countryside Act 1981 provides protection to a range of habitats and species, including bats. The Nature Conservation (Scotland) Act 2004 and Wildlife and Natural Environment (Scotland) Act 2011 amend the Wildlife and Countryside Act in Scotland.
Nature Conservation (Scotland) Act 2004 (as amended)	The act places duties on public bodies to conserve biodiversity, increase the protection for Sites of Special Scientific Interest (SSSIs), and strengthens the legal protection for threatened species.
The Wildlife and Natural Environment (Scotland) Act 2011	Provides changes to the Wildlife and Countryside Act 1981 modernising game law and deer management legislation, badger licensing legislation, strengthens controls on invasive non-native species, improves SSSI legislation and modifies Muirburn (the burning of heathland to promote regrowth) regulations to limit the season and introduce licensing.
The Protection of Badgers Act 1992	Offences under the Act include: (1) taking, injuring or killing badgers; (2) cruelty to badgers; (3) interference with badger setts; (4) selling and possession of live badgers and (5) marking and ringing. Exceptions and licences can apply.
Salmon and Freshwater Fisheries (Consolidation)(Scotland) Act 2003	The 2003 Act consolidates the majority of the Scottish salmon and freshwater fisheries law into a single Act. It is the key governing legislation for Scotland's district salmon fishery boards, and it sets out the provisions for the constitution, composition and financing of the boards. It is also the framework for a number of other important regulatory areas, including legal methods of fishing and offences, close times, local regulatory measures, protection of juvenile and spawning salmon, passage of salmon, and general powers relating to appointment of water bailiffs and enforcement of salmon and freshwater fisheries law.
Guidance	
The UK Biodiversity Action Plan (UKBAP) 1994	Produced in response to the Convention on Biological Diversity through the development and enforcement of national strategies and associated action plans for biological diversity.
Scottish Biodiversity List 2020 (Scottish Government, 2020)	The List is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland. By identifying the species and habitats that are of the highest priority for biodiversity conservation, the list helps public bodies carry out their biodiversity duty.

Document	Brief description
Tayside Local Biodiversity Action Plan (LBAP) 2016 (PKC, 2016)	The Local Biodiversity Action Plan (LBAP) incorporates the local authority areas of Angus and Perth and Kinross was produced to focus attention on the conservation and enhancement of the region's natural heritage and to address its decline.
NatureScot Species Planning Advice (NatureScot, 2021)	This is standing advice to help planning applicants seeking permission for development that could affect protected species including otter, badger, great crested newts, reptiles, water vole and to assist planning officers and other regulators in their assessment of these applications.
Scottish Environmental Protection Agency (SEPA)	Guidance on assessing the impacts of development proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (GWDTE).
Trees in Relation to Design, Demolition and Construction – Recommendations (BSI, 2012)	The British Standard "Trees in Relation to Design, Demolition and Construction - Recommendations" (BS 5837) (2012), details the steps that should be taken to ensure that trees are appropriately and successfully retained when a development takes place.

8.1.3 Study Area

The study area for the purposes of the assessment is a set of buffers from the Proposed Development site dependent on the potential receptor. These include:

- Records of notable and protected species within 5km;
- Statutory and non-statutory sites within 5km;
- Phase 1 Habitat survey within 100m;
- Tree survey within 100m;
- Invasive Non-Native Species (INNS) survey within 100m;
- Ground level Preliminary Roost Assessment for bats (*Chiroptera* spp.) on trees and structures within 100m;
- Static bat activity surveys within the site along the South Queich river;
- Water vole survey (*Arvicola amphibious*) within 50m;
- Otter (*Lutra lutra*) survey within 250m;
- Fish habitat suitability and electrofishing survey within the three watercourses potentially affected by the works;
- Badger (*Meles meles*) survey within 100m;
- Red squirrel (*Sciurus vulgaris*) survey within 50m; and
- Great crested newts (*Triturus cristatus*) habitat suitability assessment within 500m.

8.1.4 Desk Study

A request was made to Fife Nature Records Centre (FNRC) for all records of notable and protected species within 5km of the site within the last 10 years. A buffer of 5km was used as it is considered

unlikely the Proposed Development would affect specific interests of such sites over and above this distance.

A search was made for all sites with a European, national, or local authority designation with an ecological or aquatic interest, including SACs, SSSIs, Ramsar sites, National Nature Reserves (NNRs) and Local Nature Reserves (LNRs) that could be affected by the Proposed Development.

The following resources were also used to complete the search:

- NatureScot's Sitelink database website[6]; and
- Scotland's Environment Web[7].

8.1.5 Field Study

Aerial imagery was studied in the process of the desk-based assessment to ascertain the likely habitats within and surrounding the Proposed Development site, and the species these may be likely to support. Following a review of consultation responses (see Table 8-3), the following surveys were carried out to complete the baseline assessment of ecological features present within the site and surrounding area.

- Phase 1 Habitat survey (JNCC, 2010) was undertaken between 26th and 30th April 2021 to establish the broad habitat types present, their extent and distribution. The survey was completed at the beginning of the main growing season.
- A suite of surveys to assess the utilisation of the site and surrounding area by terrestrial protected species were undertaken on 21st and 22nd July 2021 for terrestrial mammals, with a ground level Preliminary Roost Assessment (PRA) for bats on trees and structures within the site completed between 26 and 30 April 2021 and static bat activity surveys conducted between 22 July to 06 August and 02 September to 06 October 2021.
- Surveys to assess the utilisation of the site and surrounding area by aquatic species were undertaken on 07 September 2021.
- A survey to map all invasive non-native plant species within the site and around the works areas was undertaken on 20, 27 and 28 July 2021.
- A tree survey to inform the Arboriculture Impact Assessment (AIA) was conducted between 20 and 21 September 2021.

All surveys were completed within the optimal survey period. Full details of the survey methods and results are given in the following Appendices (see Volume III):

- Appendix F: Terrestrial & Aquatic Ecology Technical Report

[6] https://sitelink.nature.scot/home

[7] https://www.environment.gov.scot/

- Appendix G: Arboriculture Impact Assessment
- Appendix H: Invasive Non-Native Species Management Plan

8.1.6 Consultation

To ensure comprehensive coverage of ecological issues, key Statutory Nature Conservation Bodies (SNCBs), Environment(al) Protection Agencies (EPAs), and non-governmental organisations (NGOs) relevant to ecology and aquatic ecology were consulted during the development's Scoping process and their responses have been considered in the preparation of this chapter. A summary of the relevant consultation responses is presented in Table 8-3.

Table 8-3: Consultation Responses Relevant to Terrestrial & Aquatic Chapter

Date	Consultee	Issue Raised	How/Where Addressed
16 March 2022	NatureScot	The proposal could affect the Loch Leven SPA, Ramsar, SSSI and NNR which is adjacent to the site. The protected interests of Loch Leven include eutrophic loch, overwintering geese, swans and waterfowl, and breeding ducks. As identified in the Scoping Report there is the potential for sediments from construction to enter Loch Leven SPA, Ramsar, SSSI and NNR. The loch is highly sensitive to nutrient enrichment, having suffered historically and more recently from algal blooms. During construction sediments must be prevented from entering the loch to ensure no net increase in nutrients from the proposal and no additional impacts on water clarity for example from any pollution events.	Section 8.5: Mitigation; Chapter 7: Biodiversity - Ornithology Chapter and Chapter 16: Water Quality.
		As is also noted in the scoping report, geese from Loch Leven SPA forage in fields surrounding the South Queich and some of these foraging fields may be lost by the proposal. Greylag and pink footed geese are known to forage between 15-20 km from SPAs. Therefore, we agree that the Habitats Regulation Appraisal (HRA) should include the other Special Protection Areas within 20 km of the development site. We are happy to advise further once the HRA is in preparation.	Chapter 7: Biodiversity - Ornithology Chapter
5 April 2022	Forth District Salmon Fishery Board	Although fish populations found are not designated, they are currently protected under the Salmon and Freshwater Fisheries (Consolidation)(Scotland) Act 2003 and the Board would highlight that when considering impact, trout and other freshwater fish species should be considered throughout. We believe this is worthy of consideration when the scheme goes into detailed design.	Section 8.5: Mitigation

Date	Consultee	Issue Raised	How/Where Addressed
		It is hard to tell if habitat loss or impacts to species will occur, but it is assumed. More detail on the impact of the flood scheme on habitat loss or damage to species within the EIA is required at this stage.	
5 April 2022	Forth Rivers Trust	Overall are happy with the content of the chapters. However, FRT need outline methodology to make further detailed comments.	Section 8.5: Mitigation
14 April 2022	Perth and Kinross Council's Tree and Biodiversity Officer	The Council will apply the principles of the Scottish Government Policy on Control of Woodland Removal and there will be a presumption in favour of protecting woodland resources. Where the loss of woodland is unavoidable, mitigation measures in the form of compensatory planting will be required. The EIA Scoping Report notes that long-established ancient woodland totalling 116 ha is present within 5 km, with some noted just outside the survey boundary. However, it is unclear from the Report how many individual trees and area of woodland are to be removed to allow this project to proceed, including storage areas for materials and vehicular entry etc. Clarification is required. In line with the Scottish Government's Policy on Control of Woodland Removal, and Policy 40, compensatory tree planting is required for loss of any trees and woodland. Compensatory tree planting may present opportunities to connect areas of existing trees and habitats and I would be keen to explore this.	Volume III, Appendix G: Arboriculture Impact Assessment submitted in tandem with the EIA
		The breadth of ecological survey undertaken is welcomed. The submitted PEAR was carried out at the correct time of year and in accordance with published best practice. The Phase 1 Habitat Survey identified a list of habitat types, and the impacts of this proposed project on all habitats such as broadleaved woodland, scrub and grassland needs to be assessed and explained. For example, will the hydrology of swamp and standing water be affected by the proposed scheme? PKC has a legal duty to protect and enhance all biodiversity, not just protected species and habitats, and so impacts to all biodiversity needs to be considered. It is noted that static bat activity surveys were completed in April 2021, and results will be presented within the Ecology Technical Appendix of the EIAR. There is interest in reviewing it,	Section 8.5: Mitigation

Date	Consultee	Issue Raised	How/Where Addressed
		particularly the results from static surveys. Scoping in of loss of foraging habitat is appropriate.	
		Scoping in water quality is appropriate due to the importance to all biodiversity interests. Also, as storm events increase in intensity it is essential that the main impacts on Loch Leven caused by increased erosion and runoff are addressed in tandem with hard protections.	Chapter 16: Water Quality
		Scoping in the impacts on designated sites (Loch Leven NNR, Ramsar, SPA and SSSI) and on salmonids on a stretch of the South Queich from the High Street to Loch Leven is welcomed.	Section 8.5: Mitigation
		As stated in the EIA Scoping Report, an Appropriate Assessment in line with the Habitats Regulations Appraisal is required and information to inform this Assessment such as detailed methods and proposed mitigation measures should be provided by the applicant.	Chapter 7: Biodiversity - Ornithology Chapter

8.2 Baseline Scenario

8.2.1 Desk Study

One statutory designated site was identified within 5km of the development site- Loch Leven NNR, Ramsar Site, SPA and SSSI. The site is adjacent to the Proposed Development and supports breeding pink-footed geese (*Anser brachyrhynchus*) and wintering populations of birds such as cormorant (*Phalacrocorax carbo*) and gadwall (*Anas strepera*). No non-statutory designated sites were identified within 5km of the development site, but long-established ancient woodland is present within 5km, with some noted just outside the survey area. Figure 8-1 shows the proximity of the Loch Leven internationally designated site to the Proposed Development.

Fife Nature Records Centre returned a report dated 30 April 2021 detailing the protected and notable species within 5km of the site and within the last 10 years. Protected/ notable species identified were badger, otter, red squirrel, common frog (*Rana temporaria*) and lizard (*Zootoca vivipara*), large heath butterfly (*Coenonympha tullia*) and five species of bat. Of particular note were 285 records of red squirrel sightings between 2017 and 2021.

8.2.2 Field Surveys

8.2.2.1 Habitats

The Phase 1 Habitat survey types identified during the survey are mapped in Figure 8-2 and Figure 8-3, and Table 8-4 lists the broad Phase 1 Habitat types present within the survey area. The habitats found within the Proposed Development site are discussed in detail in Volume III, Appendix F.

The dominant habitats found within the survey boundary are semi-improved neutral grassland and cultivated / disturbed arable land (highlighted in bold in the Table 8-4).

Table 8-4: Phase 1 Habitat Types

Phase 1 Habitat Type	Area (ha)
A1.1.1 - Broadleaved woodland - semi-natural	0.9
A1.1.2 - Broadleaved woodland - plantation	1.3
A1.2.2 - Coniferous woodland - plantation	0.6
A1.3.1 - Mixed woodland - semi-natural	0.9
A1.3.2 - Mixed woodland - plantation	1.1
A2.1 - Scrub - dense/continuous	3.1
A2.2 - Scrub - scattered	1.1
A3.1 - Broadleaved Parkland/scattered trees	0.4
B2.2 - Neutral grassland - semi-improved	**5.5**
B6 - Poor semi-improved grassland	1.3
C3.1 - Other tall herb and fern - ruderal	1.8
F1 - Swamp	0.8
G1 - Standing water	1.3
G2 - Running water	0.5
Hardstanding	5.8
J1.1 - Cultivated/disturbed land - arable	**6.3**
J1.2 - Cultivated/disturbed land - amenity grassland	4.6
J1.4 - Introduced shrub	0.0
J3.6 - Buildings	24.4
J4 - Bare ground	1.3
Road	3.8
Total	66.7

The site comprises two locations- an arable field to the west of Kinross, on the west side of the M90 (Area A, Figure 8-2), and an area within south Kinross on the banks of Loch Leven (Area B, Figure 8-3). The field comprising Area A is cultivated arable land with Ury Burn (dry at the time of all surveys) located on the northeast corner. Immature broadleaf plantation woodland is present on the other side of the burn, with allotments surrounded by semi-improved neutral grassland present on the southwest side of the field. A row of mature broadleaved trees lines the southern border of the field, with Kinross Garden Centre and private residential housing located just beyond the trees.

Land within the survey boundary of Area B is largely urban and residential and inaccessible for survey with well-maintained housing and their associated gardens built predominantly in the 1960's. Industrial areas lie to the south and west of the survey area with overgrown and semi-dry sustainable urban drainage system ponds present. The South Queich river flows from Loch Leven through the south of the site and underneath the motorway to the west. Parkland with amenity grassland and scattered trees is located centrally within the site with semi-natural broadleaved woodland found on the east of the survey area close to the banks of Loch Leven.

None of the habitats within the Proposed Development application boundary identified from the Phase 1 Habitat survey are aligned with any conservation designations, such as those of national (UKBAP / SBL) and international (Habitats Directive Annex 1) importance. However, due to the proximity of the Proposed Development to the internationally designated site of Loch Leven, the effect of direct or indirect impacts from the development are considered within this assessment.

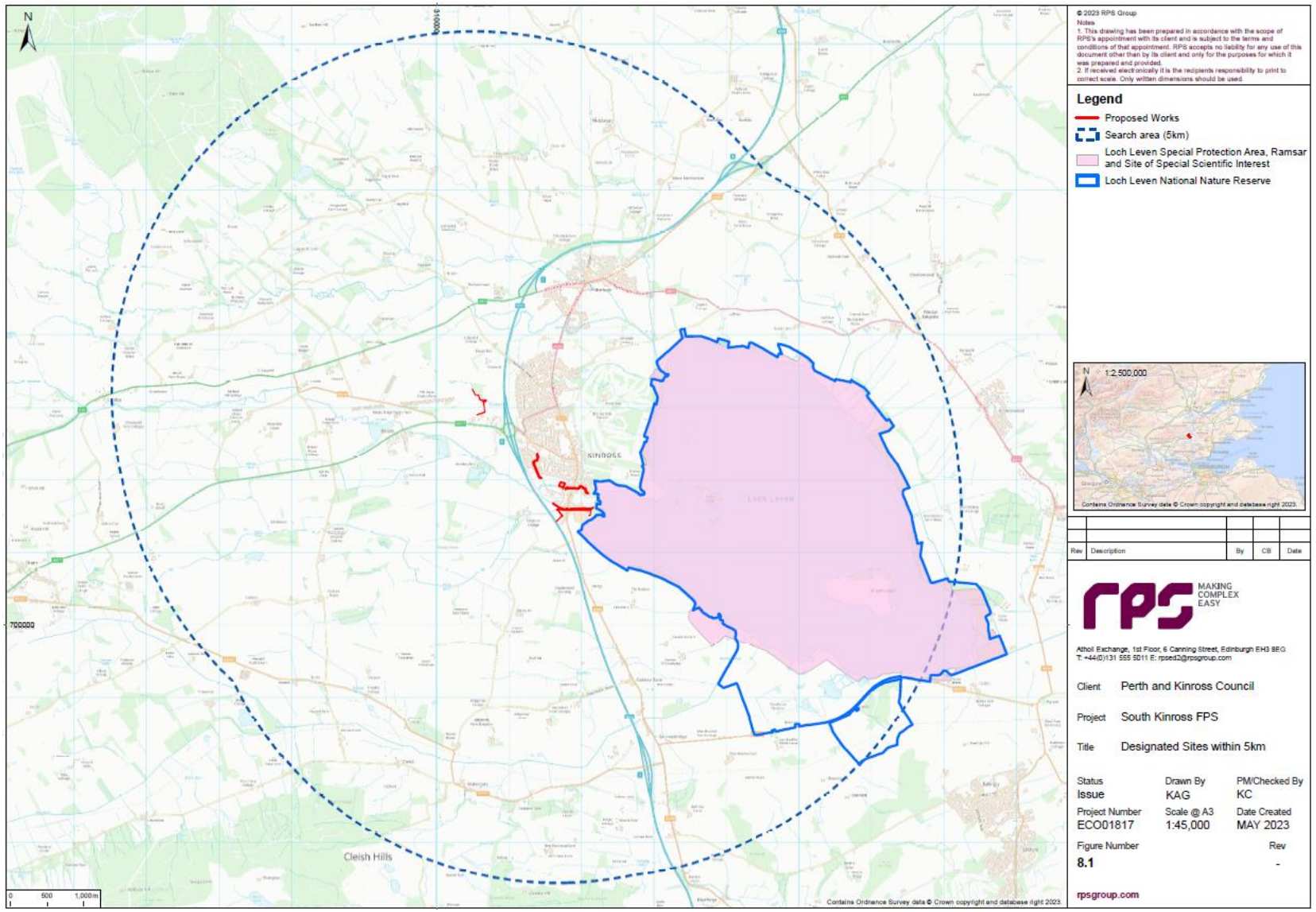


Figure 8-1: Designated Sites within 5 km **note final scheme alignments shown in Figure 3-2*

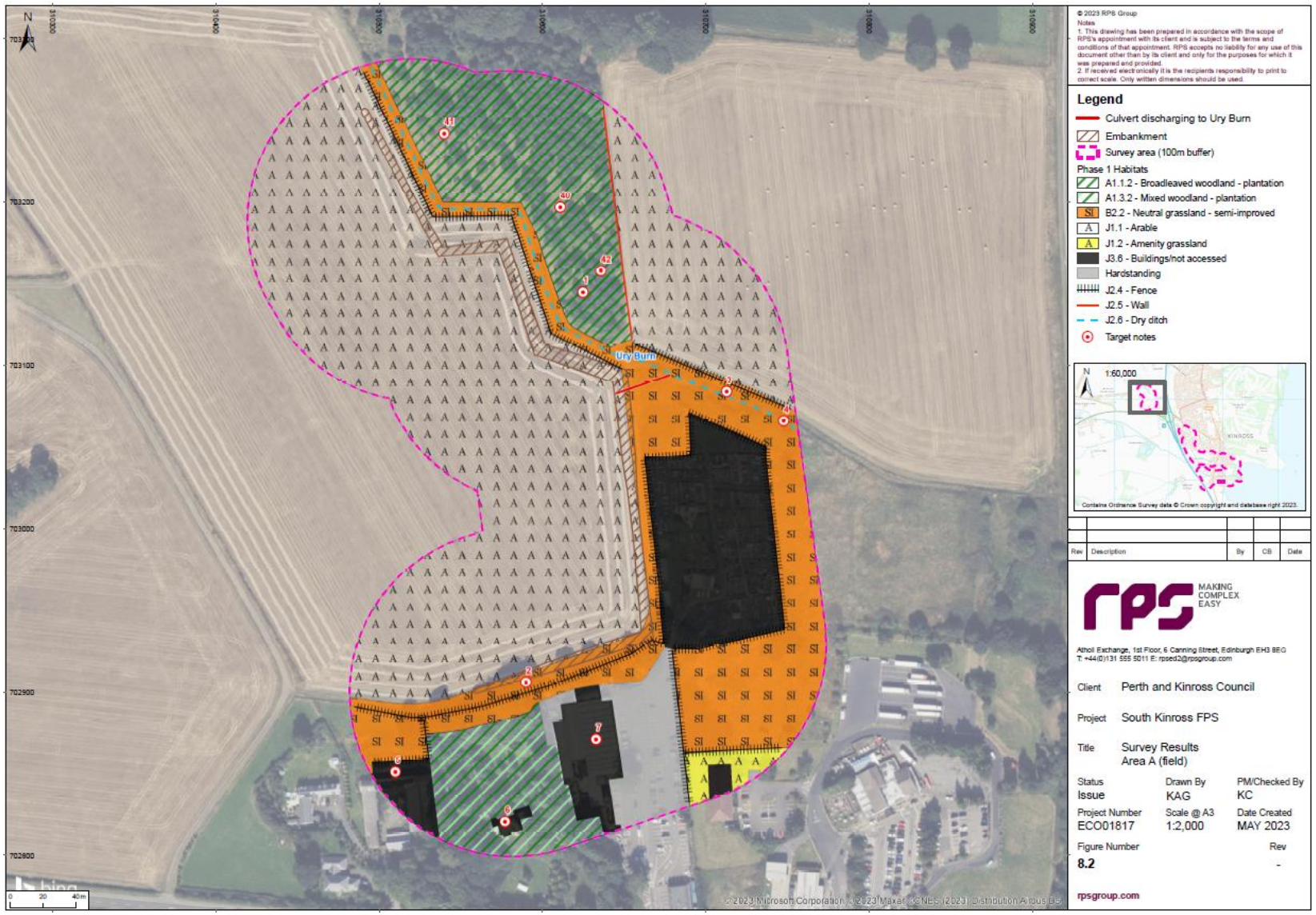


Figure 8-2: Phase1 Habitat Survey Results (Area A)

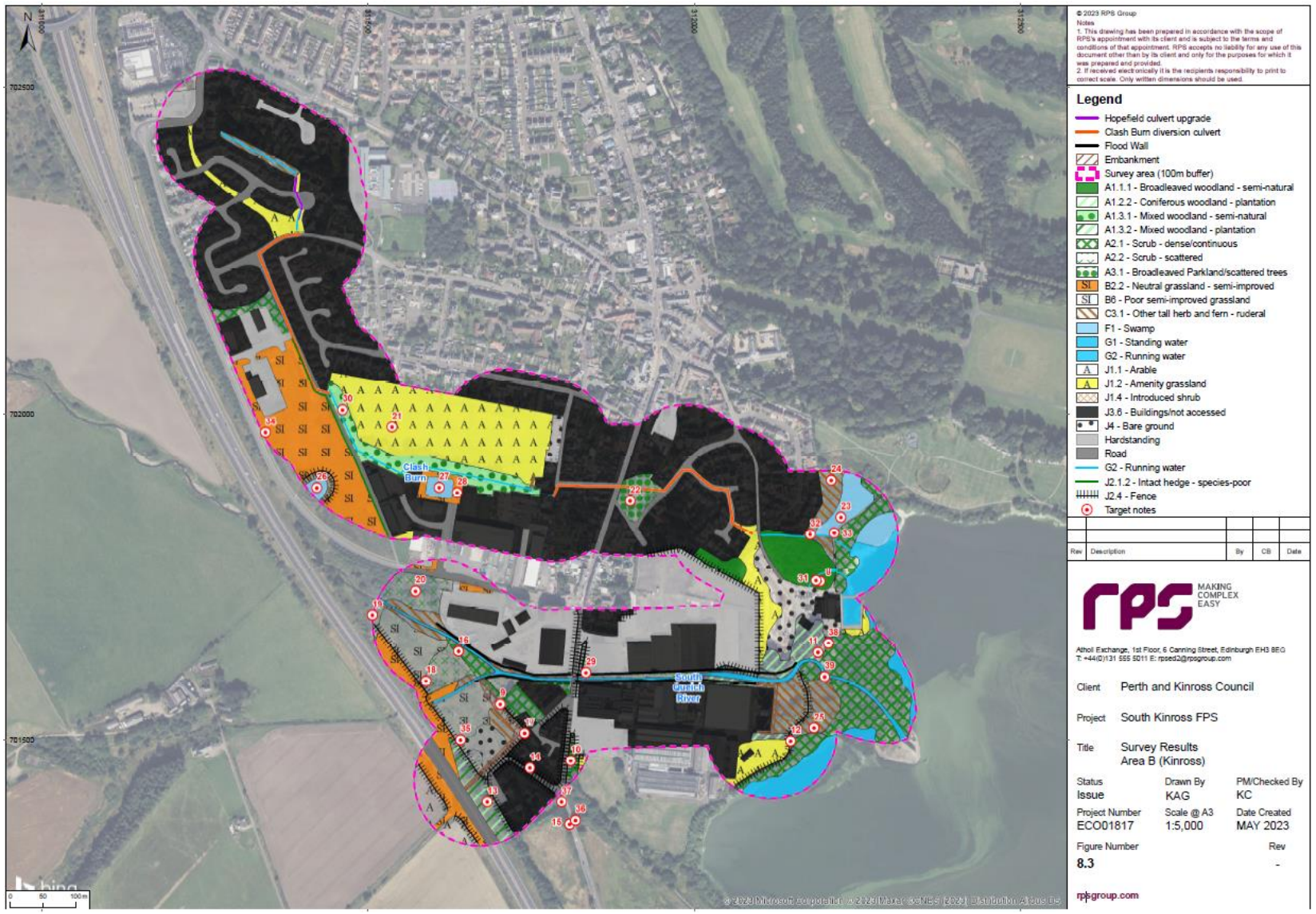


Figure 8-3: Phase 1 Habitat Survey Results (Area B) **note final scheme alignments shown in Figure 3-2*

8.2.2.2 Protected Species

Methodology and detailed results of the protected species surveys carried out in support of the Proposed Development are presented in Volume III, Appendix F. Below follows a summary of the baseline scenario for each protected species scoped into the assessment.

Bats

Both Area A and B are assessed as having high potential for foraging, commuting and roosting bat species. During the two deployments of the static bat detectors along the South Queich (a potential bat commuting corridor) at least four species of bat were recorded- Common pipstrelle (*Pipistrellus pipistrellus*) and soprano pipistrelle (*Pipistrellus pygmaeus*) bats, *Nyctalus* species bats and *Myotis* species bats. Common and soprano pipistrelle bats exhibited the highest activity levels during both the summer and autumn deployments.

Otter

Area B is considered to have high potential for otters as it features many opportunities for the species to forage, commute and rest throughout the various streams, swamp and the large waterbody of Loch Leven adjacent to the Proposed Development. Area A is considered to be unsuitable for otter as the watercourse is dry and therefore the likelihood of the species occurring here is low. During the targeted otter survey, no otter resting sites or signs of otter activity were identified. As Area B is considered to have high potential to support the species for resting, foraging and commuting, the presence of otter within the site cannot be discounted.

Water Vole

The site has been evaluated as suboptimal for water voles as it lacks suitable bankside vegetation habitat for the species. Furthermore, the streams within the site were noted to have a moderate to fast flow rendering them unsuitable for water vole. Therefore, the likelihood of this species occurring within the proposed works area is deemed to be negligible and the presence of water vole is considered to be unlikely.

Badger

Habitat within Area A such as the dense scrub, woodland and farmland offer both foraging and sett building potential for badgers. The surrounding arable fields to the west offer good foraging potential for the species. Two potential badger setts were found in Area A, one with six entrances (potentially active) and one with five entrances (disused at time of survey). Area B has low suitability for badger due to its urban nature and wetland habitat on the banks of Loch Leven, although copses of woodland may provide foraging grounds for the species.

Red Squirrel

Squirrel feeding signs were noted within woodland in Area A. The coniferous and broadleaved woodland habitat located across both Area A and B offers potential for squirrels to inhabit and forage. A red squirrel was observed by a surveyor near bat detector location 3, confirming their presence on site.

Reptiles

No targeted reptile surveys were completed; however, potential reptile habitat was identified within the site in the form of scrub, grassland and woodland edges which offer reptiles potential for foraging, basking and refugia.

Great Crested Newts

There are no waterbodies within 500m of the Proposed Development that could support the aquatic stage of great crested newt. Therefore, the likelihood of great crested newts occurring within the works area is negligible and the species has been scoped out of the assessment.

8.2.2.3 Aquatic Ecology

A fish habitat suitability assessment confirmed that both the Ury and Clash Burns are not suitable for fish, but there is a limited area within the South Queich which is suitable for spawning brown trout (*Salmo trutta)* (Figure 8-4). This area comprises a 500 to 600m stretch of the watercourse upstream of Loch Leven and is considered to be very important for the local population of brown trout. Two locations on the South Queich were electrofished semi-quantitatively to determine which species were present. At Electrofishing Location (EL) 1 no Atlantic salmon (*S. salar)*, trout, European eels *(Anguilla anguilla*) or lamprey were found. At EL 2 large numbers of brown trout were found within a small survey area. The survey confirmed that brown trout are present in high numbers between the High Street and Loch Leven.

Figure 8-4: Fish Habitat Suitability and Electrofishing Locations **note final scheme alignments shown in Figure 3-2*

8.2.2.4 Invasive Non-Native Species

The in-stream habitat of the three watercourses within the survey area was not considered suitable for the invasive non-native species American signal crayfish (*Pacifastacus leniusculus*) due to a lack of crevices and burrows needed to support it.

Stands of Himalayan balsam (*Impatiens glandulifera*) were noted throughout the survey area, with Japanese rose found at three locations within Area B. Rhododendron (*Rhododendron ponticum*) was identified on the bank of the South Queich.

A management plan has been produced which details the relevant precautions to prevent the spread of INNS during the construction phase of the development (Volume III, Appendix H).

8.3 Significance of Effects

The method of assessment for this chapter follows that of the CIEEM 2018 guidance. The term Important Ecological Features (IEFs) is used for those species and habitats identified in the assessment. For each impact with the potential to affect the relevant IEFs, the assessment considers the following parameters:

- The value and importance of the IEF taking into account its national and regional conservation status;
- The extent of the impact and whether this is positive or negative in its influence;
- The magnitude, duration and timing of the impact; and
- The impact's frequency and ease of reversibility.

The assessment similarly includes consideration of any proposed mitigation to avoid or minimise the effect of any potential impact to the relevant IEFs. The CIEEM guidelines also require the identification of potential cumulative impacts from other developments, be this negligible, minor, moderate or major. Effects can be either adverse or beneficial.

8.3.1 Value/ Importance

The approach to the assessment of the sensitivity and importance of IEFs is to consider its conservation status and the importance of the feature present on the Proposed Development site.

The national conservation status of IEFs in the UK can be divided into five categories[8]:

1. Species and habitats given special protection under Conservation of Habitats and Species (Amendment) (EU Exit) regulations 2019;

[8] Species or habitats in a sixth category, International Union for Conservation of Nature (IUCN) globally - threatened species, are unlikely to occur on any proposed UK development site, but if they did would be considered to be of International status irrespective of their regional status.

2. Species and habitats given special protection under UK legislation;
3. Species and habitats of serious conservation concern: Scottish Biodiversity List Priority species;
4. Species and habitats of some conservation concern listed on Local Biodiversity Action Plan; and
5. Species and habitats for which there is little or no conservation concern: species common and widespread throughout the UK.

The regional conservation status of IEFs can be divided into three categories:

1. Rare in the region and/or LBAP Priority Species: species for which a Species Action Plan recommends safeguarding of all sites and species with a need to protect all populations above a certain size;
2. Uncommon or patchily distributed in the region; and
3. Common and/ or widespread in the region.

The resultant conservation value of IEFs on the Proposed Development site will depend on the interaction between its national conservation status and its regional conservation status in central Scotland. Table 8-5 sets out the resultant conservation status of species and habitats. Note that the categories shown may be modified according to the national or regional circumstances of a particular species. In Table 8-5, 'National' refers to the whole of the UK; 'Regional' refers to central Scotland and 'Local' refers to the Proposed Development site and immediate environs.

Table 8-5: Conservation Value of IEFs

National Conservation Status	Regional Conservation Status		
	Rare	Uncommon	Common
EU Legislative Protection	International	National	Regional
UK Legislative Protection	National	National	Regional
SBL Listed	National	National/Regional	Regional/Local
LBAP Listed	Regional	Regional	Local
Common/widespread	Regional	Local	Local

The sensitivity of an ecological receptor to a particular impact should also be considered. Sensitivity criteria is variable across habitat type and species' taxonomic groups, and behavioural sensitivity can also vary across individuals of the same species. Sensitivity can also be dependent on species' activity, for example, species are more likely to be susceptible to disturbance during the breeding season (CIEEM, 2018). As such, professional judgement is used when assigning sensitivity to an ecological receptor. Level of sensitivity is outlined using the criteria in Table 8-6.

Table 8-6: Level of Sensitivity

Level of Sensitivity	Definition
High	Species/habitat in remote areas, away from human disturbance which would result in a long-lasting reaction to a disturbance event.
Medium	Species/habitat which are considered to have a slow recovery time and could not re-establish quickly.
Low	Species/habitat which are tolerant to human activity which result in a short-term reaction to a disturbance event.

8.3.2 Magnitude of Impact

The criteria used for assessing the magnitude of impacts on IEFs are:

- **High**: Impact that would cause major loss of habitat/population on the Proposed Development site and have a sufficient effect to alter the nature of the habitat/population in the short to long-term affecting the long-term viability. For example, more than 20% habitat loss or long-term damage, or more than 20% loss of a species' population.
- **Medium**: Impact that is detectable in the short to medium term, but which should not alter the long-term viability of the feature/population. For example, between 10-20% habitat loss or 10-20% reduction of a species population.
- **Low**: Impact of small scale or short duration that results in no long-term harm to the habitat/populations viability. For example, a loss or damage of under 10% of the habitat.
- **Negligible**: No loss or alteration of characteristics, features or elements; no observable impact in either direction.

The duration of an impact is hard to quantify across all IEFs due to inherent differences in life histories. Therefore, the duration of each impact on receptors will be assessed on an individual basis considering species and habitats ecological characteristics.

8.3.3 Significance of Effect

The significance of each effect upon each IEF is assessed. An ecologically significant effect is defined as an impact on the integrity of a defined site or ecosystem and/ or the conservation status of habitats or species (CIEEM, 2018). The effect is assessed within a specific geographic context i.e., at the scale at which the ecological feature was valued (e.g., local/ national/ international). Effects are considered to be significant under the EIA Regulations where the effect is classified as being 'major' or 'moderate', while effects assessed as 'minor' are not significant. Table 8-7 shows the Assessment Matrix used to guide the assessment of significance.

Table 8-7: Assessment Matrix

Value/Importance	Magnitude of Impact			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible or minor	Negligible or minor	Minor
Low	Negligible or minor	Negligible or minor	Minor	Minor or moderate
Medium	Negligible or minor	Minor	Moderate	Moderate or major
High	Minor	Minor or moderate	Moderate or major	Major

Using the above matrix, further consideration is then given to the following:

- **Major**: Effects are likely to be important considerations at a regional or district scale but which, if adverse, are potential concerns to the project, depending upon the relative importance attached to the issue during the decision-making process.
- **Moderate**: Effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.
- **Minor**: Effects may be raised as local issues, but which are unlikely to be of importance in the decision-making process. Nevertheless, they are of relevance in the detailed design of the project.
- **Negligible**: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

The final assessment of whether a significant effect is likely is completed by taking the mitigation measures that are adopted as part of the Proposed Development into account, including both the mitigation incorporated into the design of the Proposed Development and mitigation required to address residual impacts. This requires an assessment on the likelihood of successful mitigation being achieved and the mitigation proposed needs to be qualified in terms of the probability of success. The assessment of the likely success of any mitigation and hence the significance of any effects is based on both professional judgement and experience of other mitigation schemes. In general, a precautionary approach is advisable in determining the outcome, however a realistic rather than worst-case scenario assessment is used. In relation to determining likely significant effects on protected sites a precautionary approach is always adopted.

8.4 Description of Likely Significant Effects

8.4.1 Identification of Important Ecological Features

The majority of the receptors for the Proposed Development are only likely be impacted (ecologically) at the site or regional level. Potential IEFs identified during the desk study and field work include bat species, otter, badger, red squirrel and salmonid fish species and therefore they have been considered

further in this assessment. The statutory designated site Loch Leven (NNR, Ramsar Site, SPA and SSSI) has also been scoped into the assessment, as it supports a variety of insect, fish and bird species with an abundance of aquatic plants. The assessment of the effects of the Proposed Development to all Important Ornithological Features (IOFs) is assessed separately in Chapter 7. Furthermore, information to inform an Appropriate Assessment has also been included in that Chapter. Similarly, the assessment of the effects of the project to trees is assessed in Volume III, Appendix G.

Of the potential ecological receptors which could be impacted a number were scoped out as detailed below:

- Water vole: No burrows or other signs of the presence of water voles were identified on the Proposed Development site or in adjacent areas and therefore there would be no physical damage or disturbance to protected sites during construction of the Proposed Development.
- Reptiles: Given the localised impacts of the proposed works within this site it is predicted that there would not be significant habitat loss for any reptile species present.
- Great crested newts: No habitat considered suitable to support great crested newts was noted within the survey area and therefore the potential for this species to be present within the site is unlikely and therefore this species will not be impacted by the Proposed Development.
- Lamprey species and eel: The fish habitat suitability assessment concluded that both the Ury and Clash Burns are not suitable for any species of fish. The stretch of the South Queich within the survey area offers limited habitat for lamprey species and eels, but these species were not collected during the electrofishing survey. However, as lamprey and eels have similar habitat requirements to salmonid fish, any mitigation or enhancements for salmonids will also benefit these species (and other fish species).
- Ground Water Dependent Terrestrial Ecosystems (GWDTE): An area of swamp on the banks of Loch Leven has been assessed to be unlikely GWDTE and is surface water fed by heavy rain when Loch Leven encroaches into this area.

8.4.2 Assessment of Construction Effects

Chapter 3 details the design of the Proposed Development. This was used to assess the likely significant environmental effects as a result of the development.

8.4.2.1 Designated Sites

Loch Leven is within and adjacent to the survey area and is designated as an NNR, Ramsar site, SPA and SSSI. Qualifying features include waterfowl species such as pink-footed geese (*Anser brachyrhynchus*) and whooper swan (*Cygnus cygnus*). The pasture/ arable fields within the northern area of the development site provide foraging habitat for waterfowl associated with the Loch Leven SPA. There is a likelihood that some of this habitat will be lost due to the Proposed Development. The South Queich river connects the development to the loch, therefore there exists a pathway for water

contamination should an accidental release of pollutants occur. The impact of the development on Important Ornithological Features is assessed within Chapter 7.

Control measures to ensure that there would no potential for effects on the designated site as a result of runoff or pollution are set out in Section 8.5 and Chapter 16. These measures have been developed to ensure that effects on the designated site would not be significant.

The magnitude of the impact has been assessed as low. The conservation value of the receptor would be high sensitivity. Taking into account the mitigation measures proposed, the overall effect to the designated site during the construction phase of the development is assessed as minor adverse, and not significant.

8.4.2.2 Habitats (Terrestrial and Aquatic)

It is not foreseen that a significant amount of habitat will be lost to the Proposed Development, due to the nature of the flood defence features to be installed. Flood embankments and walls would, where possible, be set back from watercourses. Current design estimates setback distance to be 0.5m at the narrowest point, to 7m at the widest. This would help to reduce the impact to the riverbanks and watercourse channels from construction works, thereby reducing the impact upon the physical habitat. Furthermore, the proposed footprint of the scheme is generally within already developed areas. There may be a loss of a portion of low ecological value arable field to the north of the development, which may reduce foraging grounds for over-wintering geese; this impact is addressed within Chapter 7.

Two separate parameters have been used to predict the potential habitat loss during the construction phase of the Proposed Development:

- Permanent Direct Habitat Loss – the permanent footprint of any component of the development which would not be restored following construction. This includes direct defences (embankments, retaining walls and sheet pile walls), culvert upgrades, diversion culverts, permanent access tracks and all areas of permanent drainage; and
- Temporary Direct Habitat Loss – any infrastructure component that would be restored following construction, for example construction compounds and temporary haul roads and accesses. This area also includes a 20 m buffer for direct defences and a 40 m buffer surrounding embankments to allow a working area for machinery which would be restored following construction of the Proposed Development.

Table 8-8 details the habitats affected by the proposed development, the likely type of effect, the aggregate area and the percentage of the site's habitat which will be affected.

Table 8-8: Predicted Effects to Habitat Present from Construction of the Proposed Development

Phase 1 Habitat Code and Title	Permanent Direct Habitat Loss (ha)	Temporary Direct Habitat Loss (ha)	Total Area of Habitat Affected (ha)
A1.1.1 - Broadleaved woodland - semi-natural	-	-	-
A1.1.2 - Broadleaved woodland - plantation	-	0.08	0.08
A1.2.2 - Coniferous woodland - plantation	0.02	0.22	0.24
A1.3.1 - Mixed woodland - semi-natural	0.01	0.05	0.06
A1.3.2 - Mixed woodland - plantation	0.02	0.13	0.15
A2.1 - Scrub - dense/continuous	0.02	0.17	0.19
A2.2 - Scrub - scattered	0.01	0.27	0.28
A3.1 - Broadleaved Parkland/scattered trees	0.003	0.06	0.063
B2.2 - Neutral grassland - semi-improved	0.13	0.75	0.88
B6 - Poor semi-improved grassland	0.15	0.28	0.43
C3.1 - Other tall herb and fern - ruderal	0.15	0.40	0.55
F1 - Swamp	-	-	-
G1 - Standing water	-	-	-
G2 - Running water	-	-	-
J1.1 - Cultivated/disturbed land - arable	0.44	1.29	1.73
J1.2 - Cultivated/disturbed land - amenity grassland	0.01	0.15	0.16
J1.4 - Introduced shrub	-	-	-
J4 - Bare ground	0.04	0.10	0.14
Total	**1.00**	**3.95**	**4.95**

Total permanent direct habitat loss as a result of the Proposed Development is approximately 1.00 ha.

In addition to the permanent direct effects to habitats from the footprint of the Proposed Development, consideration has been given to the temporary effects from areas of infrastructure such as construction compounds and temporary access tracks and buffers to allow construction of the development. This equates to a temporary effect to habitats of 3.95ha.

Habitats of significant conservation value or sensitivity which may potentially be affected by construction of the Proposed Development and named as Priority Habitats in the Tayside Local Biodiversity Plan are:

- Coniferous plantation woodland (0.24ha affected);
- Semi-natural mixed woodland (0.06ha affected); and
- Plantation mixed woodland (0.15ha affected).

In addition to the potential temporary and permanent loss of habitats, further impacts which might affect terrestrial and aquatic habitats include pollution related events such as oil spills and sedimentation from run-off of silt laden waters. General pollution prevention and best practice measures will be implemented to reduce these risks, with further best practice mitigation measures relating to such

impacts presented in Chapter 16. These measures will be followed to reduce the risk of an impact to habitats.

Construction activities could lead to an increase in ground disturbance, sediment scour and surface water runoff from the works area. This in turn could lead to an increase in sediment laden runoff discharging into Clash Burn, the South Queich river and ultimately Loch Leven.

The construction methodologies detailed in a CEMP (see Section 8.5) will ensure that no increase in uncontrolled off-site flows would occur during the construction phase. All construction compounds will be contained and positioned away from the watercourses and Loch Leven. Designed-in mitigation measures will be implemented which will reduce any potential increase in uncontrolled surface water runoff during the construction phase. All stockpiled material and potential contaminant sources will be positioned in the construction compounds and bunded to prevent run-off. A suitable temporary drainage network, including oil/sediment interceptors, will be constructed.

With the above construction engineering methods adopted as part of the Proposed Development it is predicted that the impact would not affect surrounding local receptor habitats directly. The magnitude is predicted to be low. The overall conservation value of the habitats that may be affected has been assessed of local value and predominately of a low sensitivity. Therefore, the significance of effects of any construction activities on the habitats within the site, with the implementation of the construction measures, would be **Minor** adverse, which is not significant.

8.4.2.3 Protected Species

Bats

Whilst buildings and trees within the survey area were deemed suitable as potential bat roosts, no roosts were identified within the survey area boundary. Buildings at the former BCA site and parts of the Todd and Duncan site will be demolished to facilitate access over the extent of the right and left bank direct defences, and it is likely that vegetation (including trees) will need to be removed along the banks of the South Queich to facilitate construction of these retaining walls. A plan showing trees to be removed is presented in Volume III, Appendix G. Pre-construction surveys would identify potential bat roosts and mitigation will be put in place prior to the commencement of the construction works. The loss of any bat roosts will be sufficiently compensated for, should the need arise.

It is not considered that significant habitat used by bats for commuting or foraging will be lost to the development, according to the nature of the flood defence features to be constructed. Bat species using the South Queich river as a commuting corridor, or tree lines/ marshy grassland within the site for foraging purposes will not be impacted by the structures created as part of the Proposed Development.

The extent of habitat loss, therefore, is not significant and it is considered that construction during the bat activity season (dusk-dawn, April to October) will be during daylight hours. As such, construction activities are likely to have a low impact on roosting, commuting and foraging bat species of regional importance, resulting in a **Minor** adverse, non-significant effect.

Otters

No otter resting sites or signs of otter activity were identified within the Proposed Development site or wider survey area. However, the southern part of the site is considered to have high potential for otters as it features many opportunities for the species to forage, commute and rest.

As this species is dependent on clean watercourses the main risk to otter during construction is the potential loss of prey as a result of pollution incidents. Best practice to reduce potential pollution incidents will be detailed in the CEMP. Flood embankments and walls in the southern section of the site will, where possible, be set back from watercourses. The area between the flood wall and the watercourse will provide dry passage for otter movements along the riparian zone during all but exceptional floods. Embankments will not restrict otter movement as animals will be able to access the watercourse over these structures.

Pre-construction surveys would identify potential otter resting sites and mitigation will be put in place prior to the commencement of the construction works. The loss of any resting sites will be sufficiently compensated for, should the need arise.

The magnitude of any impacts associated with the construction phase of the development on otters has been assessed as low, with the international conservation value of otter species assessed as of medium sensitivity in the context of the development. As such, taking into account the mitigation as proposed in Section 8.5 the overall effect to this IEF is assessed as **Minor** adverse (not significant).

Badgers

Habitat within the northern area of the Proposed Development site offers both foraging and sett building potential for badgers, and two potential badger setts were found there. The southern area has low suitability for badgers due to its urban nature and wetland habitat rendering it with low potential for sett building activity.

Although the two potential setts are not within the Proposed Development construction footprint, badgers are a highly mobile species, and the increased disturbance level and construction traffic may pose a traffic collision risk to any individuals using the area for foraging and additional sett building. Pre-construction surveys are therefore proposed prior to the commencement of works, and if additional badger presence is recorded close to working areas, mitigation measures will be employed to avoid significant disturbance. Considering the local conservation value of badgers, the species has been assessed as of low sensitivity to construction related impacts. Consequently, the associated effects of the construction phase of the project to badgers taking into account all proposed mitigation is assessed as **Minor** adverse (not significant).

Red Squirrel

It is likely that a limited number of trees will be removed to facilitate the flood defence measures, but it is considered that this loss of habitat will not affect red squirrel. Red squirrels prefer well connected native woodlands however will reside in coniferous plantation, and it is likely that the species may be

resting and foraging in the woodland to the north of the survey area, with a red squirrel observation noted during the protected species surveys.

Pre-construction surveys are proposed prior to the commencement of works, and if red squirrel presence is recorded close to working areas, mitigation measures would be employed to avoid significant disturbance. Red squirrels create and use numerous dreys within a given area therefore it is considered that if any individuals are subject to low level displacement as result of construction activities, they will have other resting sites available in the area. Considering the local conservation value of red squirrel, the species has been assessed as of low sensitivity to construction related impacts. It is therefore considered that construction will have a **Minor** adverse (non-significant) effect on red squirrel.

Freshwater fish

In the absence of mitigation, the construction phase has the potential to directly, and indirectly, have an adverse effect on salmonid species, particularly in proximity to the proposed embankment/ retaining wall construction area on the South Queich. The mitigation detailed in Section 8.5 and Chapter 16 will mitigate the potential impacts arising from construction. However, there is still the potential that construction will adversely affect the watercourse and salmonid species.

The baseline habitat suitability assessment and electrofishing surveys identified one sensitive area for spawning brown trout, a 500 to 600m stretch of the South Queich between Kinross High Street and Loch Leven. Large numbers of brown trout were found during the electrofishing survey within this stretch of the South Queich, giving evidence of a significant population located there. Impacts arising from construction (including increased siltation or accidental pollution) all have the potential to affect individual fish and fish populations adversely. These are likely to be localised impacts, and as such, due to dissipation with increased distance from impact source, the potential effects to fish will decrease with distance.

The Forth Rivers Trust has recommended that the area of the watercourse between the High Street and Loch Leven is altered as little as possible by the Proposed Development, as it is important to ensure that salmonid species can be allowed to migrate upstream to spawning grounds at the top of the South Queich catchment. The design of the retaining flood walls will be outside of the river channel and therefore will not create any new barriers to fish migration. Trout species are of local conservation value and medium sensitivity in the context of the development and taking this into account and in tandem with the proposed mitigation measures and proposed flood wall design, the magnitude of any impacts associated with the construction phase of the development is assessed as low. As such, the overall effect to this IEF is assessed as **Minor** adverse (not significant).

8.4.3 Assessment of Operational Effects

It is assumed that any maintenance which would require construction activities at the Proposed Development will follow best practice and guidance from the CEMP and be treated as if this was still under the construction phase.

8.4.3.1 Summary of Maintenance Works

Flood walls will require inspections to be undertaken at 12-month intervals for determining the in-service physical condition of defences. Every third general inspection will be offset by a more comprehensive Principal Inspection (within touching distance of all inspectable elements).

Where required, typical maintenance works for flood walls would include:

- Defence repairs (concrete repairs, sealant replacement, and steel pile painting);
- Tree pruning;
- Graffiti removal; and
- Vermin control.

Flood embankments will require more regular inspection and maintenance activities including the following:

- Localised embankment raising due to settlement;
- Grass control, 2 to 3 times a year;
- 5 yearly topographic survey of embankments to monitor levels/ settlement;
- Invasive weed control;
- Tree pruning annually; and
- Vermin control annually.

It is anticipated that riverbanks, flood defences and existing bridges will also be inspected following any major flood event. These inspections would typically include:

- The probing of foundations to determine occurrence of any scouring or undercutting of foundations;
- A search for signs of deposition of debris or blockages in the waterway; and
- An examination of defences for signs of collision damage, subsidence or other ground movement.

8.4.3.2 Designated Sites and Habitats

There is the potential for pollution incidents to occur during maintenance activities within the operational period of the Proposed Development. Potential contamination sources include fuels and oils associated with maintenance vehicles and plant. The potential for this is much reduced in comparison to potential pollution events during the construction period due to the likely small scale of maintenance activities and the reduced frequency of such potentially polluting activities. Due to the high sensitivity of the habitats which might be affected (Loch Leven), but the small likelihood of this occurring, the mitigation measures and adherence with best practice and the limited reach of these possible impacts, these are assessed as of low magnitude and the potential effects of these to habitats as **Minor** adverse (not significant).

8.4.3.3 Protected Species

During the operational phase of the Proposed Development there is the potential for disturbance to protected species through human presence on the site during maintenance activities and the operation of plant. This will be at a much-reduced frequency and degree compared to the construction phase and is most likely to be within daylight hours and therefore not a source of disturbance to nocturnal and crepuscular species. The operation of the Proposed Development is likely to result in increased levels of noise and vibration however habituation of all IEFs to this is likely to occur. Due to the low likelihood of this work disturbing protected species these potential impacts are assessed as being of low magnitude and low sensitivity and their effects as **Minor** adverse (not significant) for all species.

8.4.3.4 Freshwater Fish and Habitats

It is not thought that potentially hazardous materials will need to be stored within the Proposed Development site once construction is complete. However, if this is needed due to maintenance requiring a construction element, standard pollution control measures and safe storage of materials will be implemented. Any maintenance works are expected to adhere to construction phase mitigation measures to limit sediment release to watercourses and best practice for working within and adjacent to watercourses will be followed. As such, there exists the potential for a **Minor** adverse non-significant effect on watercourses and wetland habitats during the operational phase of the Proposed Development.

8.5 Mitigation Measures

A CEMP will be produced to detail good practice measures relating to all elements of construction. General good practice measures including general pollution prevention are detailed in Chapter 16. The CEMP will also detail measures undertaken to conduct best working practices in relation to working within watercourses. Habitats will be retained where possible with a ‘working footprint’ clearly marked by temporary fencing/markers, allowing for reinstatement of habitats as soon as possible after any potential disruption. The CEMP will detail a sufficient framework to be overseen by an ECoW.

8.5.1 Pre-Construction Mitigation

There will be a time lapse between the last baseline surveys and the commencement of construction. As such, there is the potential that the ecological conditions on site could change. Pre-construction checks for otter, badger, red squirrel and bat roosts should therefore be undertaken before construction begins. Surveys will target the two potential badger setts in Area A and monitoring by motion sensitive cameras will be required to confirm the activity status of both setts if construction works are to take place within 30m.

Additionally, if the pre-construction surveys identify a change in the baseline condition, or if previously unrecorded protected species are identified then relevant species licences should be obtained and mitigation drawn up.

Surveys will be undertaken within three months prior to commencement of the works in order to obtain an accurate representation of the baseline conditions. Should this period of time elapse between pre-construction surveys and the commencement of works then the need to repeat surveys will be assessed by an appropriately qualified ecologist.

Once the updated surveys are completed species specific protection plans to be included in the CEMP will be prepared detailing any constraints, mitigation and/ or compensation requirements and emergency procedures in the unlikely event a protected species is encountered. These surveys will also inform the requirement for any licencing requirements for disturbance, damage or destruction of a resting site of a protected species.

Further surveys for invasive non-native plant species are to be completed prior to construction to ensure that relevant guidance and legislation is adhered to, and to minimise the spread of invasive species.

8.5.2 Construction Mitigation

All relevant mitigation measures will be implemented through the project CEMP, which will be prepared in consultation with, and to the satisfaction of PKC, SEPA and NatureScot. This will detail measures such as:

- Application of SEPA Pollution Prevention Guidance (PPGs) and the delimitation of working areas to minimise damage to habitats;
- A minimum 50m buffer will be maintained, where possible, between working areas, machinery and watercourses and ditches;
- Pollution prevention measures will be installed and maintained as appropriate, including sediment and dust mitigation measures;
- Chemicals, oils and hazardous materials will be stored in designated areas securely at a minimum distance of 50 m from the watercourses;
- Spillage contingency kits will be provided in all site vehicles and there will be daily checks for oil and fuel leaks;
- Application of best practice techniques of construction to ensure that drainage patterns and water quality within the study area are maintained; and
- Timing of works to avoid periods of heavy rain when the risk of fine sediment being transported from earth works is significantly increased.

Pollution incident response and drainage management measures will be prepared as a part of the CEMP to minimise potential pollution effects.

If the creation of a dry working area within the South Queich river is required, this will be undertaken outside of the sensitive period for trout (sensitive period defined as 1st October to 31st May), unless other arrangements are agreed with the local District Salmon Fishery Board. Prior to creating a dry working area in any watercourse, a fish rescue will be undertaken to remove any fish present in the area to be

de-watered. These fish will be released in suitable habitat elsewhere in the watercourse. Fish passage should be maintained in any watercourses where a dry working area is required.

An ECoW will be available to oversee key elements of enabling works and construction. They will be a suitably experienced individual, whose role will ensure works are carried out in accordance with the CEMP to ensure compliance with international and national legislation and planning conditions. The ECoW will also review results of protected species surveys prior to commencement of works in different areas within the Proposed Development site. Once works are underway, the ECoW will provide ecological and pollution control advice and supervision for all relevant mitigation measures and monitoring. The ECoW will complete pre-construction checks for all protected species: bat species, otter, badgers, red squirrel, nesting birds and reptiles during the construction phase of the development.

Best practice measures for minimising the potential for disturbance and injury to protected species will be employed and detailed in the CEMP. These will include:

- Directional lighting when required (including to avoid illuminating the South Queich);
- Covering all trenches, trial pits, excavation and pipelines to prevent animals entering these holes;
- Provision of a method of escape (e.g., a plank) where such excavations cannot be closed or filled on a nightly basis;
- Vehicle speeds will be restricted across site in order to minimise the risk of collision with animals;
- Piles will be installed using a Giken Silent Pile Press: this method is vibration free thus reducing disturbance to any protected species present in the vicinity of the works; and
- Should traditional piling works be required, due to the noise and vibration disturbance potential of protected species, the pre-construction surveys will inform any required disturbance buffers. Where traditional piling is unavoidable within these buffers, a derogation licence will be required from NatureScot.

Removal of the most suitable terrestrial habitats for reptiles to be affected by construction activities will be planned to take place outside of the hibernation periods for these species. The probable low density of reptiles within the construction areas does not merit specific searches in advance of construction. Removal of these habitats will be supervised by the ECoW who will halt works where necessary to allow reptiles to be translocated away from the construction area during the works.

For retained trees a Root Protection Area (RPA) will be maintained throughout the duration of the construction phase as per British Standard BS 5837:2012 (BSI, 2012) to ensure the integrity of the tree is maintained. If this is not possible then prior to construction commencing a tree survey will be required by a suitably qualified/ experienced arboriculturist to advise on likely impacts and/ or mitigation. Impact to trees from the development is assessed in Volume III, Appendix G.

8.5.3 Operational Mitigation

Vehicles coming on site for maintenance works would be regularly checked for oil leaks to avoid risk of pollution. Spillage kits will be available. Best practice methodologies during any maintenance works will ensure the prevention of any pollution to habitats or watercourses, along with implementation of the site pollution incident response plan and drainage management plan.

Traffic calming measures will be incorporated onto any access roads within the new development. This will prevent speeding and reduce the likelihood of road mortalities to fauna using the area.

Post-construction management of trees and shrubs will be undertaken outside of the bird nesting season (i.e. works to be undertaken between November and February inclusive). Where works outside of this time cannot be avoided, affected vegetation would be subject to an inspection by a suitably qualified ecologist. If evidence of any nesting activity was identified, works in that area would be delayed until the ecologist confirmed that nesting had finished.

8.6 Residual Impacts

Assuming best practice and mitigation is followed, no notable residual effects are expected on the ecological features present either as a result of the construction or the operational phase of the Proposed Development.

8.6.1 Compensation and Enhancement

In line with the National Planning Policy Framework 4 (Scottish Government, 2023), developments should not result in a loss of biodiversity and where possible should implement measures to increase the existing biodiversity on site. Due to the nature of the Proposed Development, it is anticipated that there would be a loss of 4.ha of woodland, scrub and grassland habitats (1ha permanent direct loss and 3.95ha temporary direct loss), with 0.45ha woodland of ecological value affected. To mitigate for the loss of such habitats a number of measures will be incorporated into the landscape design of the development.

Improvements to water's edge and bank side habitats can deliver a wide range of direct and indirect benefits, including:

- Direct benefits to plants, invertebrates, birds and animals which live on the banks and riparian zone;
- Improvements to in-channel habitats for aquatic plants, fish and invertebrates;
- Improvements to the physical habitat conditions of the watercourse, including the creation of more varied habitat niches;
- Improvements to the aesthetic value of the watercourse and improvements to its recreational value; and
- Reduction in maintenance costs of hard defences.

Measures will be considered as part of the detailed design of the Proposed Development, to allow for new vegetation to establish in order to maintain and protect existing habitat. Tree and shrub planting is proposed as compensation and would aim to create an ecologically diverse riparian zone. A landscaping strategy and planting plan will be developed as part of the detailed design and will be implemented and monitored by the contractor. Areas of environmental betterment and enhancement will be identified in line with Perth and Kinross Council's Green Infrastructure Strategy (2020), Perth and Kinross Local Development Plan (2019) and the Tayside Local Biodiversity Action Plan (2016). Site-specific measures include:

- Trees identified on site will be retained where possible, but compensatory planting along the banks of the South Queich between the hard defence and the watercourse will provide ecological enhancement by creating new nesting and roosting habitat for birds and bats as well as improving the visual aspect in this area. The riparian trees will also provide shading to the watercourse as well as an input of leaf litter which will serve as a food source for aquatic invertebrates (a prey item for brown trout). Where appropriate, broadleaf tree species will be favoured against pine to reduce acidification of the watercourse. More detail on compensatory planting is included in Volume III, Appendix G.
- Additional planting of native trees of local provenance throughout the Proposed Development site will seek to enhance riparian corridors to improve connectivity between Loch Leven and woodland areas to the west of Kinross and create wildlife commuting pathways for species such as red squirrel and bats.
- Artificial bat roosting and bird nesting habitat will be erected on trees, buildings and bridges throughout the Proposed Development where possible.
- Native species of wildflower and ornamental shrub will also be planted throughout the Proposed Development which will provide both a biodiversity and a landscape added value.
- Flood embankments will be constructed where possible with material sourced from earthworks on site (where deemed suitable for re-use). The embankments will be covered in a suitable, biodegradable geotextile, topsoil, and seeded with grasses to blend in with the surrounding landscape.

The Proposed Development will seek to will seek to protect and enhance wildlife and wildlife habitats, taking into account the ecosystems and natural processes in the area. This will be aided by the preparation and implementation of a suitable long-term management plan or a site Biodiversity Action Plan, together with long-term monitoring.

8.7 Potential Cumulative Effects

Section 8.4 considers the implications of the Proposed Development on IEFs in isolation. The CIEEM guidelines also require that the proposed FPS be assessed cumulatively, so any cumulative effects can be identified. Cumulative effects are defined as changes to the environment that are caused by an action in combination with other actions, arising from:

- The interaction between existing and/ or approved projects in the same area; as required by Schedule 4 and Section 5 of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- The interaction between the various impacts within a single project.

The potential interactions between the Proposed Development and other projects are listed in Chapter 18. It is noted that developments that are built and operational at the time of submission are considered part of the existing baseline conditions.

A total of 10 projects located within 1km of the Proposed Development have been considered as potentially adding to a cumulative effect. One of these projects, entailing the erection of four units, formation parking, landscaping, and associated works 20m to the west of the Clash Burn Diversion Culvert appears to have been withdrawn and has not been considered further.

Five projects have had planning permission approved. Each project has a limited footprint, ranging from the installation of a gas metre to the erection of a garden building and extension to a dwelling. The closest of these projects lies 160m southeast of the proposed storage embankment. Due to the small footprint and short time scale associated with each of these projects, it is unlikely that any cumulative effects in conjunction with the Proposed Development would be present.

Four projects are currently awaiting a decision in relation to planning applications. Two of these projects involve the extension of residential dwellings and domestic changes involving a small footprint and short time scale. As such it is considered unlikely that they will add to any cumulative impact. One project involved the sitting of a modular building to an extension to an existing amenity area 145m south-east of the storage embankment. This project will also consist of a small footprint and short time scale, so it is considered unlikely to add to any cumulative impact. The remaining project is the proposed development of a residential area with play area, community facilities, landscaping, access, and associated works north-west of Davis Park, Springfield Road, Kinross. This proposed project is located approximately 300m northwest of the Hopefield Culvert upgrade. A combination of temporary and permanent habitat loss and additional traffic during the construction phase of this project is likely to contribute to the cumulative effect alongside the Proposed Development. However, due to the area holding little significance for scoped in species the cumulative effect is considered to be negligible. The temporal overlap between these four projects and the Proposed Development is to be confirmed.

Overall, the cumulative impact of the South Kinross FPS and proposed projects within 1km of the site are deemed to be of negligible significance to IEFs.

8.8 Conclusion

A suite of desk and field-based assessments have been completed to provide a robust baseline against which potential construction, operational and cumulative effects of the Proposed Development can be assessed. Surveys included liaison with the Fife Nature Records Centre and field surveys for protected species including otters, badgers, red squirrel, bats and fish. Detailed surveys of the habitats and

vegetation present within and surrounding the Proposed Development have been completed including mapping the extent of invasive non-native plant species presence within the site.

Desk based assessments identified one designated site in proximity to the application boundary- Loch Leven NNR, Ramsar Site, SPA and SSSI supports a variety of insect, fish and bird species with an abundance of aquatic plants.

Surveys found the habitats and vegetation present to predominately be of low sensitivity, with the main habitat loss to be a limited area of arable field habitat likely to be lost to the Proposed Development scheme. Surveys for protected species identified the presence of badgers on site and in the surrounding area. The site was assessed as offering potential to support roosting, foraging and commuting bats with at least four species of bat recorded during static detection surveys on the South Queich River. Common and soprano pipistrelle bats exhibited the highest activity levels during the two detector deployment periods.

Although no evidence of otters was recorded in the survey area, the southern section is considered to have high potential to support the species for resting, foraging and commuting. Similarly, no signs of water vole were identified during the field surveys, but the site is not considered to be optimal for the species and as such, is considered unlikely to support them.

The woodland across the survey area has the potential for squirrels to inhabit and forage and a red squirrel was observed during the field surveys, confirming their presence on site. Although no targeted reptile surveys were completed, potential reptile habitat was identified within the site in the form of scrub, grassland and woodland edges.

The fish habitat suitability assessment confirmed that both the Ury and Clash Burns are not suitable for fish, but there is a limited area within the South Queich which is suitable for spawning brown trout. The electrofishing survey found large numbers of brown trout in the South Quiech between Kinross High Street and Loch Leven. The site and surrounding area are considered unsuitable for great crested newt due to the lack of waterbodies to support them, therefore their presence in proximity to the Proposed Development is considered to be unlikely.

The potential effects on IEFs from the Proposed Development have been assessed, taking into account consultation feedback from stakeholders as summarised in Table 8-3.

Effects to Loch Leven NNR, Ramsar Site, SPA and SSSI from the construction of the Proposed Development have been assessed and all are found to be Not Significant, with the implementation of the proposed mitigation measures as outlined.

Effects to habitats from the construction and operation of the Proposed Development have been assessed and are found to be Not Significant.

Effects to protected species from the construction and operation of the Proposed Development have been assessed and all are found to be Not Significant, with the implementation of the mitigation measures as outlined.

Overall, the effects of the Proposed Development are predicted to have no significant effects on designated sites, species or habitats. Following the implementation of good practice, detailed mitigation and enhancement for habitats, and design of flood defence structures to maintain trout spawning sites, no significant environmental effects are predicted as a result of the Proposed Development alone or in combination with other nearby developments.

A summary of predicted effects on Important Ecological Features is provided in Table 8-9.

Table 8-9: Summary of Likely Environmental Effects on Ecology

Receptor	Sensitivity of receptor	Mitigation Measures	Description of impact	Short/medium/long term	Magnitude of impact	Significance of effect	Significant / Not significant
Construction phase							
Designated Sites (Loch Leven)	High	Hydrological mitigation measures	Temporary indirect impact from pollution	Short term	Medium	**Minor adverse**	**Not Significant**
Habitats	Low	Hydrological mitigation measures and clearly defined working area to minimise the unnecessary effect	Permanent direct habitat loss Temporary direct habitat loss	Long term Short term	Low Low	**Minor adverse**	**Not Significant**
Bats	Medium	Pre-construction surveys and construction works during the bat activity season will be during daylight hours.	Permanent direct habitat loss Temporary direct disturbance	Long term Short term	Medium Low	**Minor adverse**	**Not Significant**
Otters	Medium	Hydrological mitigation measures, pre-construction surveys, cover excavations and limit vehicle speed on site.	Temporary indirect impact from pollution Permanent direct habitat loss Temporary direct disturbance	Short term Long term Short term	Medium Medium Low	**Minor adverse**	**Not significant**
Badgers	Low	Pre-construction surveys, cover excavations and limit vehicle speed on site.	Permanent direct habitat loss Temporary direct disturbance	Long term Short term	Low Low	**Minor adverse**	**Not Significant**
Red Squirrels	Low	Pre-construction surveys, cover excavations and limit vehicle speed on site.	Permanent direct habitat loss Temporary direct disturbance	Long term Short term	Low Low	**Minor adverse**	**Not Significant**

Receptor	Sensitivity of receptor	Mitigation Measures	Description of impact	Short/medium/long term	Magnitude of impact	Significance of effect	Significant / Not significant
Fish	Medium	Hydrological mitigation measures	Permanent direct habitat loss Temporary direct disturbance	Long term Short term	Medium Low	**Minor adverse**	**Not Significant**
Operational phase							
Designated Sites (Loch Leven NNR, Ramsar Site and SSSI)	High	Hydrological mitigation measures. Maintain a buffer of 20 m from watercourses, store any on site materials appropriately.	Temporary direct impact from pollution	Short term	Medium	**Minor adverse**	**Not Significant**
Habitats	Low	Hydrological mitigation measures. Maintain a buffer of 20 m from watercourses, store any on site materials appropriately.	Temporary direct impact from pollution Temporary direct disturbance and/or loss of habitat	Short term Short term	Low Low	**Minor adverse**	**Not Significant**
Protected species	Low (badgers, red squirrel); Medium (bats, otters, fish)	Maintain on-site speed limits, follow good practice guidelines for potential construction maintenance works.	Temporary direct impact from pollution Temporary direct disturbance and/or loss of habitat	Short term Short term	Low Low	**Minor adverse**	**Not Significant**

9 CULTURAL HERITAGE & ARCHAEOLOGY

9.1 Introduction

This chapter considers the potential effects of the Proposed Development, during both its construction and operation, upon the historic environment, defined as World Heritage Sites, Scheduled Monuments, Listed Buildings, Conservation Areas, Inventory Gardens and Designed Landscapes, Inventory Battlefields and non-designated archaeological sites and historic assets. The assessment presented here is supported by a baseline report presented as a technical appendix (Volume III, Appendix I).

9.2 Assessment Methodology

9.2.1 Planning Policy Context

Relevant planning policy is provided in the following documents, discussed in greater depth in Volume III, Appendix I.

- National Planning Framework 4 (Scottish Government, 2023);
- Planning Advice Note PAN 2/2011: Planning and Archaeology (Scottish Government, 2011);
- Perth and Kinross Local Development Plan (adopted 2019), Policies 26-31.

9.2.2 Relevant Guidance

The assessment, including baseline studies, has been undertaken in accordance with relevant guidance comprising:

- Standard and Guidance for Historic Environment Desk-Based Assessment (CifA, 2020);
- Environmental Impact Assessment (EIA) Handbook (Historic Environment Scotland (HES) & NatureScot, 2018);
- Principles of Cultural Heritage Impact Assessment in the UK (IEMA, 2021); and
- Managing Change in the Historic Environment: Setting (HES, 2016 updated 2020).

In keeping with Managing Change in the Historic Environment: Setting (ibid, page 8), a staged approach has been adopted in respect of effects relating to setting:

- **Stage 1**: identify the historic assets that might be affected by the Project.
- **Stage 2**: define and analyse the setting by establishing how the surroundings contribute to the ways in which the historic asset or place is understood, appreciated and experienced.
- **Stage 3**: evaluate the potential impact of the proposed changes on the setting, and the extent to which any negative impacts can be mitigated.

Stage 1 has been informed by site visits and forms part of the baseline study. Stages 2 and 3 are contained where relevant in the assessment of effects.

In keeping with the EIA Handbook (HES & NatureScot, 2018), magnitude of impact has been determined in terms of the change in the affected assets' cultural significance.

9.2.3 Study Area

A study area extending 1km from the Proposed Development has been applied (Figure 9-1 to Figure 9-4). This is considered sufficient to identify any heritage assets that might be affected physically by the design, to characterise the archaeological potential of the area and to identify any designated assets that might undergo changes in their setting as a result of the Proposed Development.

9.2.4 Baseline Methodology

A Heritage Statement has been prepared for the Project site and is provided in Volume III, Appendix I. This draws upon the following sources:

- HES datasets;
- Historic Environment Record (HER) data from Perth & Kinross Heritage Trust (PKHT);
- Maps held by the National Library of Scotland;
- Satellite imagery of the Project site; and
- Readily available published sources.

The desk-based research was augmented with a site visit undertaken in April 2023.

9.2.5 Consultation

The scoping response from HES stated that they agreed with the approach proposed in the Scoping Report that assets within their remit (Scheduled Monuments, Category A Listed Buildings, Inventory Gardens and Designed Landscapes and Inventory Battlefields) should be scoped out as no significant effects are likely in respect of them.

9.3 Baseline Scenario

9.3.1 Designated Heritage Assets

The Clash Burn Culvert Diversion/ Upgrade partially lies within the Kinross Conservation Area (Figure 9-2). Aside from this, no designated heritage assets are present within the construction footprint of the Proposed Development or adjacent.

There are 41 Listed Buildings in the Study Area (Figure 9-1 and Figure 9-2). These comprise two at Category A (under a single listing), 22 Category B and 17 Category C. The Category A Listed Buildings relate to Kinross House (LB11200) and are located within the Kinross House (GDL00247) Inventory Garden and Designed Landscape IGDL. This extends to within 100m of the elements of the Proposed Development at its closest point (Figure 9-1). The cultural significance of the house and designed landscape relates to their architectural and historic interest. Their design incorporates Castle Island and

Loch Leven, but planting is designed specifically to isolate them from the town. Consequently, there is no intervisibility between them and the Proposed Development.

Other than Kinross House, the Listed Buildings are for the most part in excess of 140m from elements of the Proposed Development, with most being concentrated around the High Street/ School Wynd/ Brewery Lane area (Figure 9-1 and Figure 9-2). The cultural significance of these relates to their architectural and historic interest and the surrounding townscape. There is no intervisibility between these and the Proposed Development.

The exceptions to the above are The Old Manse (LB36304) and the Mercat Cross (LB36305), which are located on the Sandport adjacent to the eastern Clash Burn Diversion Culvert (Figure 9-1), and Turfhills (LB43207), which is located approximately 80 m to the south of the M90 Embankment (Figure 9-2).

The Old Manse is a late 18th century former manse. It stands gable-end on to the Sandport within a walled garden. Its cultural significance resides in its architectural interest as an example of its kind. Views of the house from the Sandport make a slight contribution to the appreciation of its architectural interest, whilst views from the house to the Sandport make no contribution.

The Mercat Cross is a 17th century or earlier cross mounted on a modern base. It was removed from its original location in 1824 and erected in the small Sandport park in 1955. Its cultural significance resides primarily in its fabric as an example of its kind, but it also provides the focal point for the park; the design of which features three paths radiating from the cross.

Turfhills is an early 19th century house located on the site of an earlier house. Its cultural significance resides in its architectural interest and hence fabric. It is surrounded by trees that curtail views to the surrounding area, including the Proposed Development.

There are no IGDLS aside from Kinross House in the Study Area.

There is one Scheduled Monument in the Study Area: Brunthill settlement (SM7624). This cropmark site is located approximately 800m to the south of the Proposed Development. Its cultural significance relates to its archaeological interest and there is no intervisibility between it and the Proposed Development.

There are no Inventory Battlefields in the Study Area.

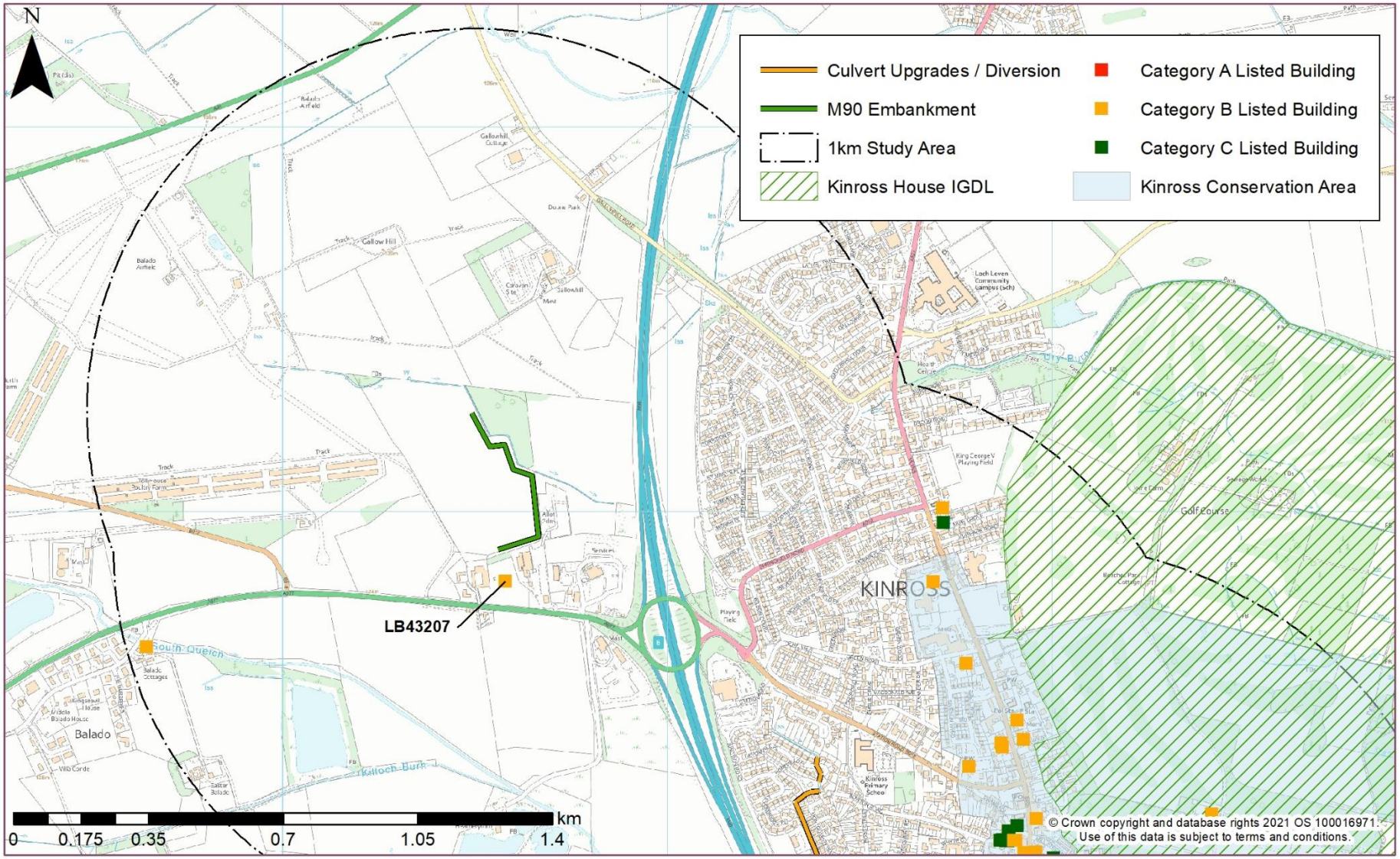


Figure 9-1: Designated Heritage Assets (north) **note final scheme alignments shown in Figure 3-2*

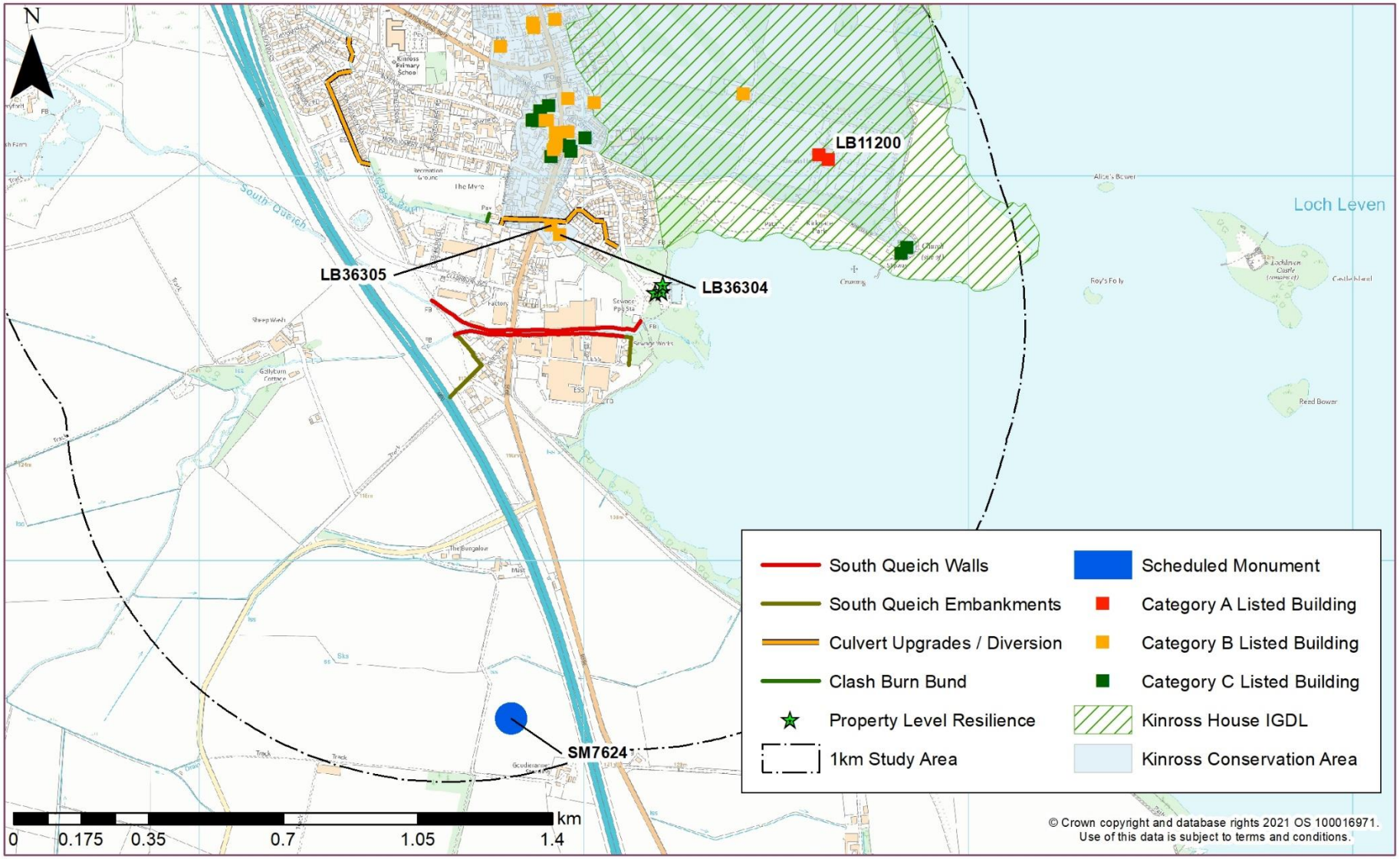


Figure 9-2: Designated Heritage Assets (south) **note final scheme alignments shown in Figure 3-2*

9.3.2 Non-Designated Heritage Assets and Archaeological Potential

The HER holds no records relating to the construction footprint of the Proposed Development.

The archaeological background of the study area and its archaeological potential is considered in general terms in the baseline study (Volume III, Appendix I). The potential of each element of the Proposed Development is considered here to establish the potential for impacts to occur.

It should be noted that the current water level in Loch Leven is the product of works undertaken 1828/30, when the New Gullet drainage canal was excavated. The canal was fed via sluice gates on the loch and regulated water flow for mills on the Leven. This work reduced water levels in the loch by approximately 1.4m, from approximately 108m to 106.6m, with capacity to lower the levels by a further 1.4m, and its area from 1823ha to 1378ha. The loch is therefore fringed by land that was formerly submerged or wetland; drains were cut at around the same time as the canal to bring these areas into agricultural use.

9.3.2.1 M90 Embankment

The M90 Embankment is located within a field over 1km from the historic core of Kinross (Figure 9-3).

Evidence of Prehistoric and Early Medieval activity is sparse in the Study Area, and none is recorded within 800m of the M90 Embankment. It is considered that the potential in relation to these periods is low.

The area in which the M90 Embankment is located is depicted as moorland on Roy's Military Survey (1747-52), with cultivated land and the farmstead of Turfhills (LB43207) immediately to the south. Although 18th century in date, Roy's map generally gives a reliable indication of the pattern of settlement at the end of the Medieval period. Given this, and the absence of recorded evidence of pre-Modern activity in the area, it is considered that there is low potential for hitherto unrecorded archaeology of pre-Modern date to be present.

The Ordnance Survey First Edition (1857) shows the location as fields, and this does not change on subsequent maps. The HER records a Second World War camp (MPK15413) immediately to the east of the M90 Embankment. The extents of the camp are well established from aerial photographs, and it is considered that there is negligible potential for elements of it to be present out with the recorded extents. It is concluded that there is negligible potential in respect of the Modern period.

9.3.2.2 Hopefield Culvert Upgrades & Clash Burn Diversion Culvert

This element of the Proposed Development lies within a modern housing development. The disturbance associated with the construction of the development will have removed any archaeological assets that may have been present. Consequently, this area is considered to have no archaeological potential.

9.3.2.3 Clash Burn Bund

The Clash Burn Bund lies in the south-eastern corner of The Myre, an area of open ground located to the west of Kinross' historic core, now occupied by playing fields and a car park. The Clash Burn runs along its southern boundary.

Evidence of Prehistoric and Early Medieval activity is sparse in the Study Area, and none is recorded within 600m of the Clash Burn Bund. This area is underlain by lacustrine deposits and hence there is some potential that it was within the loch or of wetland character during the Prehistoric period. It is considered that the potential in relation to these periods is low.

Roy's Military Survey (1747-52) shows this area as cultivated land to the west of the plots arrayed along High Street, and it may be assumed that it was also cultivated in the Medieval period. The potential for unrecorded archaeology of this period is considered to be low.

Wood's Plan of Kinross (1823) shows the area now known as The Myre as open ground annotated 'The Myre Commonty'. The Sluice Burn is shown running west/ east, before turning southwards at the eastern limit of the Myre. The Sluice Burn is then depicted as turning east. The Clash Burn appears to enter a culvert at the rear of a plot extending west from High Street.

The First Edition Ordnance Survey map (1857) shows development to the rear of the plots and Smith Street running west from the High Street. The area of The Myre is annotated 'Common', with the canalised Clash Burn forming its southern boundary and Sluice Burn crossing its northern part before turning south and disappearing, presumably into a culvert at the west end of Smith Street. The area is depicted as subdivided and in its south-eastern corner is a building annotated 'Washhouse'. A curling pond is shown to the west.

By the time of the 1896 Ordnance Survey map, the washhouse had been extended. The building remains extant. The western part of The Myre is annotated 'Bleaching Green' on this map.

No change is shown on subsequent maps until that of 1964. This shows a building annotated 'Fire Station' to the north-west of the junction between Smith Street and Myre Terrace and two further buildings to the north, alongside Myre Terrace. The fire station has since been demolished and its location is now occupied by a sports pavilion. The northern buildings have been demolished and the area in which they were located is occupied by a car park.

The area of the bund has demonstrably been open ground throughout the Post-Medieval and Modern periods. The potential for hitherto unrecorded archaeology to be present in the construction footprint of the bund is considered to be negligible.

9.3.2.4 Clash Burn Diversion/ Culvert Upgrade

The Clash Burn Diversion/ Culvert Upgrade runs along Smith Street, crosses High Street and the small park between High Street and Sand Port (Figure 9-4). It then runs along Sandport before turning to follow Nan Walker Wynd. Nan Walker Wynd is a modern development and given the construction

methods generally used and the associated disturbance, it is considered that this section of the Clash Burn Diversion/ Culvert Upgrade has no archaeological potential and is not considered further.

Evidence of Prehistoric and Early Medieval activity is sparse in the Study Area, and none is recorded within 600m of the Clash Burn Diversion/ Culvert Upgrade, aside from a crannog on Loch Leven (MPK3038). This area is underlain by lacustrine deposits and hence there is some potential that it was within the loch or of wetland character during the Prehistoric period. It is considered that the potential in relation to these periods is low.

Roy's Military Survey (1747-52) depicts Kinross as a linear settlement extending along the main road (High Street) between the Queich Burn in the south and the road west to Turfhills. Buildings are shown along the street frontage with plots to their rear. These plots are bounded to the west by cultivated land and uncultivated land to the east. Whilst Roy shows the properties along the western side of High Street as a near continuous terrace, it is evident from later maps, specifically Wood (1823), that this should be taken as indicative. Wood shows that the Sluice Burn crossed the High Street where Smith Street now meets High Street. There was almost certainly therefore a gap in the properties on both the western and eastern sides of the High Street at this location. The potential for hitherto unrecorded Medieval and Post-Medieval archaeology to be present on Smith Street and on the opposite side of High Street is therefore considered to be low.

Wood (1823) depicts the area of the Sandport park as open ground crossed by the meandering Sluice Burn. The Old Manse is shown, and a single building is depicted at the southern limit of the park. This does not appear on subsequent maps.

The First Edition Ordnance Survey map (1857) is the first to show Smith Street. The Sluice Burn is shown as entering a culvert at its western end and re-emerging on the eastern side of High Street at the northern end of the ground that is now the park, indicating it had also been culverted to the east of the High Street. This map also shows a terrace fronting onto Sandport to the north-east of the old Manse (MPK12026). There are no changes on subsequent maps until that of 1965. This shows the park in its current state, with the relocated Mercat Cross (LB36305) in its centre. A small lavatory block is depicted in the south-west, which has since been demolished. The terrace on Sandport has been demolished and replaced by housing.

There is potential for the remnants of a late 18th/ early 19th century building to be present in the park. Aside from this it is considered that the potential for modern features of archaeological interest to be present is negligible.

9.3.2.5 South Queich Hard Defences and Embankments

The South Queich hard defences run along the northern and southern banks of the South Queich from a point approximately 160m from the western shore of Loch Leven (Figure 9-4). On the northern bank they extend approximately 120m west of the confluence between the South Queich and the Gelly Burn. On the southern side they extend approximately 50m along the southern bank of the Gelly Burn. The banks of the burns are steep and likely to be largely the result of canalisation.

Evidence of Prehistoric and Early Medieval activity is sparse in the Study Area but there is a slight cluster to the south of Kinross comprising a settlement (SM7624) and findspots of Bronze Age artefacts (MPK18739, MPK3087 & MPK5211). The closest of these is approximately 600m to the south of the western embankment. There appears to be a correlation between the underlying geology and this cluster, with all being recorded on the slightly higher ground, which is underlain by glaciofluvial gravel, sand and silt. This ground is likely to have been better drained than the lower lying ground around the Queich Burn, which is underlain by lacustrine deposits of clay silt and sand. Furthermore, the banks of the two watercourses have been the subject of extensive disturbance and reworking during the Modern period (see below) which is likely to have disturbed any archaeology that may have been present. It is considered that the potential in relation to the Prehistoric and Early Medieval period is very low.

Roy's Military Survey (1747-52) shows a bridge over the Queich Burn and the properties along High Street stopping short of the Queich Burn's northern bank. The Gelly Burn is depicted as meeting the Queich Burn at *Beleve,* now known as Baleave, approximately 350m to the west of the present-day confluence. Both watercourses are depicted as meandering. The land to the south of the burn is shown as cultivated. To the north the land to the west of the High Street is depicted as cultivated, whilst that to the east is not. The current bridge is undated but appears to be 19th century. There is therefore some potential for remnants of earlier bridges to be present but aside from this it is considered the potential for Medieval or Post-Medieval archaeology is low.

Wood's map (1823) shows the Queich and Gelly Burns in their current arrangement, indicating that between the mid-18th century and 1823, the Queich Burn had been canalised and the Gelly Burn realigned to meet the Queich Burn further to the east. No buildings or other features are shown alongside the watercourses.

The First Edition Ordnance Survey map (1857) illustrates the growth of Kinross as a centre of the textiles industry. This map shows a large building annotated 'Spinning Mill (Worsted)' on formerly vacant land on the northern bank of the Queich Burn, to the east of the bridge (MPK10041). The building is located approximately 15m from the bank. No other buildings or features are shown alongside the watercourses. The map also shows the changes in the course of the Queich Burn at its eastern end and the extents of Loch Leven as a result of the cutting of the New Gullet drainage Canal.

The 1897 Ordnance Survey map shows continued expansion of the textile industry. By this time the spinning mill shown on the First Edition map had been demolished and an entirely new factory built in its place. This comprised an extensive array of buildings, including buildings set back slightly from the bank, amongst which is a terraced row which may represent workers cottages. The southern limit of these buildings corresponds with that of the car park and buildings that currently occupy this area. On the opposite side of the burn, the map shows 'Lochleven Mills (Woolen)' comprising an array of large buildings set back from the burn, with three small buildings near to the bank (MPK10041). Approximately 200m to the east an area annotated 'Filter Beds' is shown. Change to the west of the bridge is restricted to the Inverkeithing to Perth railway, which is shown as crossing both watercourses.

The 1915 map shows a broadly similar situation with regard to the mills. The filter beds are however annotated 'Disused' and are shown as having been partially replaced by a 'Septic Tank'. On the

northern bank to the west of the bridge two very small buildings or structures are shown on the bank, whilst on the opposite side of the burn the formerly open ground is shown as occupied by a saw mill.

No substantive change is shown on the map of 1938. Those of 1951 and 1959 show a substantial expansion of the mill to the south of the river, but no additional buildings along the bank.

By 1969, the terraced row on the north side of the burn had been demolished. The factory buildings to the east are depicted as having been completely remodelled and potentially replaced; this area is now occupied by modern industrial sheds. The mill buildings to the south had likewise been remodelled and extended, with the earlier buildings being incorporated into the new buildings. It is evident that since 1969 the burn has narrowed somewhat as the map depicts the buildings as extending to the southern bank, but they are now set back by around 3m. The 1969 map also shows that the South Queich had been canalised to the west of the railway.

The site visit found that the area to the north of Old Cleish Road showed signs of having been stripped of topsoil in the recent past.

It is concluded that the potential for hitherto unrecorded assets of Modern date is negligible.

9.3.2.6 Property Flood Resilience

These properties date to the late 19th and 20th centuries. They are not identified by the Conservation Area Appraisal as being unlisted buildings of merit and are not considered to represent heritage assets.

9.3.2.7 Future Baseline Conditions

In the absence of the Proposed Development, the cultural heritage baseline is unlikely to change substantively.

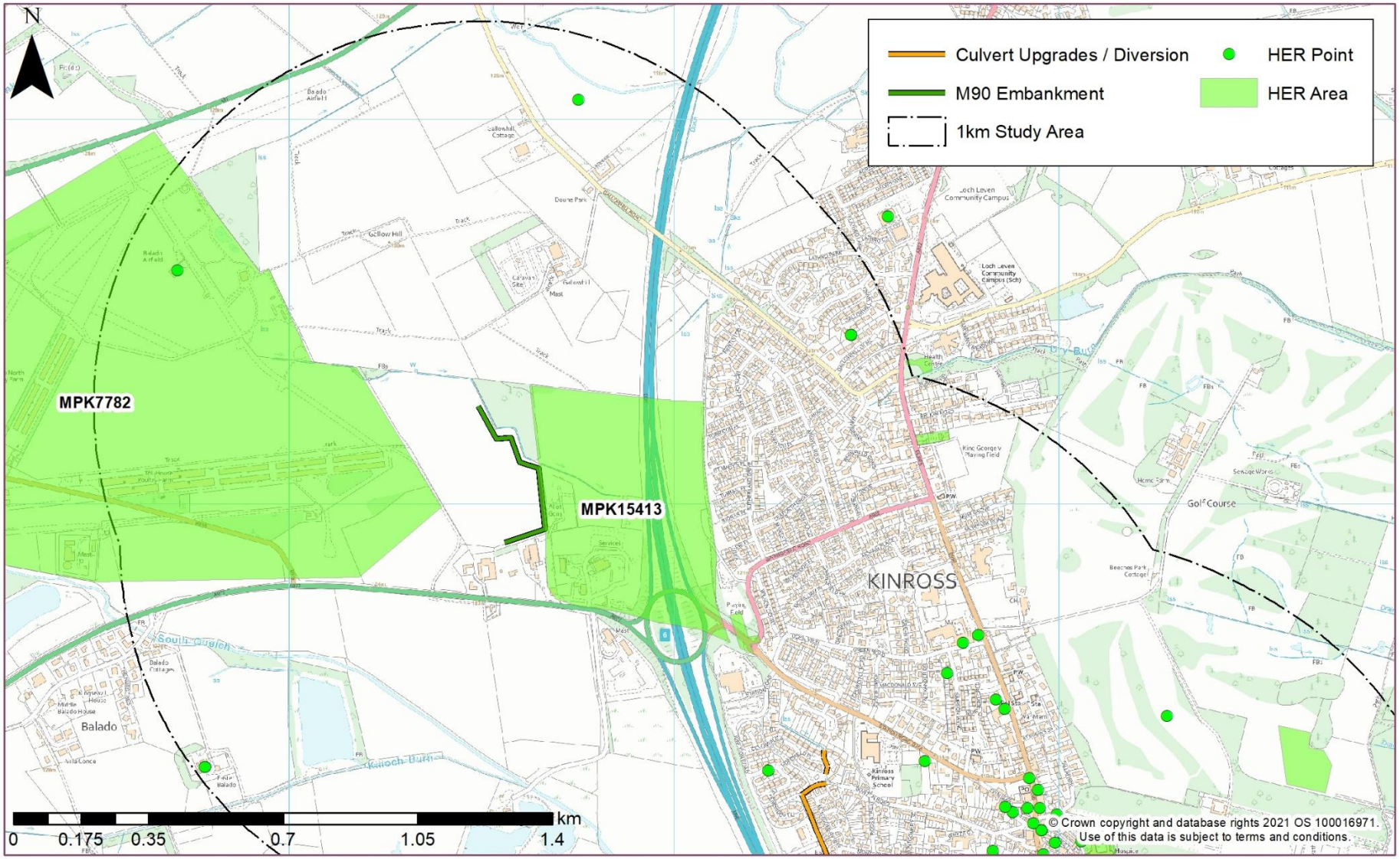


Figure 9-3: HER Entries (north) **note final scheme alignments shown in Figure 3-2*

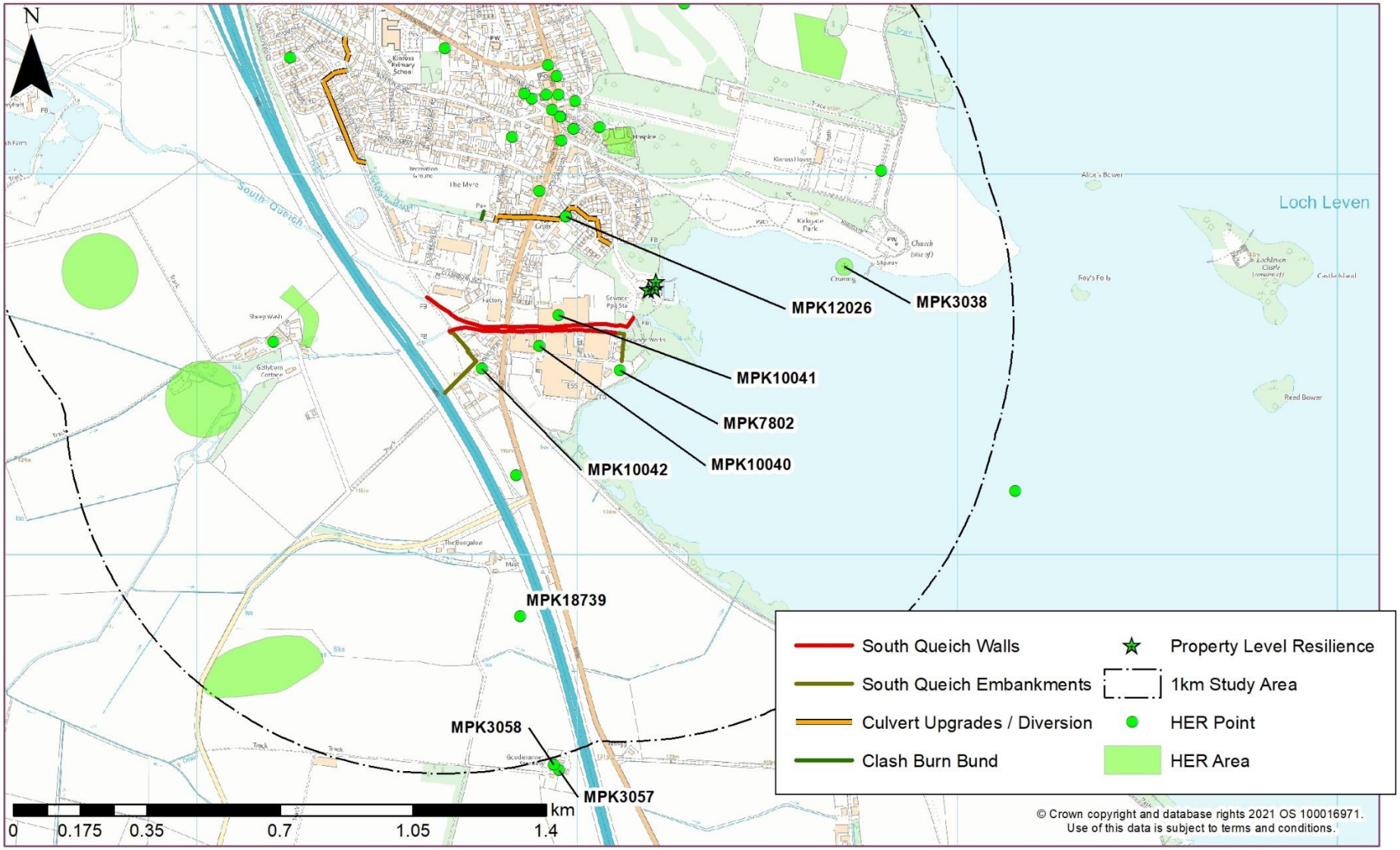


Figure 9-4: HER Entries (south) **note final scheme alignments shown in Figure 3-2*

9.4 Significance of Effects

9.4.1 Introduction

The construction and operational phases of schemes such as the Proposed Development have the potential to result in significant effects in respect of cultural heritage. Significant effects may arise during construction as a result of physical loss of heritage assets or elements thereof, whilst operational effects may occur as a result of change in the setting of heritage assets or the protection and hence conservation of assets as a result of the scheme.

The following sections identify the likely significant effects of the Proposed Development. It takes account of mitigation embedded in the design of the Proposed Development (as outlined in Section 9.5) and assumes best practice construction methods will be in place. In particular, the following measures have been taken into account when considering the likelihood of significant effects:

- The Clash Burn Bund adjacent to the Kinross Conservation Area comprises a low earthwork that in its finished from will be indistinguishable from the existing bank at the eastern end of the Myre.
- The Mercat Cross, a Category B Listed Building, will be fenced off during the construction phase to prevent accidental damage. Heras fencing or similar will be used.
- In the event that walls within the Conservation Area are taken down to facilitate construction, the stone will be retained and used to reinstate the walls to match their pre-construction condition.
- Trees within the Sandport park in the Conservation Area will be protected during the construction phase.

The measures relating to the cross, walls and trees will be secured through the oCEMP.

9.4.2 Methodology & Assessment Criteria

This assessment has been undertaken with reference to current guidance, which advises that assessment should consider change in terms of cultural significance. The guideline criteria for establishing sensitivity of receptors, magnitude of impact and effect significance (Table 9-1 to Table 9-3). Assessment is a matter for professional judgement, but the guidelines are provided to assist consistency and transparency. All effects at ‘moderate’ or above levels will be considered to be significant in the context of the EIA Regulations.

Table 9-1: Guideline sensitivity criteria

Sensitivity	Guideline Criteria
High	Assets valued at a national level, e.g., Scheduled Monuments, Category A Listed Buildings, Inventory Gardens And Designed Landscapes, Inventory Battlefields, Historic Marine Protected Areas, some Conservation Areas and non-designated assets that meet the relevant criteria for designation in the opinion of the assessor. Category B or C-listed buildings where the existing designation does not adequately reflect their value, in the opinion of the assessor.
Medium	Assets valued at a regional level, e.g., Category B listed buildings, some conservation areas and non-designated assets of similar value in the opinion of the assessor. Category C-listed buildings where the existing designation does not adequately reflect their value, in the opinion of the assessor.
Low	Assets valued at a local level, e.g., Category C listed buildings, some conservation areas and non-designated assets of similar value in the opinion of the assessor.

Table 9-2: Guideline Criteria for the Assessment of Magnitude

Magnitude	Typical Descriptors
High	Changes to the fabric or setting of a heritage asset resulting in the complete or near complete loss of its cultural significance, such that it may no longer be considered a heritage asset. (Adverse).
	Preservation of the asset *in situ* where it would be completely or almost completely lost in the do-nothing scenario or removal of elements of the setting that prevent the appreciation of the asset's cultural significance. (Beneficial).
Medium	Changes to the elements of the fabric or setting of the heritage asset that contribute to its cultural significance such that this is substantially altered. (Adverse).
	Changes to key elements of the asset's fabric or setting that result in its cultural significance being preserved, where they would otherwise be lost, or restored. (Beneficial).
Low	Changes to the elements of the fabric or setting of the heritage asset that contribute to its cultural significance such that this is slightly altered (Adverse).
	Changes that result in elements of the asset's fabric or setting that detract slightly from its cultural significance being removed (Beneficial).
Negligible	Changes to fabric or setting that leave significance unchanged.
No Change	No change to the fabric or setting.

Table 9-3: Matrix for Determination of Significant Effects

		Magnitude of change			
		Major	Moderate	Minor	Negligible
Sensitivity	High	Major	Major/Moderate	Moderate	Minor
	Medium	Major/Moderate	Moderate	Moderate/ Minor	Minor
	Low	Moderate	Moderate/Minor	Minor	Minor/Negligible

Significant impacts are in dark shading

9.4.3 Construction Effects

9.4.3.1 Designated Heritage Assets

The construction phase will not affect the fabric of any designated heritage assets. **No effects** relating to the construction phase are predicted in respect of designated heritage assets.

9.4.3.2 Non-Designated Heritage Assets

The construction phase will not affect any known non-designated heritage asset. **No effects** relating to the construction phase are predicted in respect of known non-designated heritage assets.

9.4.3.3 Archaeological Potential

Overall, the archaeological potential for all elements of the Proposed Development, except the Hopefield Culvert Upgrades and Clash Burn Diversion Culvert, is considered to be low in respect of Prehistoric to Post Medieval periods and negligible in respect of the Modern period. There is moderate potential for remains of earlier bridges across the South Queich to be present, but these are likely to underlie the existing bridge. The Hopefield Culvert Upgrades, the Clash Burn Diversion Culvert and the eastern part of the Clash Burn Diversion/ Culvert Upgrade (running along Sandport and Nan Walker Wynd) are located in areas where modern development is likely to have completely removed any archaeology that may have been present.

Given the history of the area, in the event that any unrecorded archaeology is present within the construction footprint, it is likely to have been severely disturbed. It is considered that any such archaeology will have very limited archaeological interest and is unlikely to be of greater than local importance. If present it would be of Low sensitivity. Removal or disturbance would result in the loss of its archaeological interest and hence cultural significance. This would constitute an impact of Major magnitude. It is considered that this would represent a permanent adverse effect of **Moderate** significance. This is not considered significant in the terms of the EIA Regulations. The likelihood of such effects occurring is considered very low.

9.4.4 Operational Effects

9.4.4.1 Designated Heritage Assets

The Proposed Development will not affect the character and appearance of the Kinross Conservation Area, in which it partially lies as all elements of the Proposed Development within the Conservation Area will be buried. There will be no change in the Conservation Area's cultural significance.

The Proposed Development will not affect the setting of any designated heritage assets, including Kinross Conservation Area, owing to there being no intervisibility. There will therefore be no change in any designated heritage asset's cultural significance.

No effects are predicted in respect of the operational phase.

9.5 Mitigation Measures

9.5.1 Construction Phase

No likely significant effects have been identified in relation to the construction phase. Whilst the construction of the Proposed Development could, in theory, affect hitherto unrecorded archaeology, potentially resulting in a significant effect, the likelihood of this occurring is considered very low, such that this possibility cannot be considered a 'likely' significant effect. Any mitigation measures that might be put in place to address this potential would be disproportionate to the likelihood of the impact occurring. Therefore, no mitigation measures are proposed in respect of the construction phase.

9.5.2 Operational Phase

No likely effects have been identified in relation to the operational phase.

Therefore, no mitigation measures beyond those embedded in design and outlined above are proposed.

9.6 Residual Impacts

The construction phase will not affect the fabric of any designated or previously recorded non-designated heritage assets and there is very low likelihood of hitherto unrecorded assets being affected. The operational phase will result in no change in the setting of designated heritage assets and hence will have no impact upon their cultural significance.

Given the embedded mitigation, it is concluded that the Proposed Development will have no residual effects.

9.7 Potential Cumulative Effects

As no effects have been identified in respect of the Proposed Development alone, there is no potential for cumulative effects to arise.

9.8 Conclusions

This Cultural Heritage chapter has considered the potential effects of the Proposed Development upon cultural heritage assets during its construction and operational phases.

Considering mitigation embedded in the design and construction best practice, no likely significant effects have been identified in respect of either the construction or operational phases of the Proposed Development. No additional mitigation measures are recommended.

10 LANDSCAPE & VISUAL

This chapter of the EIAR identifies, describes and presents an assessment of the likely significant effects of the Proposed Development on Landscape and Visual resources during both the construction and operational phases of the development.

The assessment presented within this chapter is informed by the following key chapters of the EIAR:

- **Chapter 3** – Project Description.

The purpose of this Landscape and Visual Impact Assessment (LVIA) is to identify and determine the effects on landscape character, landscape features, visual receptors, and visual amenity as a result of the works associated with the construction and operation of the Proposed Development. Other aspects relevant to the LVIA are addressed in the following specific chapters of the EIAR, which should be read and considered in conjunction with this chapter, namely:

- **Chapter 9** – Cultural Heritage

10.1 Assessment Methodology

10.1.1 General Approach

The methodology and approach to the assessment contained within this chapter has been carried out in accordance with best practice guidance described in the following documents:

- Guidelines for Landscape and Visual Impact Assessment, Third Edition (The Landscape Institute and Institute of Environmental Management & Assessment, 2013) (GLVIA3); and
- Technical Guidance Note 06/19 Visual Representation of Development Proposals (The Landscape Institute, 2019).

GLVIA3 recommends that an LVIA 'concentrates on principles and process' and 'does not provide a detailed or formulaic "recipe"' to assess effects, it being the 'responsibility of the professional to ensure that the approach and methodology adopted are appropriate to the task in hand' (preface to the third edition).

The effects on the landscape resources and visual receptors (people) have been assessed by considering the proposed change in the baseline conditions (the impact of the development) against the type of landscape resource or visual receptor (including the importance and sensitivity of that resource or receptor). These factors are determined through a combination of quantitative (objective) and qualitative (subjective) assessment using professional judgement. The assessment methodology is summarised in Figure 10-1.

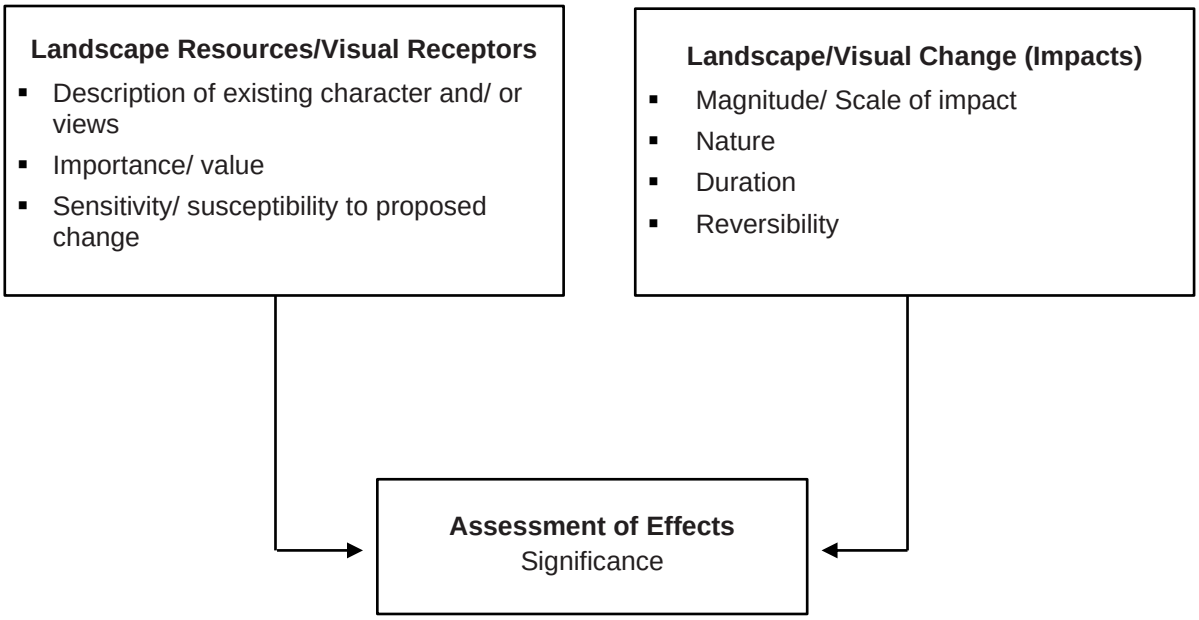


Figure 10-1: Assessment Methodology Summary

The LVIA considers the potential effects of the project upon:

- Individual landscape features and elements;
- Landscape character; and
- Visual amenity and the people who view the landscape.

10.1.2 Identification of Baseline Conditions

Baseline conditions has been identified and assessed through analysis of:

- Up to date digital copies of Ordnance Survey Discovery Series raster and vector maps;
- Aerial photography;
- Perth and Kinross Local Development Plan 2;
- NatureScot Landscape Character Type Assessments (LCTs);
- Perth and Kinross Council; Landscape Supplementary Guidance 2020;
- Historic Environment Scotland – Inventory gardens and designed landscape; and
- Drawings of the proposed development.

Site visits were undertaken to assess the existing environment, to establish the existing visual resource and to identify sensitive receptors, i.e. residential properties, scenic viewpoints. These site visits were also used to consider the potential effects on landscape character and visual impacts arising as a result of the Proposed Development.

10.1.3 Identifying Effects

Assessing the significance of an effect is a key component of the LVIA and is an evidence-based process combining professional judgment on the nature of a landscape or visual receptor's sensitivity, their susceptibility or ability to accommodate change and the value attached to the receptor. It is important to note that judgments in this LVIA are impartial and based on professional experience and opinion informed by best practice guidance.

The effects of a Proposed Development are considered to be of variable duration and are assessed as being of either Temporary (less than 1 year), Short Term (1 to 7 years), Medium (7 to 15 years), Long Term (15 – 60 years) and Permanent (effects lasting over 60 years), and permanent or reversible. Effects are considered to be long-term during the operational phase of the development, whilst operations and infrastructure works apparent during the construction and initial operating period are considered to be temporary, short-term duration.

The reversibility of an effect is also variable. The effects on the landscape and visual resource that occurs during the construction period such as the use of construction machinery are considered to be reversible.

Where effects arise during the construction period, these are most likely to be as a result of movement of construction machinery within the landscape, or construction of new structures and construction activities within the site boundary, all of which are considered to be temporary and short term in duration.

10.1.4 Study Area

Using terrain-modelling techniques combined with the Proposed Development specification a map was created which identified areas from which the Proposed Development may theoretically be visible (refer Volume III, Appendix P). This Zone of Theoretical Visibility (ZTV) is the area within which views of the Proposed Development could theoretically be obtained, determined by the topography of the area only and is representative of a theoretical worst-case scenario in line with current guidance.

The ZTV forms the basis for the study area associated with the Proposed Development for both landscape and visual impact assessment. It is noted that the ZTV does not consider local features such as roadside hedgerows, field boundary hedgerows, woodland planting, coniferous forestry or buildings. In practise the actual visibility of the Proposed Development is considerably less in extent than the theoretical one, since individual elements of the proposal are difficult to focus on at long distances and localised changes in topography, hedges, trees and woodland tend to restrict views.

10.1.5 Assessment Criteria

The objective of the assessment process is to identify and evaluate the predicted significant effects arising from a proposed development. Significance is a function of the:

- Sensitivity of the affected landscape or visual receptors, determined through consideration of the susceptibility of the receptor to the type of change arising from the specific proposals and the value attached to the receptor; and

- Scale or Magnitude, derived from a consideration of the size/scale, geographical extent, duration and reversibility of the proposed development.

These definitions recognise that landscapes vary in their capacity to accommodate different forms of development according to the nature of the receiving landscape and the type of change being proposed.

As with any new development, it is acknowledged that, the introduction of a proposed development into the existing landscape or visual context could cause either a deterioration, improvement or neutral impact on the existing landscape or visual resource.

10.1.6 Landscape Impact Assessment

The LVIA firstly assesses how the Proposed Development would impact directly on any landscape features and resources. This category of effect relates to specific landscape elements and features (e.g. woods, trees, walls, hedgerows, watercourses) that are components of the landscape that may be physically affected by the proposed development, such as the removal or addition of trees and alteration to ground cover.

The LVIA then considers impacts on landscape character at two levels. Firstly, consideration is given to how the landscape character is affected by the removal or alteration of existing features and the introduction of new features. This is considered to be a direct impact on landscape character.

Secondly, the indirect impacts of the Proposed Development on the wider landscape are considered. The assessment of impacts on the wider landscape is discussed using the surrounding character areas identified in the relevant landscape character assessments. It is acknowledged there is an overlap between perception of change to landscape character and visual amenity, but it should be remembered that landscape character is generally derived from the combination and pattern of landscape elements within the view.

The significance of effects on landscape features and character is determined by considering both the sensitivity of the feature or landscape character and the magnitude of impact.

Consideration of the sensitivity of the landscape resource against the magnitude of impact caused by the Proposed Development is fundamental to landscape and visual assessment and these two criteria are defined in more detail below.

10.1.7 Landscape Sensitivity

The determination of the sensitivity of the landscape receptor is based upon an evaluation of the elements or characteristics of the landscape likely to be affected. The evaluation reflects such factors as its quality, value, contribution to landscape character and the degree to which the particular element or characteristic can be replaced or substituted.

GLVIA 3 at paragraph 5.39 states that '*landscape receptors need to be assessed firstly in terms of their sensitivity, combining judgments of their susceptibility to the type of change or development proposed and the value attached to the landscape*.

Susceptibility is defined by GLVIA 3 at paragraph 5.40 as '*the ability of the landscape receptor (whether it be the overall character or quality/condition of a particular landscape type or area, or an individual element and/*

or feature, or a particular aesthetic and perceptual aspect) to accommodate the proposed development without due consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies'.

The value of a landscape receptor is determined with reference to the presence of relevant landscape designations, such National Scenic Areas (NSAs) and their level of importance. For the purpose of this assessment, landscape value is categorised as:

- Very High: Areas of landscape acknowledged through designation such as National Scenic Areas (NSAs) or other landscape based sensitive areas. These are of landscape significance within the wider region or nationally;
- High: Areas that have a very strong positive character with valued and consistent distinctive features that gives the landscape unity, richness and harmony. These are of landscape significance within the district;
- Medium: Areas that exhibit positive character, but which may have evidence of alteration/degradation or erosion of features resulting in a less distinctive landscape. These may be of some local landscape significance with some positive recognisable structure; and
- Low: Areas that are generally negative in character, degraded and in poor condition. No distinctive positive characteristics and with little or no structure. Scope for positive enhancement.

As previously discussed, landscape sensitivity is influenced by a number of factors including susceptibility to change, value and condition. In order to assist with bringing these factors together judgements regarding susceptibility and value have been used which define the landscape resource as being either, negligible, low, medium, high or very high. Table 10-1, below defines the criteria that have guided the judgement as to the overall sensitivity of the Landscape Resource.

Assessments of susceptibility and value of a particular landscape resource may be different and professional judgement will always be used to conclude on the judgement of sensitivity. For example, value may be high, and susceptibility may be low, and a professional judgement will be made to determine whether sensitivity is high, low or in between, supported by narrative explanation.

Table 10-1: Landscape Sensitivity

Definition		Sensitivity
Landscape resource susceptibility	**Landscape resource value**	
Exceptional landscape quality, no or limited potential for substitution. Key elements/features well known to the wider public. Little or no tolerance to change	Nationally/internationally designated/ valued landscape, or key elements or features of national/ internationally designated landscapes. Little or no tolerance to change	Very High
Strong/distinctive landscape character; absence of landscape detractors. Low tolerance to change.	Regionally/nationally designated/ valued countryside and landscape features. Low tolerance to change.	High
Some distinctive landscape characteristics; few landscape detractors. Medium tolerance to change.	Locally' regionally designated/ valued countryside and landscape features. Medium tolerance to change.	Medium
Absence of distinctive landscape characteristics; presence of landscape detractors. High tolerance to change	Undesignated countryside and landscape features. High tolerance to change	Low
Absence of positive landscape characteristics. Significant presence of landscape detractors. High tolerance to change	Undesignated countryside and landscape features. High tolerance to change	Negligible

10.1.8 Magnitude of Landscape Effect

The effect on landscape receptors and the overall judgement of the magnitude of landscape effect is based on combining judgements on '*size or scale, the geographic extent of the area influenced, and its duration and reversibility'* (GLVIA3, paragraph 5.48),

Direct resource changes on the landscape character in the study area are brought about by the introduction of the Proposed Development and its impact on the key landscape characteristics. Judgements regarding the magnitude of landscape impact are indicated in Table 10-2 below.

Table 10-2: Magnitude of Landscape Impact

Definition	Magnitude of Impact
Total loss or addition or/very substantial loss or addition of key elements / features / patterns of the baseline, i.e., pre-development landscape and/ or introduction of dominant, uncharacteristic elements with the attributes of the receiving landscape	Large
Partial loss or addition of or moderate alteration to one or more key elements/features/patterns of the baseline, i.e., pre-development landscape and/or introduction of elements that may be prominent but, may not necessarily be substantially uncharacteristic with the attributes of the receiving landscape.	Medium
Minor loss or addition of or alteration to one or more key elements/features/patterns of the baseline, i.e., pre-development landscape and or introduction of elements that may not be uncharacteristic with the surrounding landscape.	Small

Definition	Magnitude of Impact
Very minor loss or addition of or alteration to one or more key elements/features/patterns of the baseline, i.e., pre-development landscape and/or introduction of elements that are not uncharacteristic with the surrounding landscape approximating to a 'no-change' situation.	Negligible
No loss, alteration or addition to the receiving landscape resource	No change

10.1.9 Visual Impact Assessment

As outlined in GLVIA 3 (Paragraph 6.1) 'An assessment of visual effects deals with the effects of change and development on the views available to people and their visual amenity'. The assessment of effects on views is an assessment of how the introduction of a proposed development will affect views within the study area. The Assessment of visual effects therefore needs to consider:

- Direct impacts of a proposed development upon views of the landscape through intrusion or obstruction;
- The reaction of viewers who may be affected, e.g., residents, walkers, road users; and
- The overall impact on visual amenity.

10.1.10 Sensitivity of Visual Receptors

For visual receptors, judgements of susceptibility and value are closely interlinked. For example, the most valued views are likely to be those which people go and visit because of the available view. The value attributed to visual receptors also relates to the value of the view – for example a National Trail is nationally valued for its access, not necessarily for its views.

Paragraph 6.32 of the GLVIA refers to the susceptibility of different visual receptors to changes in views and states that susceptibility is mainly a function of "*the occupation or activity of different people experiencing the view at particular locations*" and "*the extent to which their attention or interest may therefore be focused on the views and the visual amenity they experience at particular locations*."

Other factors affecting visual sensitivity include:

- The location and context of the viewpoint;
- The expectations and occupation or activity of the receptor; and
- The importance of the view.

Judgements on the overall visual sensitivity/ susceptibility are provided in Table 10-3 below and overall sensitivity of the visual resource is based on combining judgements on the sensitivity of the human receptor (for example resident, commuter, tourist, walker, recreationist or worker, and the numbers of viewers affected) and judgements on the visual resource value (for example views experienced from residential properties, workplace, leisure venue, local beauty spot, scenic viewpoint, commuter route, tourist route or walkers' route).

Table 10-3: Visual Receptor Sensitivity

Definition	Sensitivity
Visual Receptor Sensitivity	
Observers, drawn to a particular view, including those who have travelled to experience the views. Little or no tolerance to change	Very High
Observers enjoying the countryside from their homes or pursuing quiet outdoor recreation are more sensitive to visual change. Little tolerance to change	High
Observers enjoying the countryside from vehicles on quiet/promoted routes are moderately sensitive to visual change. Medium tolerance to change	Medium
Observers in vehicles or people involved in frequent or infrequent repeated activities are less sensitive to visual change. High tolerance to change	Low
Observers in vehicles or people involved in frequent or frequently repeated activities are less sensitive to visual change. High tolerance to change	Negligible

10.1.11 Magnitude of Visual Effects

The magnitude of impact on the visual resource results from the scale of change in the view, with respect to the loss or addition of features in the view, and changes in the view composition. Important factors to be considered include proportion of the view occupied by the Proposed Development, distance and duration of the view. Other vertical features in the landscape and the backdrop to the proposed development will all influence resource change. Judgements regarding the magnitude of visual impact are provided in Table 10-4.

Table 10-4: Magnitude of Visual Impact

Definition	Magnitude
Complete or very substantial change in view dominant involving complete or very substantial obstruction of existing view or complete change in character and composition of baseline, e.g., through removal of key elements	Large
Moderate change in view: which may involve partial obstruction of existing view or partial change in character and composition of baseline, i.e., pre-development view through the introduction of new elements or removal of existing elements. Change may be prominent but would not substantially alter scale and character of the surroundings and the wider setting. Composition of the view would alter. View character may be partially changed through the introduction of features which, though uncharacteristic, may not necessarily be visually discordant	Medium
Minor change in baseline, i.e., pre-development view - change would be distinguishable from the surroundings whilst composition and character would be similar to the pre change circumstances.	Small
Very slight change in baseline, i.e., pre-development view - change barely distinguishable from the surroundings. Composition and character of view substantially unaltered.	Negligible
No alteration to the existing view	No change

10.1.12 Significance of Effects

The purpose of this LVIA is to determine, in a transparent way, the likely significant landscape and visual effects of the Proposed Development. It is accepted that, due to the nature and scale of development, the Proposed Development could potentially give rise to some notable landscape and visual effects.

GLVIA3 identifies that '…*a final judgment is made about whether or not each effect is likely to be significant. There are no hard and fast rules about what effects should be deemed 'significant' but LVIAs should always distinguish clearly between what are considered to be significant and non-significant effects*'.

Significance can only be defined in relation to each particular development and its specific location. The relationship between receptors and effects is not typically a linear one. It is for each LVIA to determine how judgements about receptors and effects should be combined to derive significance and to explain how this conclusion has been arrived at.

The identification of significant effects would not necessarily mean that the effect is unacceptable in planning terms. What is important is that the likely effects on the landscape and visibility are transparently assessed and understood in order that the determining authority can bring a balanced, well-informed judgement to bear when making the planning decision.

The significance of effects on landscape, views and visual amenity have been judged according to a six-point scale: Substantial, Major, Moderate, Minor, Negligible or None as presented in Table 10-5 below, which contains a description of the significance of effect criteria.

Table 10-5: Significance of Effect Criteria

Significance of Effect	Landscape Resource	Visual Resource
None	Where the project would not alter the landscape character of the area.	Where the project would retain existing views.
Negligible	Where proposed changes would have an indiscernible effect on the character of an area.	Where proposed changes would have a barely noticeable effect on views/visual amenity.
Minor	Where proposed changes would be at slight variance with the character of an area.	Where proposed changes to views, although discernible, would only be at slight variance with the existing view.
Moderate	Where proposed changes would be noticeably out of scale or at odds with the character of an area.	Where proposed changes to views would be noticeably out of scale or at odds with the existing view.
Major	Where proposed changes would be uncharacteristic and/or would significantly alter a valued aspect of (or a high quality) landscape.	Where proposed changes would be uncharacteristic and/or would significantly alter a valued view or a view of high scenic quality.
Substantial	Where proposed changes would be uncharacteristic and/ or would significantly alter a landscape of exceptional landscape quality (e.g., internationally designated landscapes), or key elements known to the wider public of nationally designated landscapes (where there is no or limited potential for substitution nationally).	Where proposed changes would be uncharacteristic and/or would significantly alter a view of remarkable scenic quality, within internationally designated landscapes or key features or elements of nationally designated landscapes that are well known to the wider public.

For the purposes of this assessment those effects indicated, in Table 10-6, as being Substantial or Major to Substantial are regarded as being significant. Effects of 'Minor to Moderate' and lesser significance have been identified within the assessment, though are not considered significant. For those effects indicated as being of 'Moderate' or 'Moderate to Major' the assessor has exercise professional judgement in determining if the effect is considered to be significant, taking account of site specific or location specific variables which are given different weighting in each instance according to location.

Table 10-6: Significance of effects matrix

Magnitude of Impact	Sensitivity				
	Negligible	Low	Medium	High	Very High
No Change	No Change	No Change	No Change	No Change	No Change
Negligible	Negligible	Negligible to Minor	Negligible to Minor	Minor	Minor
Small	Negligible to Minor	Negligible to Minor	Minor	Minor to Moderate	Moderate to Major
Medium	Negligible to Minor	Minor	Moderate	Moderate to Major	Major to Substantial
Large	Minor	Minor to Moderate	Moderate to Major	Major to Substantial	Substantial

A conclusion that an effect is 'significant' should not be taken to imply that the Proposed Development is unacceptable. Significance of effect needs to be considered with regard to the scale over which it is experienced and whether it is beneficial or adverse.

10.2 Baseline Scenario

10.2.1 General Overview

The site for proposed embankments associated with upstream works included in the Proposed Development is located on land to the west of Kinross with remaining elements of the proposal, including culverts, embankments and hard defences adjacent to the South Queich River located within the built form associated with southern extent of Kinross (refer Drawing IBE1585_OD_2000).

Land associated with the Upstream Works are comprised of a single agricultural field utilised for arable purposes to the immediate east of Balado Toll Poultry Farm. Northern and western boundaries of this single, large-scale field are defined by vegetation associated with the Ury Burn and field boundary vegetation not utilised for agricultural purposes. Lands associated with the single field are open and level in nature, though views of the field from surrounding road networks become partially screened by roadside hedgerows, scattered single trees and scattered groups of mixed species woodland planting and coniferous shelterbelt planting associated with neighbouring farmsteads. South-eastern and southern boundaries of this field lie adjacent to Caulders Garden Centre, where boundaries become more defined by mixed species broadleaved tree planting. Western boundaries of the field are defined by an existing access track only, with no vegetation forming the boundary.

Remaining portions of the Proposed Development are all located within the existing built form associated with Kinross. Lands associated with the culvert upgrade proposed at Hopefield Place are comprised of remnant land and open space provision within an existing residential area which includes single storey dwellings and a small number of two storey residential dwellings within a cul-de-sac development.

Lands associated with the proposed Clash Burn diversion culvert, are associated with existing pedestrian access routes, and path networks to the immediate west of existing residential dwellings associated with Montgomery Way. The majority of dwellings in the vicinity of this portion of the Proposed Development are single storey dwellings with larger, two storey dwellings located around individual cul-de-sacs. The southern extent of this portion of the works ties into existing recreational facilities, including playing fields to the south of Montgomery Street. Southern boundary of the recreational area is well defined by mature trees, which forms a well-defined boundary with adjacent larger scale industrial units. The proposed Clash Burn Bund, is located on a small, eastern portion of these recreational lands, where boundaries are open and defined by a mix of timber board fencing associated with a single residential property and timber bollards and low embankments which form the boundary of the sports building/facility called the 'The Myre'.

Lands associated with the Smith Street Diversion Culvert, traverse through the existing built form associated with the older portion of Kinross, where built form is single storey, stone built/ stone faced and forms a historical part of Kinross. Existing open space, formed by parkland area lying between High Street and Sandport forms interest and variety within the existing built form. Eastern portions of this portion of the works traverse through more modern, two storey residential development. Portions of this section of the Proposed Development traverse through the Kinross Conservation Area.

Lands associated with the hard defences lie immediately north and south of the South Queich River, which bisects existing, mixed industrial use buildings of varying form and finish to the south of Kinross. Lands associated with the existing river corridor are well vegetated, with maturing mixed species broadleaved trees forming a well-defined corridor, which provides partial screening of adjacent built form from surrounding residential properties.

Lands to the west of Kinross are influenced by the built form of Kinross with main transport corridors, including the M90 and A977, forming important connectivity with surrounding developments north, south and west.

10.2.2 NatureScot Landscape Character Type

A review of the National Landscape Character Type Assessment completed by NatureScot, has identified that the Proposed Development is located within a single Landscape Character Type's (LCT), identified as Lowland Basins (LCT 390), which is heavily influenced at a local level by the existing built form of Kinross and the A90 transport corridor to the immediate west of the town.

10.2.2.1 Lowland Basins (LCT 390)

A review of the accompanying information, provided by NatureScot, has identified that this LCT occurs in two locations, the first of these is occupied by Loch Leven in the extreme south of Tayside, enclosed by the Lomond and Cleish Hills to the east and south, and by the Ochils to the north and extending to the West up the flat valleys of the Queich River and Glendey Water and to the south east along the River Leven. The second of these is the Montrose Basin, a broad tidal estuary cut off from the sea by the spit of land occupied by the town of Montrose and enclosed by harder volcanic rocks to the north and south.

The relevant portion of LCT 390 is the area occupied by Loch Leven, enclosed by the Lomond and Cleish Hills to the east and south and the Ochils to the north. In respect of key characteristics, the description provided by NatureScot, identifies the following:

- *Broad basins formed where sandstones have been eroded away leaving harder enclosing rocks.*
- *Flat, relatively low-lying landform with strong horizontal composition.*
- *Extensive mudflats, reinforce openness and flatness of landscape, and dynamic character reinforces by presence of large populations of birds, and reflections of sky. Open, large scale, regular, tended pattern of fields on fringes of waterbodies.*
- *Rich natural heritage, particularly migratory and wading birds.*
- *Historic sites and associations.*
- *Dominance of water, sky and distant shores.*
- *Diverse, calm, settled and (away from main roads and other discordant elements) the quiet, calm and balanced ambience.*
- *Views are wide and panoramic across the basins along strong visual links to adjacent landscape types.*

The Landscape Character description associated with LCT 390, identifies the following elements associated with the portion of the LCT within which the Proposed Development sits:

- ***Landform*** *– Loch Leven was formed at the end of the last Ice Age as retreating ice sheets, which had scoured a hollow between the Lomond Hills, Cleish Hills and the Ochils, deposited a mass of fluvio-glacial sand and gravel, impounding a shallow loch surrounded by extensive areas of marsh and wetland. It is dominated by soils of humus iron podzols with gleys and peaty gleys derived from the surrounding hills and with alluvial soils associated with the Loch, the burns, rivers and wetlands. There is an area of valley peat at Portmoak at the foot of the Lomond Hills. The Basin is characteristically flat except for some very shallow rising ground towards the west and a series of glacial landform features, eskers, from South Kilduff east to Gellybank.*

- ***Landcover*** *– In the first half of the 19th Century, the level of the loch was lowered by 1.5 metres in order to ensure a steady supply of water to mills along the River Leven and to increase the amount of rentable farmland. Surrounding areas of marsh were drained and improved to provide the basis of the landscape that we see today. Water levels in the loch fluctuate, revealing extensive mudflats during the late summer and early autumn. The area becomes more complex at its western end near the boundary with Clackmannanshire. There is a substantial sand and gravel pit at Craigton with a number of other much smaller scale and mainly disused quarries occurring sporadically across the western part of the Basin.*

  Despite the changes brought by the lowering of water levels and the drainage of the marshes, Loch Leven retains a rich ecology and is designated as an SSSI and an NNR. It is particularly important for birds, accommodating thousands of ducks, migratory geese, swans and waders. The area has a range of natural and planted woodland with Scots pine growing in the drier areas and birch, willow and alder in wetter areas. There are some four substantial softwood forests at Portmoak, Levenmouth, Waterbutts Plantation and Cockairney Feus. Elsewhere there are frequent shelterbelts, small, mixed, softwood and hardwood forests and groups of trees sometimes, but not always, associated with steadings.

- ***Settlement*** *– Historically Loch Leven has been a focus for human settlement and land use. The earliest signs of settlement included a crannog which was destroyed during the 19th Century. Loch Leven has a number of other historic sites including Kinross House, Loch Leven Castle on Castle Island – a prominent landmark - and the Priory on St Self's Island. Several villages and hamlets grew around the fringes of the loch, their industries of weaving, paper making and fishing reliant on the supply of water. The largest of these settlements, particularly Kinross and Milnathort, having expanded over the last century, and both are strongly associated with the Basin in distant views. Both of the towns are contained in a relatively narrow area between the motorway and the Loch. Elsewhere settlements vary in size and form. Kinnesswood has also expanded over the last century, the latter pushing up the slopes of the Lomond Hills. There are small villages on the edge of the Basin and low hills e.g., Dalqueich, Cleish and Scotlandwell and small hamlets in the Basin, e.g., Gairney Bank, Carsegour, and Mawcarse. There is a regular distribution of steadings and other small building groups with some sporadic groups of houses and individual houses.*

  The former airfield at Balado has been redeveloped for intensive poultry units with wooden structured dwellings and a military installation with a distinctive golf-ball like structure which is visible over a wide

area. There are a variety of small-scale commercial uses, a gliding club at Levenmouth, the RSPB Vane Farm Visitor Centre, recreational car parks and picnic sites, camping sites, a golf club, a falconry centre, motorway service centre, and the M90 motorway itself which all contribute to a diverse land use out with the towns. Other roads too are noticeable features in this flat landscape including the A977, A91, B9097, A911, B996, B919 and B920. Some of these roads run around the perimeter of the Basin along the boundary with the low hills. The channelled River Leven's artificially straight course is a prominent feature within the Basin and from surrounding higher land. The Loch Leven Heritage Trail encircles the loch, providing a well-used pathway for use by walkers and cyclists with panoramic views of the loch. New recreational facilities have grown up with easy access to this path, although this does not undermine the unspoilt character of the basin.

The M90 motorway is the most obvious linear feature across the Basin where it is generally a noticeable feature, effectively severing the Loch, visually, from the western part of the Basin. It is a busy landscape with many point features, including the towns of Kinross and Milnathort, the loch itself and its islands, and characteristic castles, houses and steadings. Overhead transmission lines also form locally prominent linear features where the pylons are on the hill tops. Together with the distinctive skylines and slopes of the surrounding hills, views of the Loch provide a unique sense of place.

- ***Perception** – The overall impression is of a very broad, shallow basin within which, particularly at the eastern end, water and sky, together with the enclosing hills are the dominant landscape elements. Away from the towns and the Loch, the Basin is characteristically an open, large scale, flat rather angular and often diverse landscape. It is textured, locally and seasonally colourful, generally balanced, regular, calm, tended and safe. The wildfowl on, over and flying around the Loch are an important part of the landscape experience.*

10.2.3 Landscape Policies – Perth and Kinross Local Development Plan

A review of the current, adopted Perth and Kinross Local Development Plan 2 (LDP 2019) has identified the following policies of relevance to this LVIA;

Policy 1: Placemaking; Policy 1A

Development must contribute positively to the quality of the surrounding built and natural environment. All development should be planned and designed with reference to climate change, mitigation and adaptation. The design, density and siting of development should respect the character and amenity of the place, and should create and improve links within and, where practical, beyond the site. Proposals should also incorporate new landscape and planting works appropriate to the local context and the scale and nature of the development.

Policy 1: Placemaking; Policy 1B

All proposals should meet all the following placemaking criteria:

a. Create a sense of identity by developing a coherent structure of streets, spaces, and buildings, safely accessible from its surroundings.

b. Consider and respect site topography and any surrounding important landmarks, views or skylines, as well as the wider landscape character of the area.

c. The design and density should complement its surroundings in terms of appearance, height, scale, massing, materials, finishes and colours.

d. Respect an existing building line where appropriate or establish one where none exists. Access, uses, and orientation of principal elevations should reinforce the street or open space.

e. All buildings, streets, and spaces (including green spaces) should create safe, accessible, inclusive places for people, which are easily navigable, particularly on foot, bicycle and public transport.

f. Buildings and spaces should be designed with future adaptability, climate change and resource efficiency in mind wherever possible.

g. Existing buildings, structures and natural features that contribute to the local townscape should be retained and sensitively integrated into proposals.

Policy 29: Gardens and Designed Landscapes

Gardens and designed landscapes make a significant contribution to the character and quality of the landscape in Perth and Kinross. The Council will seek to manage change in order to protect and enhance the integrity of those sites included on the current Inventory of Gardens and Designed Landscapes. The Council may require the submission of a management plan with any application for development within areas included in the current Inventory.

As resources permit, the Council will continue with the process of identification of non-Inventory sites in Perth and Kinross and the associated task of devising an approach to their future management.

Policy 31: Other Historic Environment Assets

There is also a range of non-designated historic assets and areas of historical interest, including historic landscapes, other gardens and designed landscapes, historical woodlands and routes which do not have statutory protection. These resources are however, an important part of Scotland's heritage and the Council will seek to protect and preserve significant resources as far as possible, in situ wherever feasible.

Policy 39: Landscape

Development and land use change, including the creation of new hill tracks, should be compatible with the distinctive characteristics and features of Perth and Kinross's landscapes; which requires reference to the Tayside Landscape Character Assessment. Accordingly, development proposals will be supported where they do not conflict with the aim of maintaining and enhancing the landscape qualities of Perth and Kinross. They will need to demonstrate with reference to an appropriate landscape capacity study that either in the case of individual developments, or when cumulatively considered alongside other existing or proposed developments:

a. they do not erode local distinctiveness, diversity and quality of Perth and Kinross's landscape character areas, the historic and cultural dimension of the area's landscapes, visual and scenic qualities of the landscape, or the quality of landscape experience;

b. *they safeguard views, viewpoints and landmarks from development that would detract from their visual integrity, identity or scenic quality;*

c. *they safeguard the tranquil qualities of the area's landscapes;*

d. *they safeguard the relative wildness of the area's landscapes including, in particular, the areas identified on the 2014 SNH Wild Land Areas map;*

e. *they provide high-quality standards in landscape design, including landscape enhancement and mitigation schemes when there is an associated impact on a landscape's qualities;*

f. *they incorporate measures for protecting and enhancing the ecological, geological, geomorphological, archaeological, historic, cultural and visual amenity elements of the landscape; and (g) they conserve the experience of the night sky in less developed areas of Perth and Kinross through design solutions with low light impact.*

Development which would affect a Wild Land Area, as defined on the 2014 SNH map of Wild Land Areas, will only be permitted where the Council as Planning Authority is satisfied that it can be demonstrated that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation.

Local Landscape Areas (LLAs) are the local landscape designation. Development should only be permitted where it will not have a significant adverse impact on their special character or qualities, or where these impacts are clearly outweighed by social and economic benefits that are more than of local significance to Perth and Kinross.

Policy 40: Forestry, Woodland and Trees, Policy 40A:

The Council will support proposals which:

a. *deliver woodlands that meet local priorities as well as maximising benefits for the local economy, communities, sport and recreation and environment;*

b. *protect existing trees/woodland including orchards, especially those with high natural, historic and cultural heritage value;*

c. *seek to expand woodland cover in line with the guidance contained in the Perth and Kinross Forest and Woodland Strategy Supplementary Guidance;*

d. *encourage the protection and good management of amenity trees, or groups of trees, important for visual amenity, sport and recreation or because of their cultural or heritage interest;*

e. *ensure the protection and good management of amenity trees, safeguard trees in Conservation Areas and trees on development sites in accordance with BS5837 'Trees in Relation to Construction'; and*

f. *seek to secure establishment of new woodland in advance of major developments where practicable and secure new tree planting in line with the guidance contained in the Perth and Kinross Forest and Woodland Strategy. The planting of native trees and woodland will be sought where it is appropriate.*

Policy 40: Forestry, Woodland and Trees, Policy 40B:

Tree surveys, undertaken by a suitably qualified professional, should accompany all applications for planning permission where there are existing trees on a site. The scope and nature of such surveys will reflect the known or potential amenity, nature conservation and/or recreational value of the trees in question and should be agreed in advance with the Council.

The Council will follow the principles of the Scottish Government Policy on Control of Woodland Removal and developers are expected to fully accord with its requirements. In accordance with that document, there will be a presumption in favour of protecting woodland resources except where the works proposed involve the temporary removal of tree cover in a plantation, which is associated with clear felling and restocking.

In exceptional cases where the loss of individual trees or woodland cover is unavoidable, the Council will require mitigation measures to be provided.

10.2.4 Landscape Designations - Perth and Kinross Local Development Plan

As mentioned previously, the Proposed Development site lies wholly within an area covered by the LDP 2019. Relevant identified designations are listed below.

10.2.4.1 Local Landscape Areas

A review of the LDP 2019 and the accompanying Landscape Supplementary Guidance (2020) has identified that the Proposed Development lies adjacent to the western boundary of a single Local Landscape Area (LLA), identified as Loch Leven and Lomond Hills LLA. The description associated with the Loch Leven and Lomond Hills LLA, identifies the following elements:

- *Statement of Significance – Loch Leven is a feature of central significance within Perth and Kinross and is important in Scottish history generally. Its deep links with historical events give rise to strong associations with the monastic heritage of Scotland and with the life of Mary, Queen of Scots. Framed by the dramatic slopes of Benarty to the south and Bishop Hill to the east, Loch Leven is also a highly scenic location, readily accessible and visible to residents, visitors and those passing on the M90.*

  Loch Leven itself covers around 13 km^2, following a reduction in the water level in the 19th century, and remains one of the largest lochs of lowland Scotland. It contains two small islands. St Serf's Inch is the site of a priory founded in the 11th century, replacing an earlier monastic community, and which was occupied until the 16th century. Loch Leven Castle is located on the smaller Castle Island and was long a property of the Douglas family. Mary, Queen of Scots was imprisoned here in the 16th century. At the end of the 18th century Sir William Bruce built Kinross House on the loch side, aligning his gardens towards the castle in a gesture combining history and landscape.

  The parkland surroundings of Kinross House dominate the western side of the loch, separating the settlement from the waterside. The other shores are lined with native woodland or open farmland, with large areas of wetland habitat for migrating birds at the National Nature Reserve and RSPB's Vane Farm Reserve and Visitor Centre. It is also a Ramsar Site, SPA and SSSI. A footpath and cycleway now runs around the entire circumference of the loch, with artworks placed along the route.

To the south the land rises sharply to the distinctive hill of Benarty which lies on the Fife boundary. To the east similarly steep hills rise above Kinesswood and Scotlandwell to the crags of Bishop hill and Munduff Hill. Both hill groups offer accessible walking and panoramic views over Kinross-shire and beyond. Between the hills the River Leven exits the loch via the 19th century sluice house.

- *Special Qualities*
    - *Contrast between the broad, flat loch, farmed foothills and steep surrounding hills.*
    - *Striking and dramatic form of Benarty and the Lomond Hills seen from the loch side, from Kinross and the M90.*
    - *Historically a focus for human settlement and land use, with a key relationship between Kinross, Kinross House and Loch Leven Castle.*
    - *Essential sport and recreation resource for the region, suiting a broad range of users, e.g. gliding and bird watching as well as walking and cycling.*
    - *The expanse of open water fringed with wetland with wooded fringes providing an internationally important ecological habitat for birds is recognised and widely appreciated.*

10.2.4.2 Gardens and Designed Landscapes

The Inventory of Gardens and Designed Landscapes (IGDL), under the remit of Historic Environment Scotland (HES) has prepared surveys of GDL's within Scotland. The Proposed Development does not overlap directly with any features in the IGDL.

The closest GDL has been identified as:

- Kinross House (GDL00247); located approximately 0.2 km north of the eastern portion of the South Queich River defences section of the Proposed Development. A small portion of the southern boundary of the GDL is predicted to experience theoretical visibility of the Proposed Development, however due to screening provided by intervening vegetation including shelterbelt planting and mixed woodland planting along the shoreline of Loch Leven it is considered that predicted visibility is prevented and as such the GDL is predicted to experience no direct or indirect effect as a consequence of the Proposed Development and is therefore not considered further within this assessment.

10.2.4.3 Long Distance Walking Routes

A review of the available information in relation to Long Distance Walking Routes, has identified that there are no identified routes within close proximity to the Proposed Development.

10.2.4.4 Core Paths Network

A number of Core Paths (Figure 10-2) lie within close proximity to the Proposed Development, within the built form of Kinross, and have been identified from the available GIS information associated with the LDP.

Identified Core Paths include:

- Station Road to Bowton Road at Kinross Primary School (Core Path ID KROS/127); a 0.2km long route located approximately 80 m east of the Hopefield Place Culvert Upgrade section of the Proposed Development;
- 46/3 High Street via Auction Mart to Boathouse access (Core Path ID KROS/3); a 0.4km long route located approximately 62 m north of the South Queich River defence section of the Proposed Development;
- Lochside path from Boathouse parking area to Kirkgate Park (Core Path ID KROS/111); a 0.1km long route located approximately 160 m north-east of the South Queich River defence section of the proposed Development; and
- Lochside path, Kirkgate Park (from eastern playground) (Core Path ID KROS/ 110); a 0.5km long route along the southern edge of Kirkton Park, located approximately 415m north-east of the South Queich River defence section of the Proposed Development.

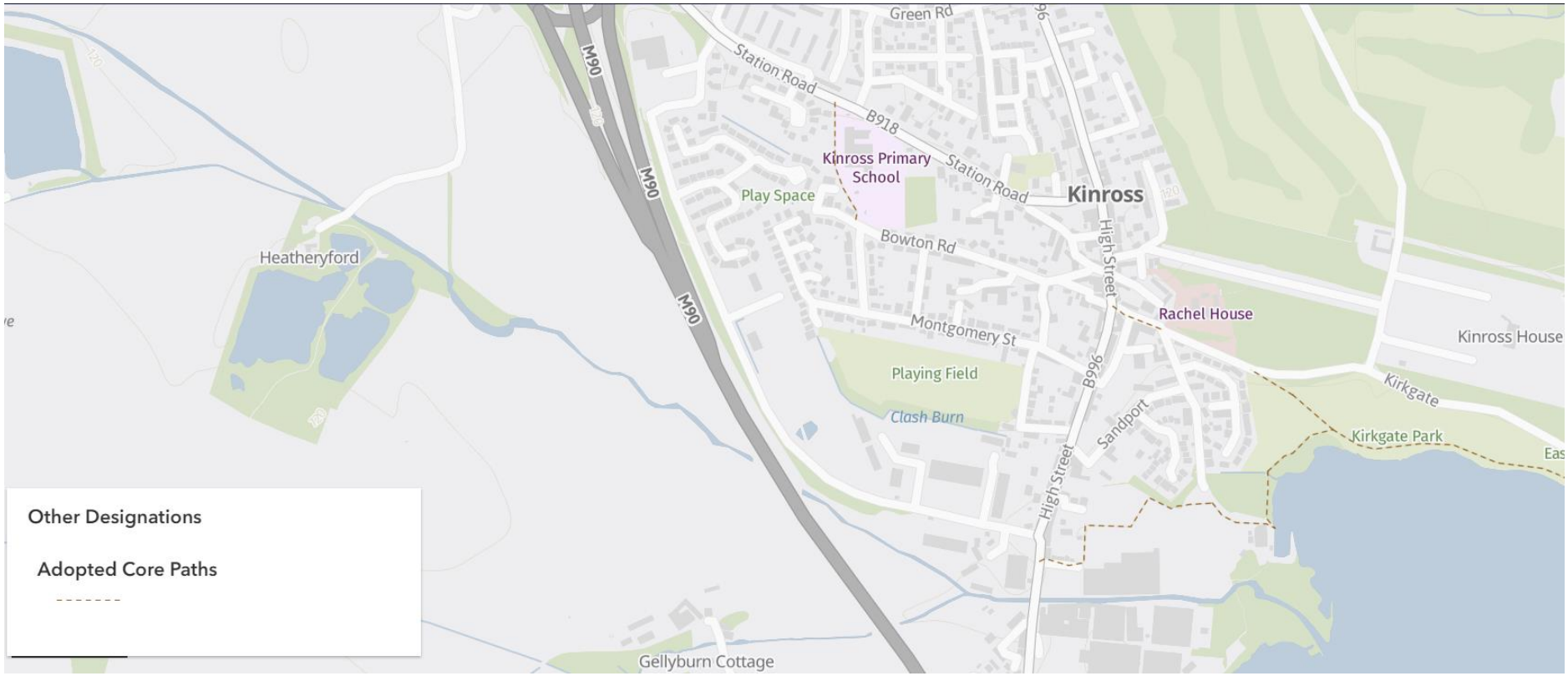


Figure 10-2: Adopted Core Paths (Perth & Kinross Council LDP2)

10.3 Proposed Development

The Proposed Development, as described in Chapter 3, consists of the following components:

- Direct Defences at South Queich / Gelly Burn - including embankments, retaining walls and sheet pile walls;
- Hopefield Place Culvert Upgrade –Culverts upgraded at Hopefield Place;
- Clash Burn Diversion Culvert;
- Clash Burn Bund - a small bund is proposed on The Myre playing fields;
- Clash Burn Diversion Culvert, Smith Street;
- Upstream Storage - An embankment constructed close to the M90.

Where there is potential for minor deviations in respect of project components, for example heights of embankments, bunds and walls above the ground, in all instances the maximum/most onerous design parameter has been applied to ensure a robust "worst case scenario" assessment.

10.4 Landscape Impacts

10.4.1 Landscape Character Area Impacts

The assessment of landscape effects follows the methodology previously described in Section 10.1 and considers those effects which are predicted to occur during the construction and operational phases of the proposed Development.

The assessment of construction phase effects relates to the following identified activities:

- Construction works associated with the formation of the embankment proposed as part of the Upstream Storage works;
- Delivery of materials to working areas; and
- Localised site clearance and reinstatement.

The construction phase associated with this portion of the Proposed Development will result in additional built elements, such as new seeded embankments and headwalls associated with culverts being introduced into the landscape. The operational phase will result in new built form being visible within the surrounding landscape.

An assessment of the significance of impact arising during the construction and operational phases on the landscape character described in Section 10.2 previously is provided in Table 10-7.

Table 10-7: Lowland Basins (LCT 390); Predicted Impacts

Lowland Basins (LCT 390)	
Sensitivity	The embankment, culvert and headwalls associated with the Upstream Storage portion of the Proposed Development is located within this LCT. Key characteristics which, together with field work, have informed an understanding of the susceptibility of this landscape to the development proposed are described as: • A general lack of elevation, with scattered instances of coniferous and mixed species woodland planting punctuating distant horizons and forming localised visual enclosure; • Large scale field pattern, generally arable in nature, with fields defined by post and wire fencing and instances of well-maintained hedgerows; • Where visible, the extensive road networks add movement locally within the landscape, • Distant horizons, formed by Lomond Hills to the east and Cleich Hills add enclosure, variety and interest within the LCT • Built form associated with Kinross locally influences the character of the LCT Overall, the character of the LCT within proximity to this element of the Proposed Development is influenced by mixed species shelterbelt planting, scattered instances of mixed species woodland, existing road infrastructure, scattered development which includes service stations, large scale farm buildings and vertical elements such as small masts and timber poles carrying overhead lines, does retain a degree of openness and rural nature. Taking account of the above characteristics and the influence of existing man-made features, the susceptibility of the LCT to the type of development proposed is judged to be **Medium**. A portion of the LCT within the study area, to the east of Kinross is designated as a Local Landscape Area, though no other portions of the LCT have been designated. Given the influences of woodland, existing road corridors and scattered development the overall value of the LCT within the study area is judged to be **Medium**. Based on the susceptibility and value attached to this LCT, the overall sensitivity of this LCT is judged to be **Medium**.
Magnitude of Change	Direct impacts on this LCT will arise from the physical construction of new embankments, concrete bases and headwalls associated with the Upstream Storage portion of the Proposed Development. Such works will result in the localised temporary loss of portions of a single arable field, along with temporary localised loss of vegetation associated with the field boundary as a result of localised ground modifications. New built form, embankments and headwall will require construction equipment and activities that will be visible during the construction phase. It is considered that construction activities will have a localised effect as the surrounding landscape will quickly absorb such activities, with localised topographical changes limiting effects along the existing M90 corridor. Localised portions of the LCT adjacent to, but beyond the works boundary of the Upstream Storage portion of the Proposed Development are predicted to experience indirect effects as a consequence of the formation of the new features, though the predicted impacts are negated by surrounding vegetation and scattered development which provide visual containment. The predicted magnitude of change associated with the formation of new embankments and headwalls are considered to be localised and medium during the construction phase, restricted to land contained within the site boundary. During the operational phase, new grassed embankments will be perceived as a very minor addition locally, as the introduction of the embankment is not uncharacteristic within the surrounding landscape. Headwalls associated with the culvert will, were visible, be perceived as a new, minor addition, though not generally obvious within the wider context. The predicted magnitude of change in the landscape resource is considered to be localised and **Negligible** during the operational phase.

Lowland Basins (LCT 390)	
Significance of Landscape Effect during Construction Phase	**Moderate**, temporary, assessed not significant effects are predicted to be experienced during the construction phase of the proposed Upstream Storage embankments. Remaining portions of the LCT are predicted to experience **no significant effects**.
Significance of Landscape Effect during Operational Phase.	**Negligible** to **Minor** localised, long-term effects, assessed as **not significant** are predicted to be experienced during the operational phase. Effects are limited in extent by surrounding topographical changes to the east, with existing woodland planting and scattered tree cover limiting the effect. Additional elements, where visible, will be perceived as a minor addition to the overall LCT. Remaining portions of the LCT are predicted to experience no significant effects during the operational phase.

10.4.2 Landscape Designation Impacts

An assessment of the significance of impact arising during the construction and operational phases on the landscape designations identified and described in Section 10.2 previously are provided in Table 10-8.

Table 10-8: Local Landscape Areas; Predicted Impacts

Local Landscape Area - Loch Leven and Lomond Hills LLA	
Sensitivity	The proposed Upstream Storage element of the Proposed Development is not located within this LLA and as such effects are considered to be indirect only. This designation covers the landscape immediately surrounding Loch Leven, comprised of parkland surroundings associated with Kinross House which dominate the western side of the loch, separating settlement associated with Kinross from the waterside. The other shores are lined with native woodland or open farmland, with large areas of wetland habitat for migrating birds at the National Nature Reserve and RSPB's Vane Farm Reserve and Visitor Centre. To the south the land rises sharply to the distinctive hill of Benarty which lies on the Fife boundary. To the east similarly steep hills rise above Kinesswood and Scotlandwell to the crags of Bishop hill and Munduff Hill. Both hill groups offer accessible walking and panoramic views over Kinross-shire and beyond. Taking account of the characteristics and the influence of existing manmade features within the Study Area the susceptibility of the designation to the type of development proposed is judged to be **Medium**. The overall value of the designation is considered to be medium as it is a regional level designation. Based on the susceptibility and value attached to this LLA, the overall sensitivity is judged to be **Medium**.
Magnitude of Change	Construction traffic and construction activities associated with the Upstream Storage element of the proposed FPS are considered to have no indirect impact on the LLA, as intervening built form associated with Kinross restricts potential effects. The predicted magnitude of change associated with the construction phase is considered to be none, as the character of the designation will remain unaltered. During the operational phase, new embankments and headwalls will not be perceived from within the LLA boundary due to screening provided by existing vegetation and built form associated with Kinross. The predicted magnitude of change in the landscape resource is considered **None** during the operational phase.
Significance of Landscape Effect during Construction Phase	**No Change**

Local Landscape Area - Loch Leven and Lomond Hills LLA	
Significance of Landscape Effect during Operational Phase.	**No Change**

As described in Section 10.2.4.2, the identified GDL at Kinross House (GDL00247); located approximately 0.2 km north of the eastern portion of the South Queich River defences section of the Proposed Development is considered to experience no direct or indirect effect as a consequence of the Proposed Development.

Table 10-9 below summarises the predicted significance of landscape effect for each of the previously assessed character areas and designations.

Table 10-9: Landscape Impacts; Predicted Impacts

Landscape Character/Landscape Designation	Predicted Construction Phase Landscape Effects	Predicted Operational Phase Landscape Effects
Lowland Basins (LCT 390)	**Moderate**, temporary, assessed **not significant effects**	**Negligible** to **Minor** localised, long-term effects, assessed as **not significant**.
Local Landscape Area - Loch Leven and Lomond Hills	**No Change**	**No Change**

10.5 Townscape Impacts

The assessment of townscape effects follows the methodology previously described in Section 10.2 and considers effects which are predicted to occur during the construction and operational phases associated with the Proposed Development.

The assessment of construction phase effects upon townscape character relates to the following identified activities:

- Hopefield Place Culvert upgrade, Clash Burn Diversion Culvert, Smith Street Diversion Culvert – Construction works associated with culvert upgrade works;
- Clash Burn Bund/ Embankment formation - construction works associated with creation of new embankment; and
- Embankment formation and defences associated with the South Queich River – construction works associated with new embankments and hard defence proposals, including walls.

Construction operations associated with the above elements of the Proposed Development include:

- Establishment of site compounds;
- Erection of temporary site fencing;
- Delivery and transportation of materials to working areas; and
- Localised site clearance and reinstatement.

The construction phase will result in additional built elements being introduced locally into the townscape. The operational phase will result in new built form being visible within localised portions of the townscape.

An assessment of the significance of impacts arising during the construction and operational phases on the townscape character associated with Kinross is provided in Table 10-10 below.

In order to avoid repetition, an assessment of construction phase impacts and predicted operational phase impacts is included within the following assessments.

Table 10-10: Kinross Townscape Predicted Impacts

Kinross Townscape	
Sensitivity	Elements of the Proposed Development, Culvert works, formation of new embankments, formation of new hard defences including walls associated with Hopefield Place Culvert, Clash Burn culvert and Embankment, Smith Street Culvert and the hard defences associated with the Queich River are contained within the townscape associated with Kinross. Key characteristics which, together with field work, have informed an understanding of the susceptibility of this townscape to the development proposed are described as: • The town centre is characterised by dense, mainly two storey vernacular development which generally form hard edges to the street, with limited open space provision. • Within the town centre, narrow, winding lanes form linkages from High Street to the east and west, the names of which often bear testimony to their original usage or owners' names such as Brewery Lane, Curate Wynd and Piper Row. • Town centre development utilises traditional building materials such as slate roofs, coursed rubble or squared stonework timber sash and case windows • North of the junction with Station Road, the High Street townscape starts to alter in character and becomes a suburb of Victorian villas, which are generally large and set back from the street, providing generous garden spaces, • New, more recent development between the town centre and the M90 transport corridor is characterised by more modern, 20th century residential development including single storey bungalows and two storey dwellings set in less generous garden plots. • To the south of the town centre, the character of the townscape becomes more industrial in nature, with the South Queich river forming a break between development areas. Building form and function in these areas is varied and more modern in style with often large, fronted glass panels forming sections of the elevation. Overall, the townscape character of Kinross, is varied and strongly influenced by the variation in built form, density and presence of larger built form associated with commercial and educational facilities located adjacent to Station Road, and further north and south on extremities of the town. Taking account of the above characteristics and the influence and variety in built form within the townscape areas, the susceptibility of the townscape to the type of development proposed is judged to be **Medium**. A portion of the Kinross townscape, relating to the historic town centre and north along the High Street to has been designated as a Conservation Area, though no other portions of the Townscape have been designated. Given the localised variations in built form, building material used, streetscapes extensive instances of industrial and residential development of more modern construction form the overall value of the townscape is judged to be **Medium**. Based on the susceptibility and value attached to this townscape, the overall sensitivity is judged to be **Medium**.
Magnitude of Change	Direct impacts on the townscape associated with Kinross will arise from the physical construction of new culvert sections at Hopefield Place, Clash Burn Diversion Culvert,

Kinross Townscape	
	Smith Street Diversion Culvert and direct defences associated with the South Queich River defences and formation of new embankments and bunds. Localised loss of vegetation such as existing grassed areas at Hopefield Place, localised sections of grassed verges associated with western and eastern edges of the Myre playing fields, portions of the existing amenity open space at to Sandport, within the Conservation Area, localised portions of existing brown field site to the west of High Street (associated with new embankment provision), localised loss of vegetation to the east of existing industrial units to the south of South Queich River and vegetation removal associated with the implementation of the direct defences associated with the Queich River, including removal of mixed species broadleaved trees. Remaining areas impacted by the Proposed Development are located within the existing road and pedestrian networks, which will become fully re-instated once construction phase operations are completed. Construction phase operations associated with the formation of new culverts, soiled embankments and flood defence walls will require construction equipment and activities that will be locally conspicuous during the construction phase. It is considered that construction activities will have a localised effect as the surrounding townscape, due to the proximity of built form, will quickly absorb such activities. Localised portions of the townscape adjacent to, but beyond the site boundary of the working areas are predicted to experience indirect effects as a consequence of the formation of the new features, though the predicted impacts are negated by existing built form and retained vegetation beyond the working areas which provide visual containment. The predicted magnitude of change associated with the implementation of new culverts and the formation of new built form is considered to be localised and large during the construction phase, restricted to land contained within the site boundary. During the operational phase, new above ground structures and features, such as grassed embankments and flood defence walls will be perceived as a moderate alteration locally, though not generally obvious within the wider context. The predicted magnitude of change in the townscape resource is considered to be localised and small during the operational phase.
Significance of Townscape Effect during Construction Phase	**Moderate** to **Major**, temporary, assessed as locally significant effects are predicted to be experienced during the construction phase. Remaining portions of the townscape beyond the working areas associated with sections of the Proposed Development are predicted to experience **no significant effects**.
Significance of Townscape Effect during Operational Phase.	**Minor** localised, long-term effects assessed as **not significant** are predicted to be experienced during the operational phase of the Proposed Development. Effects associated with the proposed hard defence elements along northern and southern banks of the South Queich River are limited in extent by surrounding built form which restricts visibility. Additional built form becomes less apparent in the local landscape as additional boundary planting establishes and matures. Additional built form elements will be perceived as a minor addition to the overall townscape. Remaining portions of the townscape outside of the site boundary are predicted to experience **no significant effects**.

10.6 Visual Impacts

An initial selection of six viewpoints were identified as an aid to illustrate the existing visual context of the Proposed Development and were provided to PKC Planners for consideration and comment as to their suitability and whether additional viewpoints were to be considered as part of the LVIA. No comment has been provided by PKC Planners, in relation to suitability or otherwise of the suggested viewpoint locations. As a result, following design development and review of the initial viewpoint selected, five viewpoints have been

chosen as appropriate to illustrate the visual context of the Proposed Development and as an aid to the visual impact assessment. All the viewpoints have been located on publicly accessible roads, footpaths, verges and walking routes (refer to Volume III, Appendix J).

Viewpoints used in the visual impact assessment have been selected to meet the following criteria:

- A balance of viewpoints from where the main direction of view is towards the Proposed Development;
- A range of views towards the Proposed Development from within the Study Area;
- Locations of interest e.g. recreational areas, local roads, settlements, Core Paths.

To avoid repetition, an assessment of construction phase impacts and predicted operational phase impacts is included within the following viewpoint assessment tables.

Table 10-11: Viewpoint 1 – A977

Viewpoint 1 – A977			
Grid Ref	310367, 702758	**Existing View Figure Number**	VP01
Direction of View	North	**Approx Distance to Proposed Development**	0.4 km

Description of existing view and potential receptors	This viewpoint is located at a gated field/farm access adjacent to the A977, east bound carriageway, approximately 0.4km from the proposed location of earthworks embankments associated with the Upstream Storage facility associated with the Proposed Development. Views north from this location, as represented in Volume III, Appendix J; Figure VP01 are generally panoramic in nature, though become partially restricted in nature by field boundary hedgerows to the right of the view, and shelterbelt plantation to the left of the view. The immediate foreground is comprised of a single arable agricultural field with stoned access laneway present to the right of the view. Field boundaries are defined by a variety of vegetation types, including mixed species hedgerows. Distant horizons within the central portion of the view are formed by elevated southern facing slopes associated with Tillyrie Hill, with large scale pylons forming a minor punctuation and visual draw above the horizon. Built form is generally well screened within the view by intervening vegetation, however where visible they form a minor element of the overall view. Transport corridors, such as the M90 are not visible in the view from this location. Views from this location are primarily experienced by transient receptors, traveling east on the A977 but are also experienced by residential receptors and visitors to the bed and breakfast facility immediately east of this location.
Sensitivity	Receptors on the A977 are judged to be of a low susceptibility as they are generally traveling at speed and experience the view as a glimpsed peripheral view. Residential and visitor receptors are considered to be of a **High** susceptibility. Whilst the view is not representative of views from a recognised stopping place or promoted viewpoint, the value of the view is judged to be **Medium**. Overall, the sensitivity of the view is judged to be **Medium**.
Magnitude of Change	During the construction phase, operations and machinery movements associated with the formation of the culvert and embankment associated with the Upstream Storage facility associated with the Proposed Development will be visible at mid-distance within a small portion of the overall view set well below perceived horizons and against a well vegetated background. Where visible, construction phase activities will be viewed as a **Minor**, temporary, short-duration addition to the overall view (refer Volume III, Appendix J; Figure VP01). During the operational phase visible elements of the Proposed Development scheme (embankments) will be perceived as a **Minor** addition to the view, with visible portions viewed well below existing horizon lines against a well vegetated background which will aid visual integration.

Viewpoint 1 – A977	
	Visual effects experienced during the construction phase are considered to be localised and small. Visual effects experienced during the operational phase are judged to be **Negligible**, as proposed changes will be difficult to discern within the view.
Significance of Visual Effect during Construction Phase	Minor, localised, temporary, short duration, assessed as **not significant** visual effects are predicted to be experienced during the construction phase of the Proposed Development, Upstream Storage facility embankments and culvert elements.
Significance of Visual Effect during Operational Phase	**Negligible** to **Minor**, long term, assessed as not significant visual effects are predicted to be experienced during the operational phase of the Proposed Development, Upstream Storage facility.

Table 10-12: Viewpoint 2 – Old Cleish Road

Viewpoint 2 – Old Cleish Road			
Grid Ref	311703, 701469	**Existing View Figure Number**	VP02
Direction of View	North-east	**Approx Distance to Proposed Development**	0.01 km

Description of existing view and potential receptors	This viewpoint is located on the grassed verge adjacent to the Old Cleish Road, at a point where boundary vegetation permits northern views. The view is located immediately south of the proposed location for the Cleish Road Embankment and approximately 0.2 km south-west of the proposed hard defence (walls) associated with the South Queich River. Views north-east from the grassed verge are partially restricted in nature by boundary vegetation, which includes remnant hedgerows and scattered vegetation along the western boundary of the development area, as represented in Volume III, Appendix J; Figure VP02. The immediate foreground is comprised of rough grassland/remnant agricultural field whose boundaries are generally defined by timber post and wire fencing. The M90 transport corridor and associated embankments are partially visible as linear features at mid-distance, though screened by vegetation at lower elevation to the left of the view. Existing vegetation associated with the Gelly Burn, forms a linear feature at mid-distance within the view, whilst industrial buildings to the immediate south of Junction Road, are partially screened also by existing vegetation. Distant horizons are formed by more elevated lands to the north of the A91, such as Warroch Hill, with coniferous woodland cover on slopes forming areas of textural interest within the view. M90 road signage and residential built form associated with the western edges of Kinross are partially visible at distance, perceived below distant horizons as minor elements of the view. This view is primarily experienced by residential receptors to the immediate south of the viewpoint location, though the extent of existing view is restricted by instances of field boundary vegetation.
Sensitivity	Receptors at this location are judged to be of a **High** susceptibility as they are primarily residential receptors. The value of the view is judged to be **Medium**, as the available view contains visibility of large-scale industrial development and visibility of vehicle movement on the M90. Overall, the sensitivity of the view is judged to be **Medium**.
Magnitude of Change	During the construction phase, operations and machinery movements associated with the formation of the Cleish Road Embankment will be experienced at close proximity to the viewpoint location. Whilst such construction phase operations will be experienced at close proximity, they will be partially screened by retained vegetation along the southern boundary. Construction phase operations associated with the formation of the hard defences (walls) associated with the South Queich River will be perceived at mid-distance within a small portion of the overall view, set well below distant horizons, which will help to reduce visual intrusion. Visible construction phase operations and vehicle movements will be viewed generally against a vegetated background and well below distant horizons and where visible in the view will be viewed as a locally **Moderate** addition to the overall view (refer Volume III, Appendix J; Figure VP02).

Viewpoint 2 – Old Cleish Road	
	During the operational phase the Cleish Road Embankment will be visible within the immediate foreground, where gaps in vegetation permit views. Visible portions of the embankment will be perceived as a **Minor** change to the view as generally it will be viewed below existing horizon lines against a well vegetated background which will aid visual integration. Visible portions of the hard defences associated with the South Queich River, will be difficult to discern at mid-distance, as visible elements will be perceived in combination with existing industrial built form and viewed well below distant horizons. Visual effects experienced during the construction phase are considered to be localised and **Medium**. Visual effects experienced during the operational phase are judged to be small, as visible portions of the proposed embankment will be perceived as a **Minor**, distinguishable, additional element within available view.
Significance of Visual Effect during Construction Phase	**Moderate**, localised, temporary short duration assessed as significant visual effects are predicted to be experienced during the construction phase of the Cleish Road Embankment. Remaining visual effects, associated with the hard defences associated with the South Queich River are judged to be **Minor**, temporary short duration assessed as **not significant.**
Significance of Visual Effect during Operational Phase	**Minor**, long term assessed as not significant visual effects are predicted to be experienced during the operational phase of the Cleish Road Embankment.

Table 10-13: Viewpoint 3 – B996 (High Street)

Viewpoint 3 – B996 (High Street)			
Grid Ref	311799, 701520	**Existing View Figure Number**	VP03
Direction of View	North	**Approx Distance to Proposed Development**	0.05 km

Description of existing view and potential receptors	This viewpoint is located on the western footpath, adjacent to the B996, to the south of the South Queich River, approximately 50m from the Proposed Development (hard defences for South Queich River). Views north from the footpath are partially restricted and focused by existing built form immediately adjacent to the B996, which direct views along the roadway. (refer Volume III, Appendix J; Figure VP03). Existing built form forms the primary element of the view, which screens views of the South Queich River beyond. Street lighting columns add additional verticality within the view and are visible above perceived horizons created by roof lines associated with built form. The existing bridge crossing the South Queich River is perceived within a small central portion of the view, as a small change in vertical alignment of the B996, though there are no views of the South Queich River corridor from this location due to it being at a lower elevation and screened by intervening topographical changes and built form. Vegetation associated with the northern and southern banks of the South Queich River is generally not perceived as a separate element of the view, rather is read in combination with existing vegetation cover further north, associated with industrial development and residential development of Kinross. This view is primarily experienced by transient receptors on the B996 and adjacent footpath network when traveling north, though is also experienced, in the periphery, by residential receptors in the vicinity.
Sensitivity	Transient, road receptors at this location are judged to be of a low susceptibility, whilst pedestrian and residential receptors are judged to be of a **Medium** susceptibility. Whilst the view is also representative of views available to pedestrians and residential properties, the value of the view is judged to be **Medium** as it is primarily of mixed development form and type. Overall, the sensitivity of the view is judged to be **Medium**.
Magnitude of Change	During the construction phase, operations and machinery movements associated with the hard defence elements associated with the South Queich River (walls) will not generally be visible in the available view due to screening provided by intervening built form. Upper portions of cranes and piling rigs will become more visibly apparent within a

Viewpoint 3 – B996 (High Street)	
	small central portion of the view, east of the existing bridge/road crossing which is visible at mid distance in the available view (refer Volume III, Appendix J; Figure VP03). During the operational phase hard defences associated with the South Queich River section of the Proposed Development, will not be perceived in the available view due to screening provided by intervening topographical changes and built form. Visual effects experienced during the construction phase are judged to be **Negligible** due to the screening effects of intervening topographical changes and built form. Visual effects experienced during the operational phase are judged to be **None**, as visible portions of the proposed hard defences will not be perceived in the view due to screening effects of intervening topographical changes and built form.
Significance of Visual Effect during Construction Phase	**Negligible** to **Minor**, short term, temporary effects assessed as not significant visual effects as the construction phase operations will generally not be visible in the view due to intervening topographical changes and screening by built form.
Significance of Visual Effect during Operational Phase	**None** as elements of the Proposed Development will not be visible in the available view due to screening by intervening topographical changes and built form.

Table 10-14: Viewpoint 4 – High Street/Access to Bridgend Industrial Estate

Viewpoint 4 – High Street/Access to Bridgend Industrial Estate			
Grid Ref	311882, 701645	**Existing View Figure Number**	VP04
Direction of View	South	**Approx Distance to Proposed Development**	0.06 km

Description of existing view and potential receptors	This viewpoint is located on the pedestrian footpath, which forms part of the Core Path route (KROS/3) which links the High Street via the Auction Mart to the Boathouse on the western shoreline of Loch Leven. Views south from this location, (refer Volume III, Appendix J; Figure VP04) are urban, industrial in nature and views are restricted by existing built form located along the southern edge of the South Queich River. The immediate foreground is comprised of road network and existing parking. Views are partially filtered by existing vegetation associated with the parking facility and existing vegetation along the northern banks of the South Queich River corridor, which are visible at mid-distance. Roof lines associated with existing built form create the perceived horizon line within the view whilst changes in built form locally, provide variety and interest within the view. This view is available, in the periphery by transient road receptors and pedestrians using the Core Path, though is primarily experienced by residential receptors in close vicinity.
Sensitivity	Residential receptors at this location are judged to be of a **Medium** susceptibility as the available view south is primarily industrial in nature. Transient road receptors are considered to be of low susceptibility as their main focus will be along the direction of travel, whilst pedestrians using the Core Path network are also considered to be of a **Medium** susceptibility as the majority of views are industrial in nature. Whilst the view is representative of views from a Core Path, the value of the view is judged to be **Medium** due to the influence of the built form and localised, industrial nature of buildings in close proximity. Overall, the sensitivity of the view is judged to be **Medium**.
Magnitude of Change	During the construction phase, operations and machinery movements associated with the formation of the hard defences (walls) will be visible across the central portion of the view, at mid-distance. Construction phase operations will be viewed to the front of existing built form, though perceived below horizon lines formed by roof lines. Cranes and piling rigs associated utilised during the construction phase will be visible as **Minor**, short duration elements within the view, and visibility of such machinery will alter as the works progress (refer Volume III, Appendix J; Figure VP04). Vegetation removal as part of the proposed construction phase works will be experienced as a **Minor** alteration to the view. During the operational phase, upper portions of vertical elements (walls) associated with the Proposed Development will not be easily discernible against the existing built form, with visible elements perceived as a **Minor** addition to the view. Remaining portions of

Viewpoint 4 – High Street/Access to Bridgend Industrial Estate	
	vertical elements will be screened by intervening boundary treatment along the southern edge of the car park facility. Visual effects experienced during the construction phase are considered to be **Medium**, as construction operations visible in the view will create a distinct localised alteration to the character of the available view. Visual effects experienced during the operational phase are judged to be small, as visible portions of the proposed hard defences will, whilst distinguishable, not significantly alter the character or composition of the view.
Significance of Visual Effect during Construction Phase	**Moderate**, localised, short term, temporary assessed as not significant visual effects as the construction phase operations will be partially visible across the central portion of the view, partially screened by elevational changes and location of works.
Significance of Visual Effect during Operational Phase	**Minor**, localised, long-term effects assessed as not significant as visible portions of the Proposed Development will be perceived as a minor component of the overall view available with the character of the view remaining largely unaltered.

Table 10-15: Viewpoint 5 – Loch Leven Heritage Trail

Viewpoint 5 - Loch Leven Heritage Trail			
Grid Ref	312145, 701654	**Existing View Figure Number**	VP05
Direction of View	South-west	**Approx Distance to Proposed Development**	0.01 km

Description of existing view and potential receptors	This viewpoint is located on the Loch Leven Heritage Trail footpath between the Loch Leven National Nature Reserve Car park and the wider Heritage Trail Route around Loch Leven. Views south-west from this location are restricted by existing vegetation to the south of the car park facility and include visibility of the infrastructure associated with the adjacent pumping station (refer Volume III, Appendix J; Figure VP05). Existing vegetation elevates perceived horizon lines within the middle portion of the view at distance, whilst the South Queich River corridor is not visible in the view due to intervening vegetation. The northern end of the existing timber footbridge is visible as a minor element of the view within a small overall portion of the view. This view is experienced recreational receptors (walkers) on the Heritage Trail at this location.
Sensitivity	Receptors at this location are judged to be of a **High** susceptibility as they are primarily recreational receptors. Whilst the view is not representative of views from a stopping place, the value of the view is judged to be medium as it is primarily rural in nature, though locally influenced by man-made structures. Overall, the sensitivity of the view is judged to be **High**.
Magnitude of Change	During the construction phase, operations and machinery movements associated with the Proposed Development will be visible beyond intervening vegetation, which screens the South Queich corridor in existing views from this location (refer Volume III, Appendix J; Figure VP05). Construction phase operations and visible construction phase elements will be visible within a small central portion of view. During the operational phase visible elements of the proposed hard defences will be perceived as a **Minor** alteration within the central portion of the view, read in combination with other man-made features. Visual effects experienced during the construction phase are considered to be **Medium**, as construction operations visible in the view will create a distinct localised alteration to the character of the available view. Visual effects experienced during the operational phase are judged to be **Negligible**, as visible portions of the proposed hard defences will, whilst distinguishable, not alter the character or composition of the view.
Significance of Visual Effect during Construction Phase	**Moderate** to **Major**, locally significant, short duration temporary, assessed as significant effects as the construction phase operations associated will be visible in the view at close proximity.

Viewpoint 5 - Loch Leven Heritage Trail	
Significance of Visual Effect during Operational Phase	**Minor**, localised, long-term effects assessed as not significant visual effects as visible portions of the proposed FPA will be perceived as a minor component of the available view with the character of the view remaining unaltered.

Table 10-16 below summarises the predicted significance of visual effects from each of the previously assessed viewpoints for the construction phase and operational phase of the Proposed Development.

Table 10-16: Summary of Predicted Visual Effects

Viewpoint		Predicted Construction Phase Visual Effects	Predicted Operational Phase Visual Effects
1	A977	**Minor**, localised, temporary, short duration, assessed as **not significant** visual effects	**Negligible** to **Minor**, long term, assessed as **not significant** visual effects
2	Old Cleish Road	**Moderate**, localised, temporary short duration assessed as **significant** visual effects	**Minor**, long term assessed as **not significant** visual effects
3	B996 (High Street)	**Negligible** to **Minor**, short term, temporary effects assessed as **not significant** visual effects	**No Effect**
4	High Street / Access to Bridgend Industrial Estate	**Moderate**, localised, short term, temporary assessed as **not significant** visual effects	**Minor**, localised, long-term effects, assessed as **not significant**
5	Loch Leven Heritage Trail	**Moderate** to **Major**, locally significant, short duration temporary, assessed as **significant** effects	**Minor**, localised, long-term effects assessed as **not significant** visual effects

10.6.1 Views from Core Paths

As mentioned previously in Section 10.2.4, there are a number of Core Paths (Figure 10-2) that lie within close proximity to the Proposed Development. None of the identified path networks will be directly affected by works associated with the Proposed Development and effects are considered to be limited to visual effects only. Receptors on the Core Paths networks are considered, generally to be of a high susceptibility to the type of development proposed.

In relation to predicted visual impacts on views from Core Path (KROS/127) (200m route from Station Road to Bowton Road) which is located approximately 80m east of the Hopefield Place Culvert Upgrade. The Core Path forms a linear route to the west of Kinross Primary School within the built form of Kinross and predicted visual impacts are restricted by boundary vegetation associated with the primary school and adjacent residential properties, such that there are predicted to be no visual impacts arising as a consequence of the proposed culvert upgrade works.

In relation to predicted visual impacts on views from Core Path (KROS/3) (46/3 High Street via Auction Mart to Boathouse access) located approximately 0.1km north of the South Queich River defence section of the Proposed Development, it is judged that there will be localised visual impacts on southern views from the core path along a 75m length if the route. As described in the visual assessment for viewpoint 4 previously, it is judged that Core Path users are of a medium susceptibility to visual impacts as the majority of the route

traverses through industrial townscape character. Proposed construction phase operations will be viewed to the front of existing built form, though perceived below horizon lines formed by roof lines. Predicted visual impacts are considered to be localised and medium, giving rise to a moderate localised visual impact. It is judged that operational phase visual impacts associated with this short section of the Core Path route are considered to be small, as visible portions of the proposed hard defences will, whilst distinguishable, not significantly alter the character or composition of the view, giving rise to a minor, localised and assessed as not significant visual effect on southern views from a 75m section of the Core Path.

In relation to predicted visual impacts on views from Core Path (KROS/111) (Lochside path from Boathouse parking area to Kirkgate Park) located approximately 160m north-east of the South Queich River defence section of the Proposed Development, this Core Path forms a connection between the previously assessed Core Path (KROS/3) and Core Path (KROS/110) and forms a small section of the wider Loch Leven Heritage Trail. It is judged that construction and operational phase visual impacts will be screened by intervening woodland and shrub/ scrub planting associated with the western shoreline of Loch Leven, giving rise to no visual effect on western views from the Core Path.

In relation to predicted visual impact on views from Core Path (KROS/110) (Lochside path, Kirkgate Park (from eastern playground)) located approximately 415m north-east of the South Queich river defence section of the Proposed Development and forms a small section of the wider Loch Leven Heritage Trail. It is judged that construction and operational phase visual impacts will be screened by intervening woodland and shrub/ scrub planting associated with the shoreline of Loch Leven, giving rise to no visual effect on south-wester views from the Core Path.

10.6.2 Views from Residential Receptors

As part of the visual effects assessment associated with the Proposed Development, an assessment of the predicted visual impacts on residential receptors that occur within close proximity to each section of the development has been undertaken. A review of the properties within the vicinity of each section of the Proposed Development has identified that the following properties will experience views during the construction and operational phases:

- 12 properties at eastern end of Hopefield Place, located within 70m of the proposed Hopefield Place Culvert Upgrade;
- 3 properties on Old Cleish Road, located within 50m of the proposed Queich Place Embankment;
- 5 properties on Queich Place located within 60m if the proposed Queich Place embankment, which will also be affected by the proposed South Queich flood defence wall works;
- 28 properties along Montgomery Way, located within 30 – 40m of the Clash Burn Diversion Culvert works;
- 50 properties (approx.) adjacent to the Smith Street Diversion culvert works.

Potential views from properties and residential clusters beyond those identified above are considered to be screened by existing built form associated with Kinross.

For the purposes of this assessment residential receptors have been considered as being of high sensitivity to the type of development proposed.

For all residential properties identified above, it is considered that construction phase operations will be locally visible, though partially screened by various rear boundary and front boundary garden treatments. Construction stage operations will be visible for a short duration and are judged to be locally medium, giving rise to localised moderate to major, temporary short duration visual effects. Operational phase visual impacts are considered to be localised and negligible as following completion of the construction phase operations all elements of the existing streetscape character (footpaths, roadways) will be made good and returned to former use, such that elements of the proposed scheme will not be visible as they have been located underground. It is therefore judged that operational phase impacts equate to a no change scenario, giving rise to no effect during the operational phase of the Proposed Development.

10.7 Mitigation Measures

Mitigation measures are those measures taken to help reduce or remedy townscape and visual impacts or compensate for the loss of townscape value created by the Proposed Development.

10.7.1 Mitigation of Construction Impacts

The clearance and demolition work at each of the identified sections of the Proposed Development and subsequent construction works will be restricted to land within the site boundary. A site compound, including site accommodation, together with material storage areas, construction machinery, cranes and other associated temporary works will be required during the construction phase at various locations in and around Kinross. These features will be visible during the construction phase from areas immediately adjacent to the proposed development sites. Cranes and piling rigs associated with the South Queich hard defences may be visible at a greater distance, though this will be dependent upon view direction and intervening built form. These temporary features will be viewed as a feature of construction in the urban setting that is robust. All construction impacts are limited to the construction period and therefore of temporary duration. Considerate contractor measures will be used at construction stage to reduce potential impacts.

10.7.2 Mitigation of Operational Impacts

It is proposed to provide a soft landscape scheme within the site boundary associated with the South Queich river hard defences that includes landscape treatments to the riverbanks which will include new tree, shrub and other planting, primarily of locally appropriate, native species with the aim of using nature-based solutions in the design and the use of low maintenance native tree species.

It is important that a landscape management plan is prepared to ensure the healthy establishment of all trees within the Proposed Development and the replacement of any dead or dying plants in subsequent years.

10.8 Potential Cumulative Effects

There are a number of approved developments in close proximity to the Proposed Development, however it is not known at this time whether all or any of the identified approved developments will be constructed and as such cumulative effects may vary from that predicted within the following assessment.

A full list of developments relevant to the assessment of cumulative effects has been described in Chapter 18.

In terms of cumulative townscape and visual impacts on the built character of Kinross there are a number of consented developments in the vicinity that are not directly adjacent to the Proposed Development. It is not known if all or any of these consented schemes will be developed and the ultimate cumulative townscape and visual context of Kinross is therefore not certain.

However, the visible elements of the Proposed Development, associated with the hard defences along the South Queich River will be read in the context of the existing urban form, without adding significant cumulative townscape and visual impacts. It is also considered that the townscape on this southern side of Kinross has the capacity to absorb the Proposed Development, without significant cumulative townscape and visual impacts.

10.9 Conclusion

A landscape and visual impact assessment has been completed for the Proposed Development using methodologies derived from the Guidelines for Landscape & Visual Impact Assessment 3rd Edition 2013.

A review of the Perth and Kinross Local Development Plan has identified the designations that may have relevance in terms of townscape, landscape and visual impact. This review has confirmed that the most relevant matters relating to designations and zonings include Local Landscape Areas, Conservation Area and historic Parks and Gardens. The Conservation Area associated with Kinross is focused on the town centre and historical core of the town. A small portion of the overall Proposed Development (relating to buried culvert) traverses through the southern section of the Conservation Area, and the predicted significance of effect is judged to be locally **Moderate** to **Major** during the construction phase, reducing to **Minor**, and not significant during the operational phase of the Proposed Development.

The nearest Historic Garden and Designed Landscape (Kinross House) is predicted to experience no indirect or direct effect as a consequence of the Proposed Development.

Analysis of the townscape character within the immediate environs of the Proposed Development displays a variety of urban character, ranging from medium to large scale commercial/ industrial development to the south of Kinross, with variety of residential and commercial plot scales throughout the remainder of the townscape. Existing features within the boundary of construction works areas will be retained, refurbished or replaced as part of the works. The wider townscape resource has the ability to absorb a development of this scale and it is predicted that there will be **Minor**, direct effects upon the Townscape Character during the operational phase at the immediate boundaries. Remaining portions of the Townscape are predicted to experience no significant effects during the operational phase.

Of the five viewpoints assessed for visual impacts during the operational phase, all viewpoints are considered to experience no significant visual effects as the new embankments and hard defences will be quickly absorbed by the surrounding landscape and townscape character.

Overall, the wider townscape and visual resources of the Proposed Development's surroundings have the capacity to accommodate a development of this type and scale.

11 MATERIAL ASSETS & LAND USE

11.1 Introduction

This chapter of the EIAR describes the assessment undertaken of the potential impacts presented from the Proposed Development on material assets and land use.

There is no clear-cut definition of what constitutes a 'material asset', however for the purposes of the EIAR, a material asset can generally be categorised under the following:

- Built Assets: including transport, energy and services infrastructure, settlement and commercial land, port/ harbour infrastructure, community resources and the historical environment; and
- Natural Assets: including forestry, open space, minerals, water resources, watercourses.

Land use is defined by European Environment Agency as:

> *"…the socio-economic description (functional dimension) of areas: areas used for residential, industrial or commercial purposes, for farming or forestry, for recreational or conservation purposes..."*

The chapter aims to set out the methodology for the assessment of impacts on material assets and land use. It also aims to lay out the potential risks and likelihood of such impacts occurring during both the construction and operational phases. In addition to this, potential mitigation measures to reduce these impacts have also been explored, as well as the cumulative effects between the Proposed Development and other projects in the area, and residual effects that may still be experienced after mitigation measures have been applied.

11.2 Assessment Methodology

11.2.1 Guidance and Legislation

The assessment of Material Assets & Land Use has been carried out with regard to the following guidance and legislation:

- IEMA guide to: Materials and Waste in Environmental Impact Assessment (IEMA, 2020);
- Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland (SNH & HES, 2018); and
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017).

11.2.2 Study Area

The study area for the assessment of Material Assets & Land Use covers the area in which works will be undertaken as well as some wider areas of the town to the north of the Proposed Development and

Kinross House Estate. Figure 11-1 shows the study area for the assessment of Material Assets & Land Use as well as an outline of the Proposed Development.

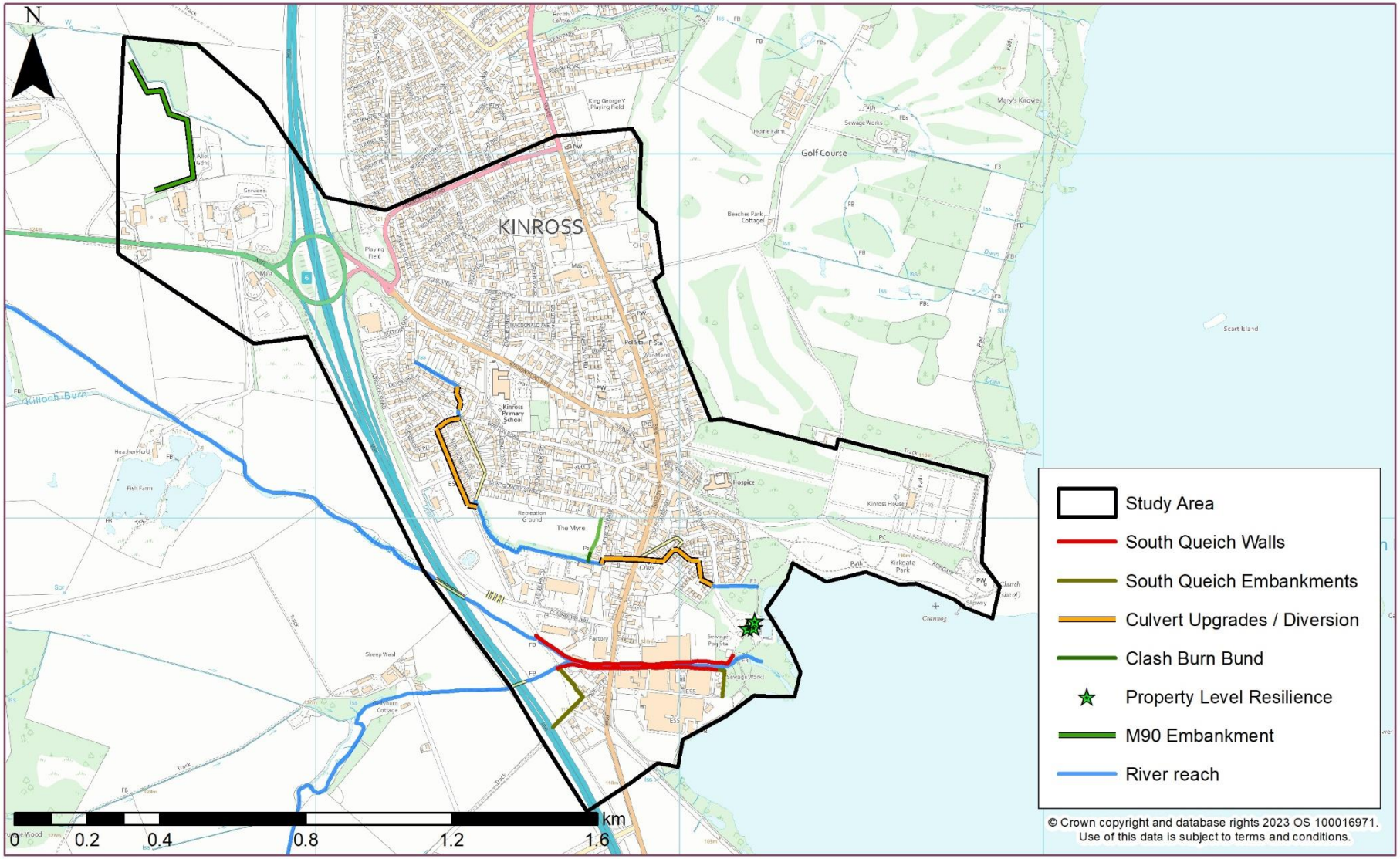


Figure 11-1: Material Assets & Land Use Study Area with Proposed Development **note final scheme alignments shown in Figure 3-2*

11.2.3 Desk Study

A desk study has been carried out for material assets in order to:

1. Assess the baseline conditions;
2. Provide a description of the likely significant effects of the Proposed Development on the material assets identified in the assessment of the baseline conditions;
3. Assess the significance of the described significant effects;
4. Provide a range of mitigation measures to manage, reduce or prevent any significant effects from occurring; and
5. Establish the possibility of any residual or cumulative effects occurring as a result of the Proposed Development after mitigation has been implemented.

The methodology for this assessment follows the guidance and legislation laid out in Section 11.2.1 and uses the following sources of information:

- National Records of Scotland;
- Scottish Water asset plans;
- Openreach asset plans;
- SSEN asset plans;
- SGN asset plans;
- Indigo Pipelines asset plans;
- Bus route and timetable information;
- Google Earth, Maps and Streetview; and
- Information from site walkovers and surveys.

11.3 Baseline Scenario

This section outlines the current environmental conditions in the absence of the Proposed Development from the perspective of Material Assets & Land Use. For this baseline scenario assessment, a number of relevant material asset categories have been identified, assessed and summarised.

The baseline scenario within the study area forms the basis of the assessment, enabling the likely significant effects to be identified through a comparison with the baseline conditions. The baseline is primarily drawn from existing conditions and the current state of the environment at the time of writing. The baseline scenario represents the conditions that will exist in the absence of the proposed development at the time it is likely to be implemented.

11.3.1 Settlement

The settlement of Kinross is located in Perth & Kinross, approximately 30km northwest of Edinburgh and 20km east of Stirling. The town is bounded by Loch Leven to the east and the M90 motorway to the west.

Kinross was estimated in 2020 to have a population of approximately 5,610 people. There are approximately 2,892 females and 2,718 males. In terms of age groups, approximately 993 residents are under the age of 16, 3,231 residents are aged between 16 and 64 and 1,386 residents are over the age of 65 (National Records of Scotland, 2020). A total of 585 residents are under 10 years of age and 376 residents are over 80 years of age.

11.3.1.1 Residential

The majority of Kinross is made up of residential areas. In fact, there are a total of 2,346 residential dwellings across the town. Of these, 97% are occupied and 2.4% are vacant and 0.6% are second homes.

Perth & Kinross has an average household size of 2.12 people (Statistics.gov.scot, 2021), so it is assumed that the town of Kinross is in line with the wider council area.

11.3.1.2 Commercial

The main commercial area in Kinross is in the centre of the town, predominantly along High Street. These commercial units are generally a mixture of There are also some commercial units in the south of Kinross, near the South Queich which include:

- Sainsbury's Kinross Superstore (Supermarket);
- Cashmere at Loch Leven (Textiles);
- Todd & Duncan (Textiles); and
- Kinross 4x4 Centre Ltd (Land Rover dealer).

11.3.1.3 Industrial

There are a number of industrial units in Kinross. These are mainly located in the south, near to the South Queich. Industry in the town is mainly made up of textiles manufacturing, agricultural machinery supply, vehicle service and repair, and construction specialists. The industrial units in the town include:

- Anchorpoint Interiors (Interior architects);
- DHR Valet & Detailing (Car wash);
- Fairways Gm (Farm equipment supplier);
- Flemings Driveway Restoration (Paving contractor);
- Henderson Grass Machinery (Farm equipment supplier);

- Kipper Hire (Arboricultural machinery supplier);
- Koronka S Manufacturing Ltd (Fuel storage);
- Mozolowski & Murray (Conservatory supply and installation);
- Ness Plant (Farm equipment supplier);
- Sandy Baird (Refrigeration services);
- Smith Street Motors (Vehicle repair);
- TimeToShine (Car wash);
- Todd & Duncan (Textiles manufacturing);
- Tyrefair (Tyres, MOT, servicing and car repairs);
- Wise Knotweed Solutions (Environmental Consultant); and
- Wise Property Care (Contractor).

11.3.2 Transport

The M90 motorway is an important national transport route in Scotland and is the main connection between Kinross and other settlements such as Edinburgh and Perth. The M90 runs from Junction 1A of the M9 motorway, south of the Queensferry crossing, to Perth. This is a major transport route within Scotland.

Kinross is served by local and long-distance bus services including Megabus services M90, M91 and M92 which stop at the Sainsbury's Park & Ride site off Junction 6 of the M90. Stagecoach run bus services throughout the town and within the Kinross-shire and Bridge of Earn area.

There are no railway lines that pass through the study area and there is no railway station in Kinross. Historically, there used to be a rail link from Kinross to Perthshire, Fife and Clackmannanshire. The Fife and Kinross railway came from the south and the Devon valley railway came from the west. Kinross Junction railway station once stood on the line between Perth and Edinburgh but was closed in 1970 to make way for construction of the M90 motorway.

11.3.3 Utilities

11.3.3.1 Gas

The gas network in the study area is mainly operated by SGN, however, some areas of Kinross are operated by Indigo Pipelines, including Hopefield Place and Nan Walker Wynd. Generally, based on available guidance, it is assumed that the gas mains network has a depth of 600mm under footways and 750mm under roads (HSE, 2014). Based on mapping of the gas network across Kinross (provided by SGN and Indigo Pipelines) as well as slit trenches, the following gas mains were identified in areas where the proposed works will be carried out:

- SGN
    - Low pressure mains at Smith Street;
    - Low pressure mains a High Street bridge;
    - Medium pressure mains along back of properties on Montgomery Way; and
    - Medium pressure mains run parallel to dismantled railway line, passing under the South Queich and the Gelly Burn.
- Indigo Pipelines
    - Low pressure mains at Hopefield Place; and
    - Low pressure mains at Nan Walker Wynd.

Please refer to Volume III, Appendix K for asset plans of gas infrastructure in Kinross show the locations of these gas mains.

11.3.3.2 Electricity

The electricity network in the study area is operated by Scottish and Southern Electricity Networks (SSEN). They provide low voltage (LV), high voltage (HV), extra high voltage (EHV) and transmission cables for electricity supply. LV operates at up to 1kV and depths from 0.45m to 1m underground, HV operates at 1 -11kV at depths from 0.6m to 1m and EHV operates at 22-132kV at depths of 0.8m to1.1m underground. Transmission cables operate at 275 -400kV and are typically overhead wires (SSEN, 2021).

The majority of cables in the study area are LV underground wires. Based on asset plans and slit trenches, the following electricity network cables have been identified in areas where the Proposed Development will be constructed:

- LV mains on Hopefield Place;
- 11kV mains at back of properties on Montgomery Way;
- LV mains on small service roads for industrial units/ offices at the back of properties on Montgomery Way;
- LV mains along Smith Street and past Mercat Cross;
- LV mains along Nan Walker Wynd; and
- Low voltage mains along High Street bridge.

Please refer to Volume III, Appendix K for asset plans of these electricity cables.

11.3.3.3 Telecommunications

Telecommunications infrastructure is operated by Openreach in the study area. They maintain a network of physical wiring from telephone exchanges to customer's premises. In accordance with best

practice, ducting is laid beneath road carriageways at a depth of 450-600 mm and under footways at a depth of 250-300mm, where physical constraints allow. Based on information gathered from Openreach asset plans and slit trenches, the network includes:

- Underground ducting;
- Aerial ducting, poles;
- Sub-stations;
- Cabinets;
- Tunnels;
- Jointboxes; and
- Manholes.

The majority of the telecommunications network in the study area is made up of underground ducting and jointboxes with some areas including aerial ducting and poles. The following telecommunications network has been identified in areas where the Proposed Development will be constructed:

- Node and jointbox at Hopefield Place;
- Node, jointboxes and kiosk at back of Montgomery Way;
- Aerial ducting and poles on eastern edge of the Myre;
- Aerial ducting and poles at Mercat Cross and Sandport;
- Underground ducting and jointboxes along Nan Walker Wynd;
- Aerial ducting and poles at rear of properties on Queich Place (in a field); and
- Underground ducting at High Street and High Street Bridge.

Please refer to Volume III, Appendix K for asset plans of this telecommunication infrastructure.

11.3.3.4 Water Supply and Sewer Network

The water supply and sewage network in the study area falls under the responsibility of Scottish Water, a public body that is accountable to the Scottish Government. Scottish Water serves 2.56 million households and 152,806 businesses, operating and maintaining a large network of water supply pipes, sewers (foul, clean and combined), pumps, sewage treatment facilities and other related infrastructure across Scotland.

Scottish Water mains pipes are generally laid at a minimum depth of 750mm and a maximum depth of 1,350mm (WaterSafe, 2023).

Based on information from Scottish Water asset plans and slit trenches, there are a number of assets in the study area where the Proposed Development will be constructed including:

- Water mains and foul sewer at Hopefield Place;

- Foul and clean water sewers near footpath near Bowton Road, Montgomery Way and Hopefield Place;
- Combined sewer behind properties on Montgomery Way;
- Clean water sewer to south of Montgomery Way, at north-west edge of the Myre playing fields;
- Combined sewer and water mains along Smith Street;
- Combined sewer and water mains at High Street and High Street Bridge;
- Combined sewer and water mains along Sandport;
- Foul sewer and water mains along Nan Walker Wynd.

11.3.4 Services

11.3.4.1 Police, Fire & Healthcare

There are several key emergency services and healthcare facilities in the study area. These include:

- Kinross Police Station;
- Kinross Fire Station;
- Rowlands Pharmacy Kinross;
- Kinross Family Dental; and
- Rachel House Children's Hospice.

Figure 11-2 shows the location of these services.

It should be noted that there is no hospital in Kinross. The nearest hospital is the Queen Margaret University Hospital in Dunfermline, approximately 17km south of Kinross.

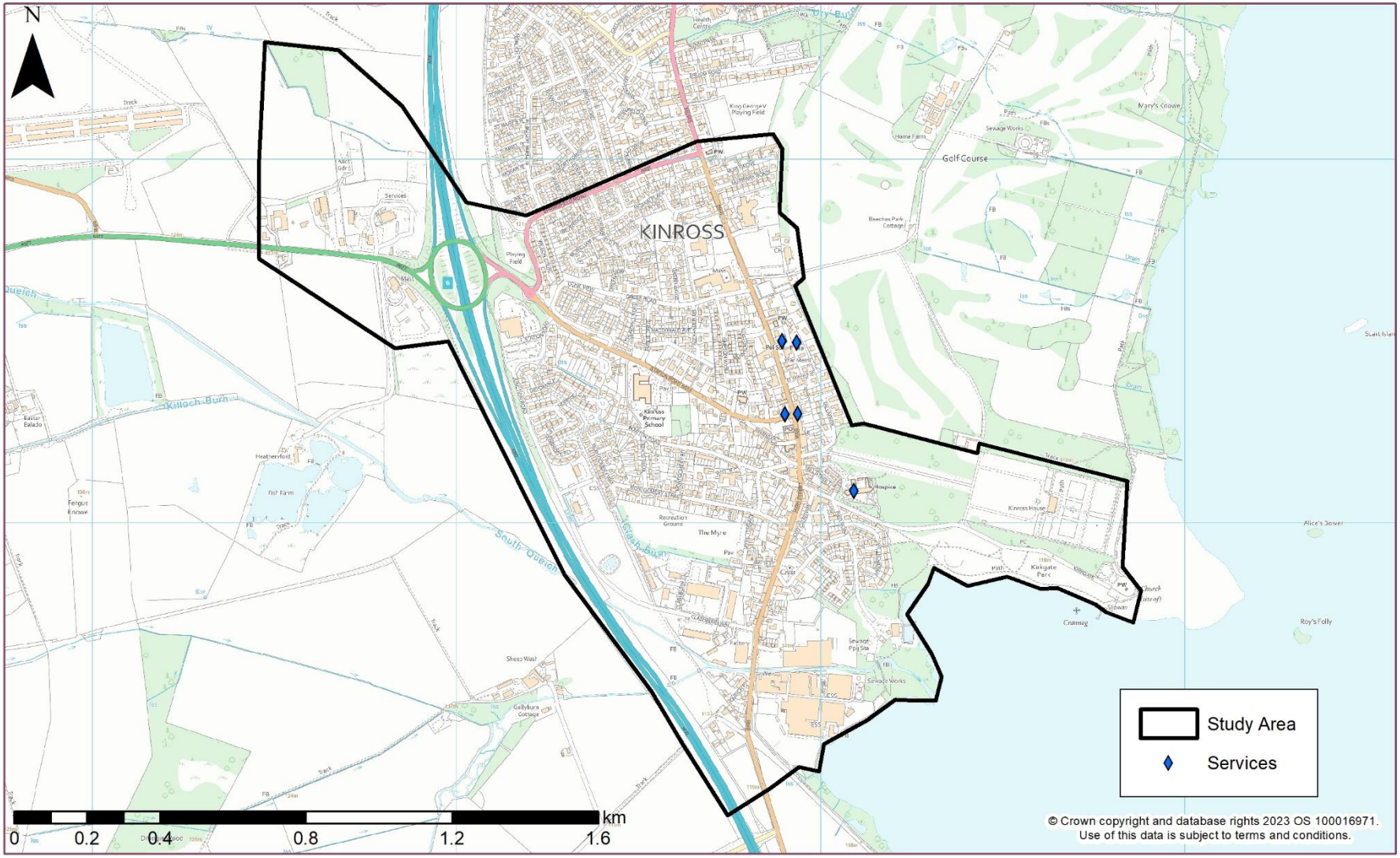


Figure 11-2: Locations of services in the study area

11.3.4.2 Other

There are a number of other services in the study area from veterinarians and funeral directors to sport facilities. These include:

- Alphavet (Veterinarian);
- Dance Connect (Dance studio);
- Kinross Bowling Club;
- Kinross Golf Club;
- Loch Leven Fisheries;
- Loch Leven National Nature Reserve; and
- Stewart Funeral Group.

Figure 11-3 shows the location of these facilities.

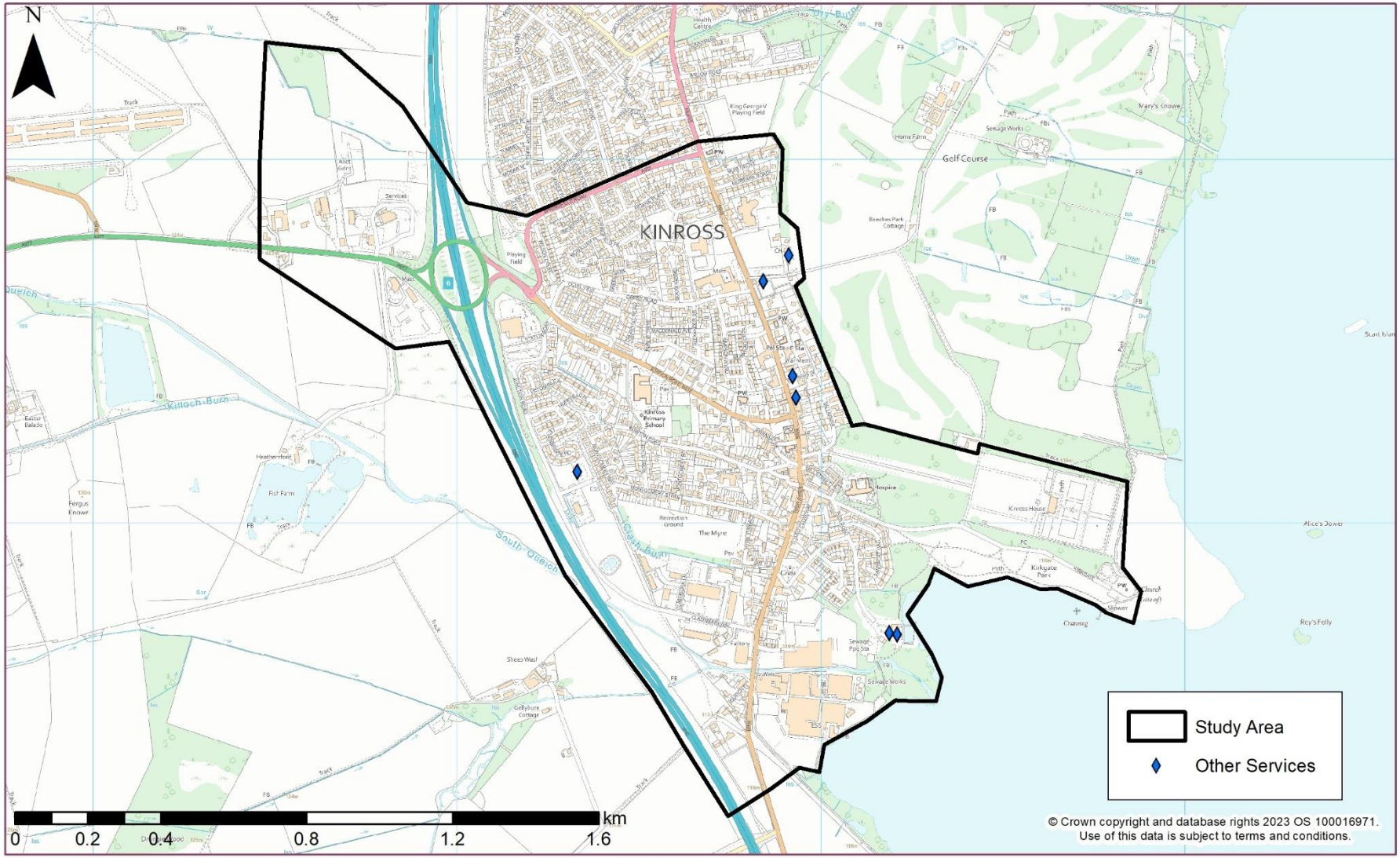


Figure 11-3: Locations of other services in the study area

11.3.5 Community Facilities

For the purposes of this assessment, a community facility is classified as a building or space where community led activities for community benefit are the primary use and the facility is managed, occupied or used primarily by the voluntary and community sector. Community facilities can be located in a wide range of venues, including purpose-built structures such as schools, community centres and village halls, as well as adapted venues (e.g., historic listed buildings, converted houses, flats, shops, rooms or halls or places of worship).

There are a large number of community facilities that fit the above description in the study area including:

- Kinross Church Centre;
- Kinross Gospel Hall;
- Kinross Parish Church;
- Kinross Post Office;
- Kinross Primary School;
- Loch Leven Church;
- Millbridge Hall (Community Centre);
- Rosemount Nursery School;
- St James Roman Catholic Church;
- St Paul's Church.

Figure 11-4 shows the location of these community facilities.

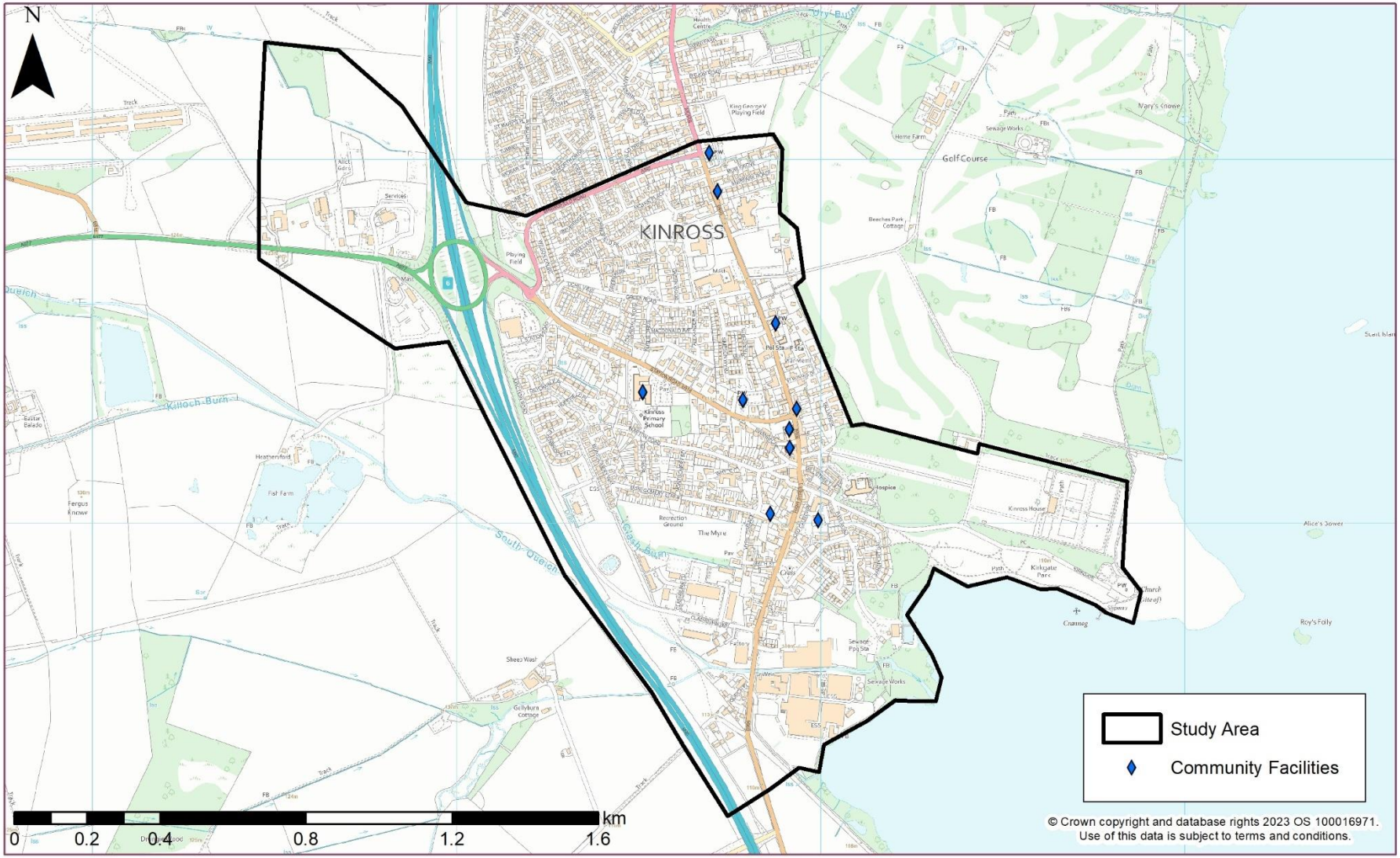


Figure 11-4: Locations of community facilities in the study area

11.3.6 Waste

Using SEPA's Waste Sites Capacity Tool, there is only one waste site located within the study area. This site is the Kinross Recycling Centre (Licence number: WML/L/1025103) which is located on Clashburn Way in south Kinross, between The Myre playing fields and the South Queich. This site has a permitted annual waste capacity of 7,499 tonnes and it accepted 2,403 tonnes of waste in 2021.

Kinross Wastewater Treatment Plant is located less than 1km to the east of the study area. There are also 3 landfill sites approximately 12km to the north-east of the study area.

For further details on waste please refer to Chapter 14.

11.4 Description of Likely Significant Effects

This section outlines the range of different significant effects on material assets that could arise due to the construction and operation of the Proposed Development. Each type of material asset (as described in Section 11.3) is assessed in terms of the potential for likely significant effects.

11.4.1 Settlement

There are likely to be construction phase impacts on access to commercial, industrial and residential premises, especially where culverts are being replaced/ updated. This is particularly the case at Hopefield Place, Smith Street, Nan Walker Wynd and Sandport. This may also be the case at High Street, adjacent to Mercat Cross.

Flood wall and embankment construction along South Queich may impact some industrial and commercial units in terms of access during the construction phase construction. This is because construction traffic and personnel may need access to industrial sites during construction. This impact may be particularly pronounced at the following industrial units:

- Todd & Duncan;
- Flemings Driveway Restoration;
- Sandy Baird;
- Koronka S Manufacturing; and
- John Moncrieff Lighting

There may also be construction phase impacts on premises such as Caulders Garden Centre and Kinross Stove & Cooker Centre due to access requirements to construct M90 embankment.

Construction phase impacts are also expected on access to public footpaths behind properties on Montgomery Way and between Hopefield Place, Montgomery Way and Bowton Avenue.

On the other hand, there will be a benefit in the long-term, during the operational phase, due to the improved flood protection provided to the town.

11.4.2 Transport

There are likely to be impacts due to temporary road closures for culvert upgrades impacting traffic at Hopefield Place, Smith Street, Sandport, Nan Walker Wynd during the construction phase. There may also be short-term construction phase impacts at the High Street as culverts will be upgraded under a section of the carriageway, which may have wider-spread traffic and transport effects as High Street is a busy main road in Kinross.

Smith Street Bus Stop (actually on High Street) may be impacted by culvert upgrades during the construction phase near the Mercat Cross. The Stagecoach service (bus numbers 56 and 56A) that operates between Perth Bus Station and Kinross Park and Ride may be impacted by this in the short-term. The Hamish Gordon Coaches service (number 622) may also be impacted at this stop as it runs between Leslie and Loch Leven Community Campus, Kinross.

There may also be temporary road closures at High Street, Sandport Close, Queich Place, Old Cleish Road for construction of flood walls and embankments in the short term. However, this impact will be reduced due to the fact that construction will take place away from these streets and will instead take place next to the riverbanks or in the premises of industrial units near the South Queich.

Bus stops in both directions at Bridgend may be impacted by works on flood walls near High Street Bridge and with access to the site compound. Buses affected are the 56, 56a, x56 (Edinburgh Bus Station to Perth Bus Station) and Hamish Gordon Coaches 622.

There may also be some disruption to traffic across wider areas of Kinross as construction traffic will require access to a number of roads in the short-term.

It is important to note that all expected impacts will be during the construction phase and transport services and patterns will return to baseline conditions during the operational phase.

Please refer to Figure 11-5 and Figure 11-6 for information on construction access requirements and the location of the site compound.

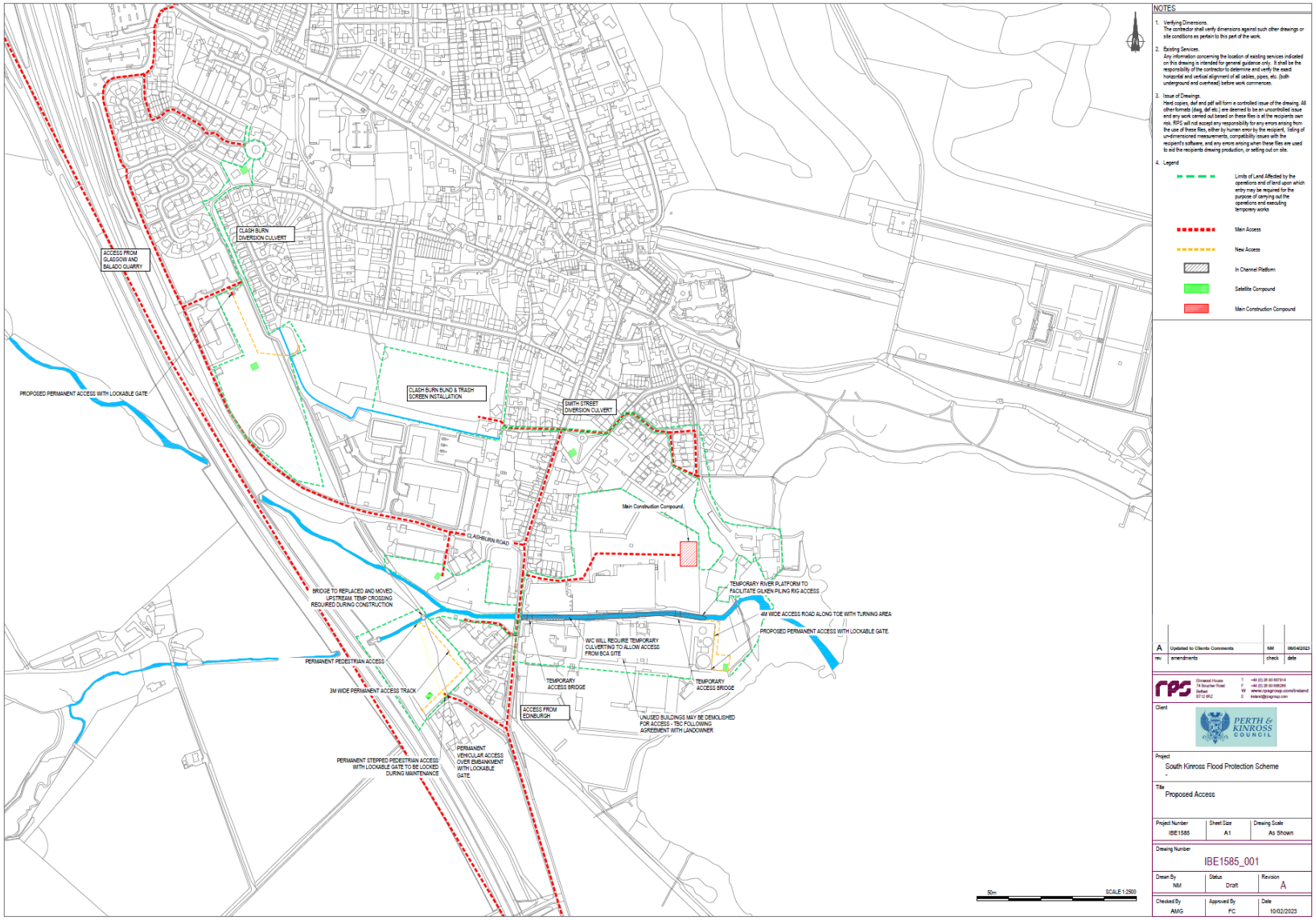


Figure 11-5: Construction traffic access requirements and site compound location (1 of 2)

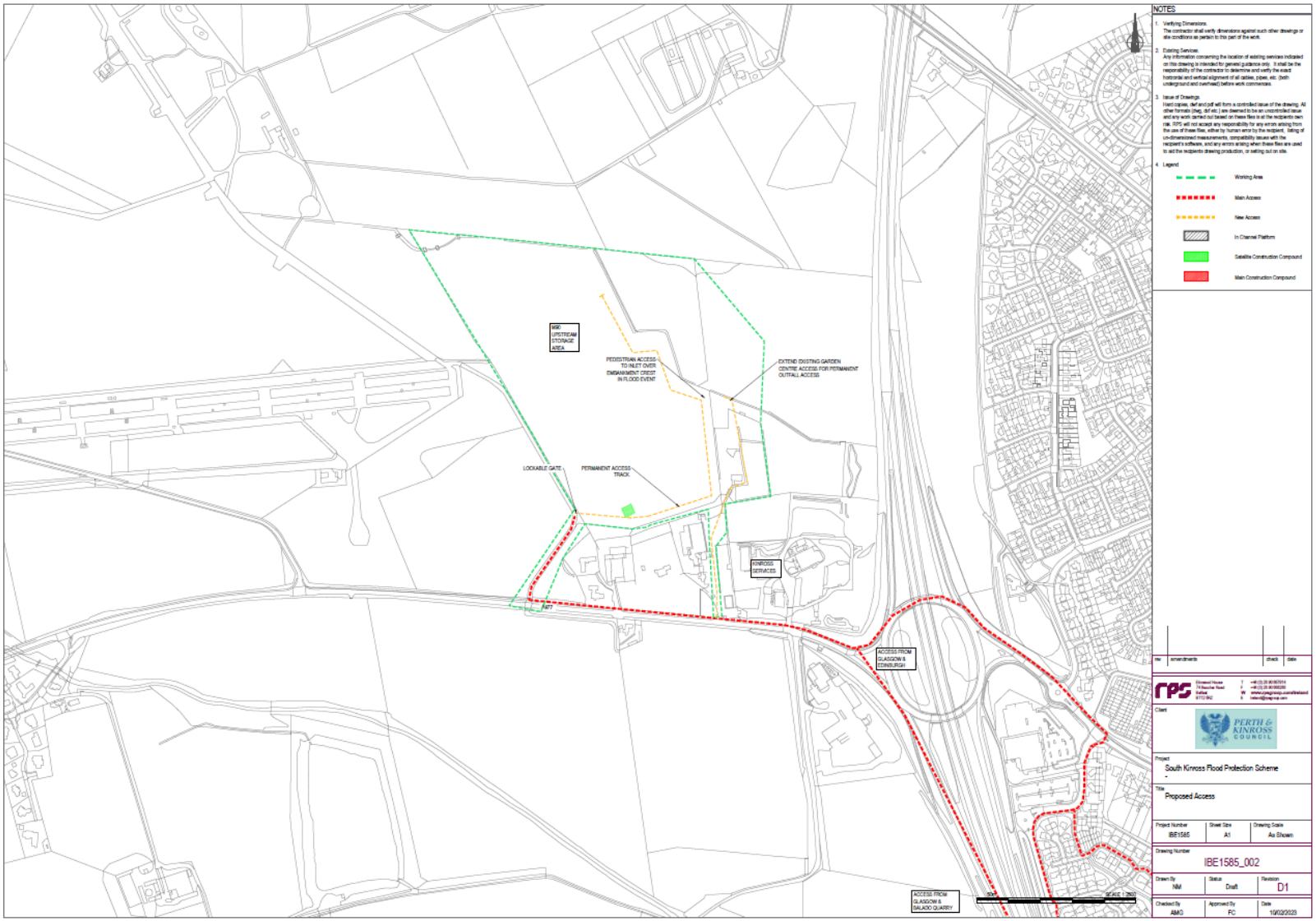


Figure 11-6: Construction traffic access requirements and site compound location (2 of 2)

11.4.3 Utilities

11.4.3.1 Gas

As part of the Proposed Development, some roads will be dug up to replace culverts which may impact on gas pipes. Work, where possible, will aim to avoid gas pipelines. Construction phase impacts are expected to the following gas mains:

- SGN
    - Low pressure mains at Smith Street;
    - Low pressure mains a High Street bridge;
    - Medium pressure mains along back of properties on Montgomery Way; and
    - Medium pressure mains run parallel to dismantled railway line, passing under the South Queich and Gelly Burn.
- Indigo Pipelines
    - Low pressure mains at Hopefield Place; and
    - Low pressure mains at Nan Walker Wynd.

It is likely that re-routing of gas mains at the above locations will be required as the proposed culverts have the potential to clash with existing gas mains. This is because, while the culvert invert has a minimum depth of 1.1m, which is deeper gas mains (0.6-0.75m), in reality, cover for pipelines is less than 0.6m in some areas.

Consultations at C3 level have been held with SGN and Indigo Pipelines to identify possible diversion works. SGN noted that potential clashes may occur between the Proposed Development and gas infrastructure at the footpath to the west of Montgomery Way and between Hopefield Place and Montgomery Way, Nan Walker Wynd/ Sandport and in fields to the east of Old Cleish Road. Indigo Pipelines outlined the potential for clashes with two existing pipelines at Hopefield Place and Nan Walker Wynd/ Sandport.

No impacts during the operational phase are likely as roads and gas infrastructure will be returned to their previous state.

Figure 11-7 and Figure 11-8 shows utility clashes relating to the Proposed Development.

11.4.3.2 Electricity

As part of the Proposed Development, some roads will be dug up to replace culverts which may impact on electricity lines underground. Work, where possible, will aim to avoid electricity lines. Construction phase impacts are expected to the following electricity lines:

- LV mains on Hopefield Place;
- 11 kV mains at back of properties on Montgomery Way;

- LV mains on small service roads for industrial units/ offices at the back of properties on Montgomery Way;
- LV mains along Smith Street and past Mercat Cross;
- LV mains along Nan Walker Wynd; and
- Low voltage mains along High Street bridge.

It is likely that re-routing of electricity lines will be required as the proposed culverts have the potential to clash with existing electricity lines. This is because, while the culvert invert has a minimum depth of 1.1m, which is deeper electricity lines (0.45-1.1m), in reality, cover for these lines is less than 0.45m in some areas. It should be noted that construction phase impacts are unlikely on overhead wiring.

Consultations at C3 level have been held with SSEN to identify any possible diversion works. SSEN note that there may be clashes with their network at the footpath between Hopefield Place and Montgomery Way, the fields to the west of Old Cleish Road, the footpath to the west Montgomery Way and at Sandport/ Nan Walker Wynd. Re-routing of the electricity network may be required at these locations.

No impacts during the operational phase likely as roads and electricity infrastructure will be returned to their previous state.

Figure 11-7 and Figure 11-8 shows utility clashes relating to the Proposed Development.

11.4.3.3 Telecommunications

As part of the Proposed Development, some roads will be dug up to replace culverts which may impact on telecommunication lines underground. Work, where possible, will aim to avoid telecommunication infrastructure. Construction phase impacts are expected on the following BT telecommunications infrastructure:

- Node and jointbox at Hopefield Place;
- Node, jointboxes and kiosk at back of Montgomery Way;
- Underground ducting and jointboxes along Nan Walker Wynd; and
- Underground ducting at High Street.

It is likely that some re-routing and relocation will be required as the proposed culverts have the potential to clash with existing telecommunications infrastructure. This is because, while the culvert invert has a minimum depth of 1.1m, which is deeper telecommunication ducting (0.25-0.6m), in reality, cover for these cables is less than 0.25m in some areas.

There may also be impacts on aerial ducting and poles at rear of properties on Queich Place (in a field) due to the construction of a flood embankment. This may require temporary or even permanent re-routing of ducting and replacement of poles in alternative locations.

Consultations at C3 level with Openreach have been held to identify any possible diversion works. Openreach concluded from these discussions that existing apparatus may be necessary as a consequence of the Proposed Development, especially at Sandport and Nan Walker Wynd.

Construction phase impacts are unlikely on the following BT telecommunications infrastructure:

- Aerial ducting and poles on eastern edge of the Myre;
- Aerial ducting and poles around Mercat Cross and Sandport;

No impacts during the operational phase are likely as roads and other infrastructure will be returned to previous state.

Figure 11-7 and Figure 11-8 shows utility clashes relating to the Proposed Development.

11.4.3.4 Water Supply and Sewer Network

As part of the Proposed Development, some roads will be dug up to replace culverts which may impact on water and sewer network infrastructure. The identified water supply and sewer network infrastructure may require temporary or even permanent re-routing. Work, where possible, will aim to avoid this infrastructure. Construction phase impacts are expected on the following Scottish Water sewer and water supply infrastructure:

- Water mains and foul sewer at Hopefield Place;
- Foul and clean water sewers near footpath near Bowton Road, Montgomery Way and Hopefield Place;
- Combined sewer behind properties on Montgomery Way;
- Clean water sewer to south of Montgomery Way, at north-west edge of The Myre playing fields;
- Combined sewer and water mains along Smith Street;
- Combined sewer and water mains at High Street and High Street Bridge;
- Combined sewer and water mains along Sandport;
- Foul sewer and water mains along Nan Walker Wynd.

While the depth of the new and upgraded sections of culvert are deeper than the expected depth of water mains, in reality cover for these mains is less than 0.75m in some areas. Culvert sections at Hopefield Place to the footpath between Hopefield Place and Montgomery Way are only 1.3m deep, meaning that direct clashes with water mains pipes is possible as they sit between 0.75 and 1.35m underground. There are also potential clashes at Smith Street, High Street, Sandport and Nan Walker Wynd. This means that permanent re-routing of water mains may be needed in these locations.

Consultations at C3 level with Scottish Water have been held to identify any possible diversion works. Scottish water concluded from these discussions that significant re-routing of water mains and the sewer network is likely due to upgrading of culverts and flood walls. Temporary and permanent re-

routing is potentially required across much of the Proposed Development area, including the route of culverts and flood walls and embankments within the town of Kinross.

Figure 11-7 and Figure 11-8 shows utility clashes relating to the Proposed Development.

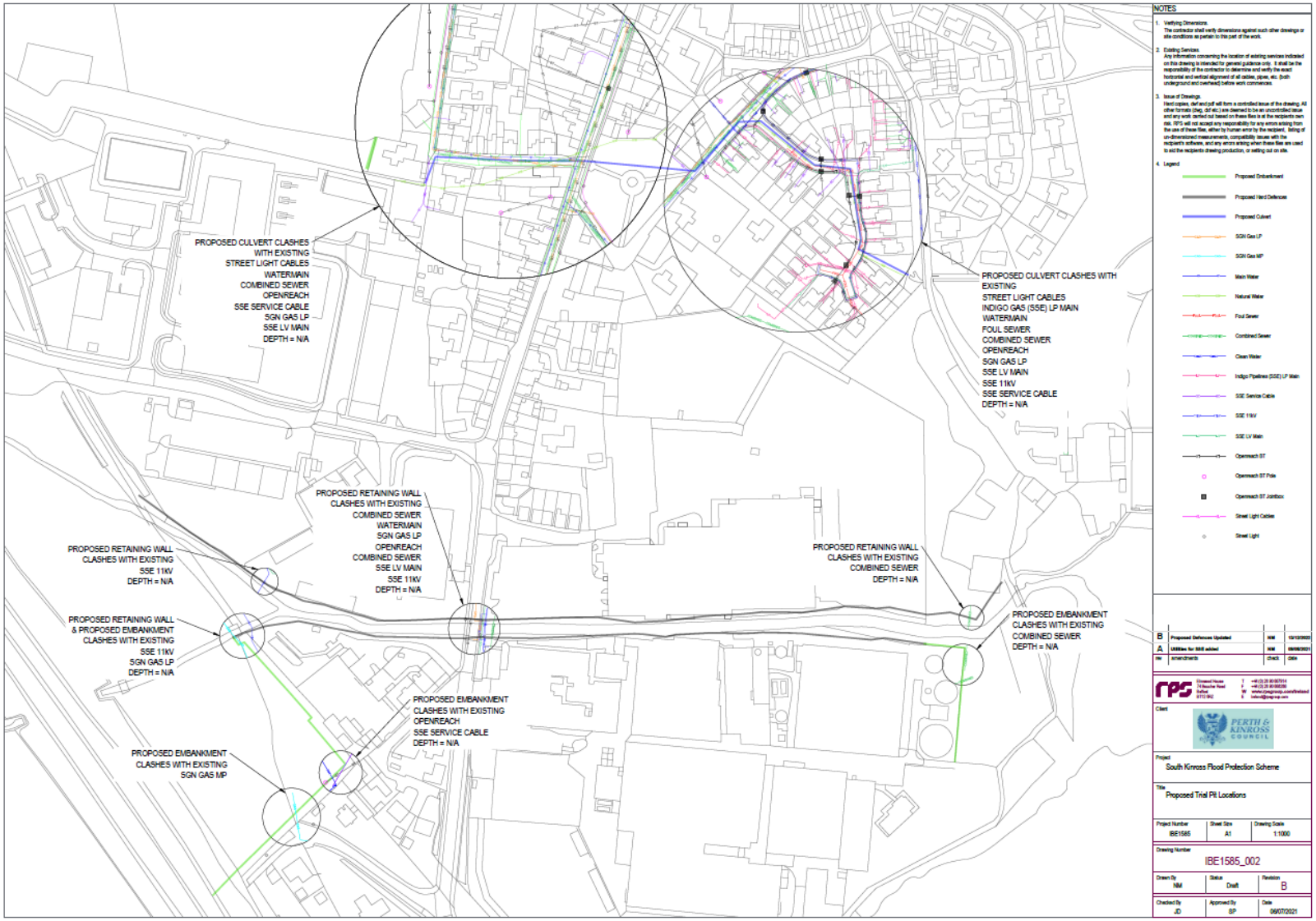


Figure 11-7: Utility clashes (1 of 2) **note final scheme alignments shown in Figure 3-2*

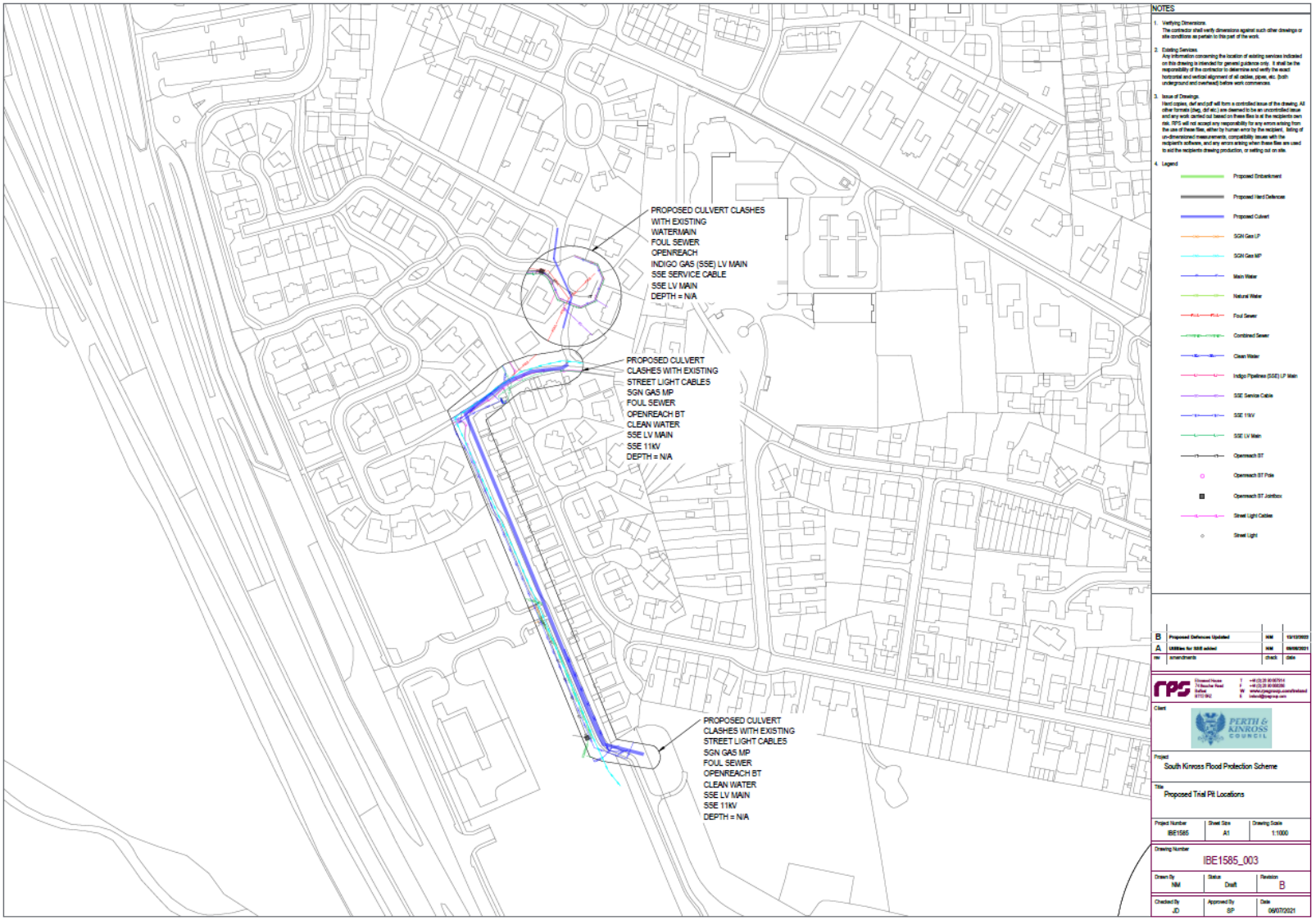


Figure 11-8: Utility clashes (2 of 2) **note final scheme alignments shown in Figure 3-2*

11.4.4 Services

11.4.4.1 Police, Fire & Healthcare

There are likely to be no direct impacts during the construction phase on police, fire or healthcare facilities as these services are not located on any road where construction is expected to take place.

Indirect impacts may be experienced during construction due to road closures. This may mean that emergency services do not have access to some roads or have to take alternative routes.

No impacts are expected on emergency services during the operational phase.

11.4.4.2 Other

There are no major construction phase impacts expected on other services and facilities in the study area. However, access to Loch Leven National Nature Reserve and Loch Leven Fisheries may be temporarily impacted due to construction of the flood walls and embankments along the South Queich downstream of High Street bridge.

Access during the operational phase will be maintained so there is unlikely to be any impacts.

11.4.5 Community Facilities

There are no major construction phase impacts expected on community facilities in the study area as no facilities are located in construction areas.

Access during the operational phase will be maintained so there is unlikely to be any impacts.

11.4.6 Waste

There is not likely to be any construction phase impacts on waste as no waste facilities, apart from Kinross Recycling Centre, are located within the study area.

Similarly, there is not expected to be any impacts during operation on waste facilities.

For further details on waste please refer to Chapter 14.

11.5 Significance of Effects

This section outlines the significance of effects on material assets that could arise due to the construction and operation of the Proposed Development.

The significance of effects are described in terms of:

- Sensitivity / Importance of the receptors – including factors such as the vulnerability, recoverability and value/ importance of the receptor; and
- Magnitude of the impact – including factors such as the extent, duration, frequency and reversibility of the impacts.

The matrix as shown in Table 11-1 was used for the determination of significant effects for material assets.

Table 11-1: Matrix for the Determination of Significant Effects

		Magnitude of change			
		Major	Moderate	Minor	Negligible
Sensitivity	High	Major	Major/Moderate	Moderate	Minor
	Medium	Major/Moderate	Moderate	Moderate/Minor	Minor
	Low	Moderate	Moderate/ Minor	Minor	Minor/Negligible

Significant impacts are in dark shading

11.5.1 Settlement

The vulnerability of the settlement within the study area is considered to be Low and the recoverability of any affected receptors is considered to be High. The impacted receptors are of High value/ importance as receptors are homes and businesses. The overall sensitivity is therefore considered to be **Medium**.

The extent of the effect is relatively small as areas impacted by the Proposed Development only cover a small geographical area and the duration of impacts are only expected during the construction phase, in the short-term. The effects are expected to only occur once, during the construction phase, and any longer-term impacts are considered to be reversible. Therefore, the overall magnitude of effects is likely to be **Negligible**.

Therefore, according to the matrix in Table 11-1, the overall significance of effects on settlement is considered to be **Minor**.

11.5.2 Transport

The vulnerability of transport infrastructure within the study area is considered to be Low and the recoverability of any affected receptors is considered to be High. The impacted receptors are of High value/ importance as receptors are key transport links between Kinross and other towns and cities in Scotland. The overall sensitivity is therefore considered to be **Medium**.

The extent of the effect is relatively small as areas impacted by the Proposed Development only cover a small geographical area and the duration of impacts are only expected during the construction phase, in the short-term. The effects are expected to only occur once, during the construction phase, and any longer-term impacts are considered to be reversible. Therefore, the overall magnitude of effects is likely to be **Negligible**.

Therefore, according to the matrix in Table 11-1, the overall significance of effects on transport is considered to be **Minor**.

11.5.3 Utilities

11.5.3.1 Gas

The vulnerability of gas infrastructure within the study area is considered to be Medium and the recoverability of any affected receptors is considered to be High. The impacted receptors are of High value/ importance as receptors are key as gas supply lines provide homes and businesses with vital energy. The overall sensitivity is therefore considered to be **Medium**.

The extent of the effect is relatively small as areas impacted by the Proposed Development only cover a small geographical area and the duration of impacts are only expected during the construction phase, in the short-term. However, re-routing of gas pipelines at Hopefield Place, Smith Street, High Street Bridge, Nan Walker Wynd / Sandport, sections of footpath to the west of Montgomery Way and at the downstream end of the South Queich may be required due to impacts from culvert upgrades. The effects are expected to only occur once, during the construction phase, and any longer-term impacts are considered to be reversible. Therefore, the overall magnitude of effects is likely to be **Moderate**.

Therefore, according to the matrix in Table 11-1, the overall significance of effects on gas supply is considered to be **Moderate**.

11.5.3.2 Electricity

The vulnerability of electricity infrastructure within the study area is considered to be Medium and the recoverability of any affected receptors is considered to be High. The impacted receptors are of High value/ importance as receptors are key as electricity supply lines provide homes and businesses with vital electricity. The overall sensitivity is therefore considered to be **Medium**.

The extent of the effect is relatively small as areas impacted by the Proposed Development only cover a small geographical area and the duration of impacts are only expected during the construction phase, in the short-term. However, underground electricity lines will require re-routing, especially in areas such as Sandport / Nan Walker Wynd, fields to the east of Old Cleish Road and sections of the footpath running from Hopefield Place to The Myre playing fields. Effects are expected to only occur once, during the construction phase, and any longer-term impacts are considered to be reversible. Therefore, the overall magnitude of effects is likely to be **Moderate**.

Therefore, according to the matrix in Table 11-1, the overall significance of effects on electricity supply is considered to be **Moderate**.

11.5.3.3 Telecommunications

The vulnerability of telecommunications infrastructure within the study area is considered to be Medium and the recoverability of any affected receptors is considered to be High. The impacted receptors are of High value/ importance as receptors are key as telecommunication lines provide homes and businesses with vital telephone and broadband connections. The overall sensitivity is therefore considered to be **Medium**.

The extent of the effect is relatively small as areas impacted by the Proposed Development only cover a small geographical area and the duration of impacts are only expected during the construction phase, in the short-term. The effects are expected to only occur once, during the construction phase, and any longer-term impacts are considered to be reversible. However, it should be noted that the re-routing of underground telecommunications infrastructure in some areas (e.g., Nan Walker Wynd and Sandport) as well as re-positioning of aerial ducting and poles at the rear of Queich Place may be required during the operational phase, making it a permanent impact. Despite this, the overall magnitude of effects is still only likely to be **Moderate**.

Therefore, according to the matrix in Table 11-1, the overall significance of effects on telecommunications is considered to be **Moderate**.

11.5.3.4 Water Supply and Sewer Network

The vulnerability of water supply and sewer infrastructure within the study area is considered to be Medium and the recoverability of any affected receptors is considered to be High. The impacted receptors are of High value/importance as receptors are key as water supply and sewer network pipelines and associated infrastructure provide homes and businesses with sanitation and potable water. The overall sensitivity is therefore considered to be **Medium**.

The extent of the effect is relatively small as areas impacted by the Proposed Development only cover a small geographical area and the duration of impacts are mainly expected during the construction phase, in the short-term. However, sections of culvert at Smith Street, High Street, Sandport and Nan Walker Wynd, the downstream end of the South Queich and sections of footpath between Hopefield Place and the Myre playing fields may require permanent re-routing of water mains and the sewer network. Most of the effects are expected to only occur once during the construction phase, but more long-term, permanent changes may be required during the operational phase. Therefore, the overall magnitude of effects is likely to be **Medium**.

Therefore, according to the matrix in Table 11-1, the overall significance of effects on water supply and sewers is considered to be **Moderate**.

11.5.4 Services

11.5.4.1 Police, Fire & Healthcare

The vulnerability of emergency services within the study area is considered to be Low and the recoverability of any affected receptors is considered to be High. The impacted receptors are of High value/ importance as receptors are key as emergency services lines provide vital emergency response to local residents in case of fire, crime or health related incidents. The overall sensitivity is therefore considered to be **Medium**.

The extent of the effect is relatively small as areas impacted by the Proposed Development only cover a small geographical area and the duration of impacts are only expected during the construction phase, in the short-term. The effects are expected to only occur once, during the construction phase, and any longer-term impacts are considered to be reversible. Therefore, the overall magnitude of effects is likely to be **Negligible**.

Therefore, according to the matrix in Table 11-1, the overall significance of effects on emergency services is considered to be **Minor**.

11.5.4.2 Other

The vulnerability of other services within the study area is considered to be Low and the recoverability of any affected receptors is considered to be High. The impacted receptors are of Low value/ importance as receptors are not considered key services to the local community. The overall sensitivity is therefore considered to be **Low**.

The extent of the effect is relatively small as areas impacted by the Proposed Development only cover a small geographical area and the duration of impacts are only expected during the construction phase, in the short-term. The effects are expected to only occur once, during the construction phase, and any longer-term impacts are considered to be reversible. Therefore, the overall magnitude of effects is likely to be **Negligible**.

Therefore, according to the matrix in Table 11-1, the overall significance of effects on other services is considered to be **Minor/Negligible**.

11.5.5 Community Facilities

The vulnerability of community facilities within the study area is considered to be Low and the recoverability of any affected receptors is considered to be High. The impacted receptors are of High value/ importance as receptors are considered key services to the local community, however there are no direct impacts expected on these receptors. The overall sensitivity is therefore considered to be **Low**.

The extent of the effect is relatively small as areas impacted by the Proposed Development only cover a small geographical area and the duration of impacts are only expected during the construction phase, in the short-term. The effects are expected to only occur once, during the construction phase, and any longer-term impacts are considered to be reversible. Therefore, the overall magnitude of effects is likely to be **Negligible**.

Therefore, according to the matrix in Table 11-1, the overall significance of effects on community facilities is considered to be **Minor/Negligible**.

11.5.6 Waste

The vulnerability of waste facilities within the study area is considered to be Low and the recoverability of any affected receptors is considered to be High. The impacted receptors are of High value/importance as receptors are considered key services to the local community, however there are no direct impacts expected on these receptors. The overall sensitivity is therefore considered to be **Low**.

The extent of the effect is relatively small as areas impacted by the Proposed Development only cover a small geographical area and the duration of impacts are only expected during the construction phase, in the short-term. The effects are expected to only occur once, during the construction phase, and any longer-term impacts are considered to be reversible. Therefore, the overall magnitude of effects is likely to be **Negligible**.

Therefore, according to the matrix in Table 11-1, the overall significance of effects on waste facilities is considered to be **Minor/ Negligible**.

11.6 Mitigation Measures

This section outlines a range of measures that have been selected and designed to reduce or prevent the significant adverse effects as described in Section 11.4 arising from the Proposed Development.

It should also be noted that the Health & Safety Executive's (HSE) '*Avoiding danger from underground services - HSG47 (Third Edition)'* (2014) guidance, which outlines safe excavation methods, was referred to in order to complete this section.

There are three different types of mitigation that can be considered including:

- Primary Mitigation – measures included as part of the design of the Proposed Development;
- Secondary Mitigation – measures to be adopted during construction; and
- Tertiary Mitigation – measures required as a result of legislative requirements.

The various primary, secondary and tertiary mitigation measures for material assets are laid out in the proceeding sections.

11.6.1 Primary Mitigation

The design of the Proposed Development aims to avoid clashes with utilities where possible, and reduce the number of roads, properties, businesses, services and community facilities affected.

Culverts under roads and accompanying manholes will aim to avoid infrastructure wherever it is possible.

11.6.2 Secondary Mitigation

11.6.2.1 Phasing and Timing of Works

Works are to be completed in phases to reduce disruption across Kinross. The duration of works is estimated to be 53 weeks, with 40 weeks for culvert upgrades and diversions, including reinstatement and utility and service diversions.

Works will also be timed to have as minimum an impact on traffic and transport across Kinross and beyond as possible. Where disruption is unavoidable, traffic, including any affected bus routes, will be temporarily re-routed to avoid construction areas.

11.6.2.2 Re-routing of Services

Where required, utilities will be re-routed to avoid any interruptions in gas, water, electricity and telecommunications supplies. Any required network rearrangements should be brought to the attention of the responsible supplier / authority (i.e. Openreach, SGN, Indigo Pipelines, Scottish Water, SSEN etc.) at the earliest possible stage to consult on options and specific design requirements. Engagement is underway with all utility companies through C3 requests.

11.6.2.3 Exposing, Identifying and Marking Services

During construction, all those working to expose services will be competent to do so and be fully trained on the use of detection tools, safe excavation techniques and have an understanding of the risk to safety from damaging services.

All excavation work will follow safe digging practices. Once a detecting device has located the position and route of services, excavation may then proceed, with the digging of trial holes to confirm the positions of services.

Any mechanical excavation will be carefully planned to avoid any damage to services and reduce health and safety risks to drivers and operators.

There will be careful selection of tools and plant at different sections to excavate safely and avoid damage to services.

Identification of each of the exposed services will also take place and a marking system will be developed and agreed to help all working on site to understand which service is which. Markings on the ground will be done with paint, stakes, pins or posts.

11.6.2.4 Safety at Excavations

Any required excavations will be properly supported, stepped or battered back to prevent them collapsing during construction.

Edge protection, fencing and coverings will also be provided where necessary to prevent anyone falling into the excavation. Furthermore, steps to prevent excavated material falling into the excavation will be taken.

11.6.2.5 Backfilling

Backfilling of any excavation will be done carefully to ensure that services are not damaged. Warning tiles, tape etc. will be returned to their original positions above the services.

11.6.2.6 Updating Plans

It is recommended that if the plans or other information provided are inaccurate, or if the Proposed Development changes the path or depth of a service, the service owners / operators should be informed so they can update their records accordingly.

11.6.2.7 Permit to Work

A permit-to-work system is recommended. This is a formal recorded process used to control work that is identified as potentially hazardous and provides a means of communication between managers, supervisors and operatives. This system will aim to:

- Ensure that proper consideration is given to the risks of the proposed works;
- Identify who may authorise particular jobs and who is responsible for specifying the necessary precautions;

- Identify the types of work considered hazardous; and
- Identify the permitted tasks, risks, duration and control measures to be applied.

11.6.3 Tertiary Mitigation

There are no tertiary mitigation measures being recommended for material assets for the Proposed Development.

11.7 Residual Impacts

There are not expected to be any residual impacts on material assets after mitigation measures are fully implemented.

11.8 Potential Cumulative Effects

It is a requirement of the EIA Regulations to consider cumulative effects. Cumulative effects are defined as effects on a receptor that may arise when the Proposed Development is considered together with other proposed developments in the area.

It is unlikely that there will be any cumulative effects between the Proposed Development and other developments in the area. This is because all the identified developments are small in scale and are spatially removed from the South Kinross FPS. There may be some indirect effects during the construction phase, depending on the timing of works.

For more information on cumulative effects please refer to Chapter 18.

11.9 Conclusions

Based on the findings of this chapter of the EIAR it is not expected that any major impacts on material assets will be experienced as a result of the Proposed Development. In fact, for the construction phase, impacts are likely to be of **Minor** or **Negligible** significance for most types of material assets assessed. However, there may be a **Minor** or **Moderate** impact on utilities infrastructure (gas, electricity, telecommunications and water supply networks) across the study area. While significant re-routing (temporary and permanent) may be required, it is expected that, during the operational phase, there will be no impacts as the site will be returned to its baseline state albeit with some changes to the routes of key utilities in some areas.

There are a range of mitigation measures that have been recommended including avoidance and re-routing of utilities and service cables, pipes and mains, the phasing of works to avoid widespread impacts on material assets and timing of works to minimise disruption, especially on traffic and transportation. Further construction phase mitigation measures such as exposing, identifying and marking of services, safety measures during excavation and backfilling and updating of asset plans are also recommended.

This chapter has also found that there are unlikely to be any residual impacts after all mitigation measures are fully implemented.

Cumulative effects are unlikely due to the small scale of other developments and the distance between the Proposed Development and other developments in the area. However, indirect cumulative effects during the construction phase cannot be discounted completely depending on the dates and timings of works.

12 NOISE & VIBRATION

12.1 Introduction

This chapter of the EIAR provides an assessment of the likely significant noise and vibration impacts associated with the Proposed Development as described in Chapter 3 of the EIAR.

The Proposed Development is located in South Kinross and includes areas within the settlement of Kinross and areas just outside the settled areas. Within the settled areas where works are proposed, the relevant areas are a mixture of residential, industrial and commercial.

The potential noise and vibration issues associated with the proposed development are:

- Noise impact associated with construction plant/ equipment used during the construction phase;
- Vibration impact associated with construction plant/ equipment used during the construction phase; and
- Road traffic noise impacts associated with traffic movements associated with the construction phase.
- There are no significant noise or vibration generating sources associated with the operational phase of the Proposed Development and therefore, operational phase noise/vibration impact assessment has been scoped out.

Operational phase traffic movements associated with the Proposed Development will be very low and substantially lower than the level that would be required to generate any significant traffic noise increases on the local road network. On this basis, operational phase traffic noise impact assessment has been scoped out.

12.2 Assessment Methodology

Operational phase noise was scoped out of this assessment as it is not anticipated that there will be any significant operational phase noise sources. On this basis, there was no requirement for a noise monitoring survey to assess operational phase noise. The construction phase noise assessment has been completed on the basis of compliance with the relevant construction phase noise guidance BS5228:2009+A1:2014, as detailed in Section 12.2.1.

This guidance stipulates noise guideline limits that must be adhered to during the construction phase. As detailed in Section 12.2, the most onerous guideline limits presented in Table 12-1 on the basis that no baseline noise survey was completed. Background vibration monitoring was not undertaken as there are currently no vibration sources on site.

12.2.1 Relevant Noise & Vibration Guidance

12.2.1.1 British Standard BS5228:2009+A1:2014 Noise and Vibration Control on Construction and Open Sites: Part 1 – Noise

This British standard consists of two parts and covers the need for protection against noise and vibration of persons living and working in the vicinity of construction and open sites. The standard recommends procedures for noise and vibration control in respect of construction operations and aims to assist architects, contractors and site operatives, designers, developers, engineers, local authority environmental health officers and planners.

Part 1 of the standard provides a method of calculating noise from construction plant, including:

- Tables of source noise levels;
- Methods for summing up contributions from intermittently operating plant;
- A procedure for calculating noise propagation;
- A method for calculating noise screening effects; and
- A way of predicting noise from mobile plant, such as haul roads.

The standard also provides guidance on legislative background, community relations, training, nuisance, project supervision and control of noise and vibration.

The ABC method outlined in Section E3.2 has been used for the purposes of determining whether the predicted noise levels from the construction activities will result in any significant noise impact at the nearest noise sensitive properties.

Table 12-1 outlines the applicable noise threshold limits that apply at the nearest noise sensitive receptors. The determination of what category to apply is dependent on the existing baseline ambient (L_{Aeq}) noise level (rounded to the nearest 5dB) at the nearest noise sensitive property. For daytime, if the ambient noise level is less than the Category A threshold limit, the Category A threshold limit (i.e. 65dB) applies. If the ambient noise level is the same as the Category A threshold limit, the Category B threshold limit (i.e. 70dB) applies. If the ambient noise level is more than the Category A threshold limit, the Category C threshold limit (i.e. 75dB) applies.

Table 12-1: Noise Threshold Limits at Nearest Sensitive Receptors for Construction Activities

Threshold Limits [dB(A)]			
	Category A	Category B	Category C
Night-time (23:00 - 07:00)	45	50	55
Weekdays (19:00 - 23:00), Saturdays (13:00-23:00), Sundays (07:00-23:00)	55	60	65
Weekday daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75

12.2.1.2 British Standard BS5228:2009+A1:2014, Code of Practice of Noise and Vibration Control on Construction and Open Sites: Part 2 – Vibration

Part 2 of the standard gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels, including industry-specific guidance.

Human beings are known to be very sensitive to vibration, the threshold of perception being typically in the PPV range of 0.14mm·s−1 to 0.3mm·s−1. Vibrations above these values can disturb, startle, cause annoyance or interfere with work activities. At higher levels they can be described as unpleasant or even painful. In residential accommodation, vibrations can promote anxiety lest some structural mishap might occur. Guidance of effects of vibration levels are illustrated in Table 12-2 below.

Table 12-2: Guidance on Effects of Vibration Levels

Vibration Level	Effect
0.14 $mm \cdot s^{-1}$	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are lesssensitive to vibration
0.3 $mm \cdot s^{-1}$	Vibration might be just perceptible in residential environments
1.0 $mm \cdot s^{-1}$	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given toresidents
10 $mm \cdot s^{-1}$	Vibration is likely to be intolerable for any more than a very brief exposure to thislevel

Limits of transient vibration, above which cosmetic damage could occur, are given numerically in Table 12-3 (Ref: BS5228-2:2009+A1:2014). Minor damage is possible at vibration magnitudes which are greater than twice those given in Table 12-3, and major damage to a building structure can occur at values greater than four times the tabulated values.

Table 12-3: Transient Vibration Guide Values for Cosmetic Damage

Type of Building	Peak Particle Velocity (PPV) (mm/s) in Frequency Range of Predominant Pulse	
Reinforced or framed structures. Industrial and heavy commercial buildings.	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
Unreinforced or light framed structures. Residential or light commercial buildings.	15 mm/s at 4 Hz increasing to20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to50 mm/s at 40 Hz and above.

12.3 Baseline Scenario

Operational phase noise was scoped out of this assessment as it is not anticipated that there will be any significant operational phase noise sources. On this basis, there was no requirement for a noise monitoring survey to assess operational phase noise.

Background vibration monitoring was not undertaken as there are currently no vibration sources on site.

Section 12.2.1 outlines the guidance provided in BS5228:2009+A1:2014 for assessing construction noise. Table 12-1 provides relevant construction noise guideline limits for different periods of the day for weekdays and weekends. The relevant noise guideline limits are determined by the existing ambient (L_{Aeq}) noise levels at the relevant location.

On the basis that no noise monitoring survey was completed, the lowest and most onerous noise guideline limits from Table 12-1 have been used in this assessment. These lowest noise guideline limits assume the lowest ambient noise levels are present in the study area for the purposes of a worst-case scenario and construction phase mitigation measure will be based on the application of these lower limits.

12.4 Description of Likely Significant Effects

12.4.1 Construction Phase

12.4.1.1 Description of Construction Activities

Chapter 3 of the EIAR provides a full description of the proposed construction works. A brief summary of the main aspect of the construction process are detailed below:

- Works including embankments, retaining walls and piling to direct defences at South Queich/ Gelly Burn;
- Culvert upgrade at Hopefield Place;
- Diversion culvert at Clash Burn;
- Bund in Myre playing fields at Clash Burn;
- Diversion culvert of Clash Burn in the vicinity of Smith Street;
- The construction of an embankment close to the M90 services; and
- Property flood resilience works at properties affected by Loch Leven.

Section 12.4.1.2 provides details on typical construction plant/ equipment that will be required for the various construction activities listed in the bullet points above. The construction plant/ equipment details included in Table 12-4 have been used for the purposes of completing the construction phase noise impact assessment.

12.4.1.2 Description of Construction Plant/ Equipment

Table 12-4 details source sound power levels for typical plant/equipment that will be required to complete the construction works listed in Section 12.4.1.1.

Table 12-4: Plant and Equipment to be used during the Construction Phase (Ref: BS5228:2009+A1:2014)

Activity/Plant (Reference from Annex C& D, BS5228:2009+A1:2014)			
Equipment	**Power Rating (kW)**	**Equipment, Size, Weight (Mass), Capacity**	**Sound Power Level (dB)**
Breaking concrete: mini excavator with hydraulic breaker (C5 – Ref 2)	-	1.5t	111
Clearing Site: Tracked excavator (C2 - Ref 3)	102	22t	106
Haulage: Road Lorry - Full (C6 - Ref 21)	270	39t	108
Ground Excavation: Dozer (C2 - Ref 12)	142	20t	109
Rolling and Compaction: Vibratory roller (C5 - Ref 27)	20	3t	95
Power: Diesel Generator (C4 - Ref 83)	3	210kg	93
Lifting: Wheeled Mobile Telescopic Crane (C4 - Ref 38)	610	400t	106
Pumping Water: Water pump (C2 - Ref 45)	20	6 in	93
Distribution of Material: Tipper Lorry (C8 - Ref 20)	-	-	107
Piling: Sheet Steel Piling - hydraulic jacking - power pack (C3 - Ref 10)	147	6t	96
Concrete: Concrete mixer truck +truck mounted concrete pump + boom arm (C4 – 32)	-	-	106
Grader (C6 – 31)	205	25t	114
Rammer compacter (D3 – 118)	-	111kg	108
Wheeled scraper (D10 – 204)	526	23.7m^3 heaped	114

12.4.1.3 Prediction of Construction Noise Levels

The sections below include an assessment of construction noise in the specific areas where construction works will take place in relative proximity to residential properties. Construction phase works will only take place during normal daytime hours during the week (i.e. 07:00 – 19:00) and therefore, this impact assessment has been completed in the context of weekday daytime BS5228 noise guideline limit.

As previously stated in Section 12.2, the lowest most-onerous noise guideline limit of 65dB(A) has been assumed for all construction activities (see Table 12-1).

Works at South Queich / Gelly Burn

A large section of the construction activities associated with South Queich and Gelly Burn are located at a sufficient distance from residential properties such that there is limited possibility of the 65dB BS5228 noise guideline limit being exceeded. As the BS5228 noise guideline limits are applicable to residential properties, there will be no significant construction noise impact in the commercial areas around Clashburn Road and east of High Street.

Construction activities will take place in relatively close proximity to properties at Queich Place and Old Cleish Road, and there is potential for the 65dB BS5228 guideline limit to be exceeded at some of these properties depending on the exact nature of the plant/ equipment activities/ movements in the vicinity of this site boundary. There will be a requirement for mitigation measures to be in place at the site boundary adjacent to Queich Place/ Old Cleish Road to ensure that there is no exceedance of the 65dB limit at this location. Mitigation measures at this location are detailed in Section 12.6.

Culvert Upgrade at Hopefield Place

The culvert works will include a range of plant/ equipment such as an excavator, a concrete mixer, a dump truck, a rammer compactor, water pumps and hydraulic breakers. On the basis of typical noise levels from these items of plant/ equipment (see Table 12-4), there is potential for the 65dB BS5228 guideline limit to be exceeded at some of the properties at Hopefield Place/ Levenbridge Place/ Montgomery Way depending on the exact nature of the plant/equipment activities/movements in the vicinity of this site boundary.

There will be a requirement for mitigation measures to be in place at the site boundary adjacent to Hopefield Place/ Levenbridge Place/ Montgomery Way to ensure that there is no exceedance of the 65dB limit at this location. Mitigation measures at this location are detailed in Section 12.6.

Diversion Culvert at Clash Burn

The culvert works will include a range of plant/ equipment such as an excavator, a concrete mixer, a dump truck, a rammer compactor, water pumps and hydraulic breakers. On the basis of typical noise levels from these items of plant/ equipment (see Table 12-4), there is potential for the 65dB BS5228 guideline limit to be exceeded at some of the properties at Levenbridge Place/ Montgomery Way depending on the exact nature of the plant/equipment activities/movements in the vicinity of this site boundary.

There will be a requirement for mitigation measures to be in place at the site boundary adjacent to Levenbridge Place/ Montgomery Way to ensure that there is no exceedance of the 65dB limit at this location. Mitigation measures at this location are detailed in Section 12.6.

Bund in Myre Playing Fields at Clash Burn

The earthworks to create this bund will include a range of plant/ equipment such as excavators, dump trucks, a rammer compactor, grader, dozers and tippers. On the basis of typical noise levels from these items of plant/equipment (see Table 12-4), there is potential for the 65dB BS5228 guideline limit to be exceeded at some of the properties at Myre Terrace/ Smith Street/ Montgomery Street depending on the exact nature of the plant/equipment activities/movements in the vicinity of this site boundary.

There will be a requirement for mitigation measures to be in place at the site boundary adjacent to Myre Terrace/ Smith Street/ Montgomery Street to ensure that there is no exceedance of the 65dB limit at this location. Mitigation measures at this location are detailed in Section 12.6.

Diversion Culvert of Clash Burn in the Vicinity of Smith Street

The culvert works will include a range of plant/ equipment such as an excavator, a concrete mixer, a dump truck, a rammer compactor, water pumps and hydraulic breakers. On the basis of typical noise levels from these items of plant/ equipment (see Table 12-4), there is potential for the 65dB BS5228 guideline limit to be exceeded at some of the properties at Smith Street/ High Street/ Sandport/ Nan Walker Wynd/ Sandport Close depending on the exact nature of the plant/ equipment activities/ movements in the vicinity of this site boundary.

There will be a requirement for mitigation measures to be in place at the site boundary adjacent to Smith Street/ High Street/ Sandport/ Nan Walker Wynd/ Sandport Close to ensure that there is no exceedance of the 65dB limit at this location. Mitigation measures at this location are detailed in Section 12.6.

Construction of an Embankment close to the M90 Services

The construction activities associated with the construction of the embankment close to the M90 services are located at a sufficient distance from the majority of residential properties such that there is limited possibility of the 65dB BS5228 noise guideline limit being exceeded. There are a small number of residential properties off the A977 (including the Turfhills House B&B) which are in relatively close proximity to the site boundary of these works, however there is sufficient distance between the works and these properties such that the 65dB BS5228 guidelines limit can be achieved. As the BS5228 noise guideline limits are applicable to residential properties, they are not applicable to the commercial areas off the A977.

Construction activities will take place in relatively close proximity to a small number of properties off the A977. There will be a requirement for mitigation measures to be in place at the site boundary adjacent to these properties to ensure that there is no exceedance of the 65dB BS5228 limit at this location. Mitigation measures at this location are detailed in Section 12.6.

Property Flood Resilience Works at Properties Affected by Loch Leven

On the basis of typical noise levels from these items of plant/ equipment (see Table 12-4), there is potential for the 65dB BS5228 guideline limit to be exceeded at these properties depending on the exact nature of the plant/equipment activities/movements in the vicinity of these properties. Mitigation measures at this location are detailed in Section 12.6.

12.4.1.4 Traffic

The UK Design Manual for Roads and Bridges (DMRB, Volume 11, Section 3, Part 7) states that it takes a 25% increase or a 20% decrease in traffic flows in order to get a 1dB(A) change in traffic noise levels. Construction phase traffic movements associated with the proposed works are not anticipated to be of the scale to generate traffic flow increases of the order of 25% or more. Therefore, the majority of traffic flow increases will result in a less than 1dB(A) change in the traffic noise levels at properties adjacent to these routes and will thus not generate a significant noise impact.

12.4.1.5 Vibration

The potential for vibration impacts will be largely limited to the proposed piling activities associated with the proposed development. The piling activities will be associated with the construction of flood walls for works in the vicinity of South Queich / Gelly Burn. The majority of these works will not be sufficiently close to residential properties such that there will be no significant vibration impact in accordance with the guidelines threshold limits include in Table 12-2.

Piling works are expected along the footprint of the proposed flood walls. Where piling works will be required in relatively close proximity to residential properties, mitigation measures will be required. Once the piling has been confirmed then further assessment can be undertaken to predict vibrations at nearest sensitive receptor locations.

Piling works are required in close proximity to commercial properties at Bridgend Industrial Estate, Todd and Duncan and BCA sites. There will therefore be a requirement for mitigation measures to ensure that no buildings experience any structural damage as per guidelines levels outlined in Table 12-3. Section 12.6 outlines mitigation measures for potential vibration impacts associated with the proposed development.

Mitigations including vibration monitoring to ensure that limits as defined in BS 5228 are complied with. The monitoring may not need to be continuous but could be specifically targeted to the piling operations for example. All the specific vibration mitigations will also be included in the final CEMP (appointed contractor CEMP).

12.4.2 Operational Phase

The potential for operational phase noise and vibration impacts has been scoped out as there will be no significant operational phase noise and vibration sources. Any traffic movements associated with operational phase maintenance activities will be of such a low level that there will be no potential for any significant traffic noise impacts.

12.5 Significance of Effects

The EIA Regulations require the identification of the likely significant environmental effects of the project. This includes consideration of the likely effects during the construction and operational phases. The assessment is based on consideration of the likely magnitude of the predicted impact and the sensitivity of the affected receptor.

12.5.1 Magnitude of Impact/ Level of Significance

12.5.1.1 Construction Noise

Construction noise comprises both plant noise and site traffic noise. The construction noise ‘of effect’ for this assessment is based on the ‘5dB change’ method in BS5228-1:2009 2014 ‘Code of practice for noise and vibration control on construction and open sites – Part 1: Noise’ which is summarised in Table 12-5 below.

BS 5228:2009+A1:2014 does not contain any significance criteria equivalent to what is presented in Table 12-5, although examples of how limits of acceptability have been applied historically and some examples of assessing significance are presented. In this case Example Method 2, which refers to change of 5dBA in the ambient noise level, has been used to assess the effects at residential receptors.

The magnitude of construction noise Impacts has been determined in accordance with Annex E of BS 5228-1:2009+A1:2014. The significance criteria for assessing noise impact from construction works have been based on example Method 2 contained within Annex E.3.3 of BS 5228-1:2009+A1:2014, as referred indicates that:

> *"Noise levels generated by site activities are deemed to be potentially significant if the total noise (preconstruction ambient plus site noise) exceeds the pre-construction ambient noise by 5dB or more, subject to lower cut off values of 65dB, 55dB and 45dB L_{Aeq} period, from site noise alone, for the daytime, evening, and night-time periods, respectively, and a duration of one months or more, unless works of a shorter duration are likely to result in a significant effect."*

Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction baseline plus construction noise) exceeds the pre-construction baseline by more than 5dBA subject to the lower cut-off value of 65dBA noise from construction activities alone.

For the majority of noise sensitive receptors, pre-construction ambient noise levels are relatively low, resulting in the criteria set within the lower cut-off levels given in Table 12-6 below applying the most stringent limits. As such the lower cut-off levels are used throughout the construction assessment to all noise sensitive receptors.

This classifies the magnitude of effect based on the sound level difference between the ambient noise level with and without construction. This is calculated by finding the difference between the baseline ambient level and the total level (construction noise plus baseline ambient level) at each location.

Table 12-5: Magnitude of Impact: Construction Noise Daytime (Ref: BS5228 Part, 1)

Sound Level Difference between Ambient Noise and Total Noise (dB, L_{Aeq})	Total Daytime Noise Level (dB $L_{Aeq, 12h}$) (Ambient and Construction Noise)	Magnitude of Impact
< 0 dB	< 65 dB (lower cut-off level)	Negligible
0 - 5 dB	65 - 70 dB	Low
5 – 10 dB	70 –75 dB	Medium
> 10 dB	> 75 dB	High

Table 12-6: Magnitude of Impact: Construction Noise Night-time (Ref: BS5228, Part 1)

Sound Level Difference between Ambient Noise and Total Noise (dB, L_{Aeq})	Total Night-time Noise Level (dB $L_{Aeq, 12h}$) (Ambient and Construction Noise)	Magnitude of Impact
< 0 dB	< 45 dB (lower cut-off level)	Very Low
0 - 5 dB	45 - 50 dB	Low
5 – 10 dB	50 –55 dB	Medium
> 10 dB	> 65 dB	High

On account of the temporary nature of construction activities, higher noise threshold limits apply to construction phase activities as compared to permanent operational phase activities.

12.5.2 Significance

Following the identification of receptor importance and magnitude of the effect, it is possible to determine the significance of the impact. TAN Chapter 2 Table 2.6 Significance of Effects provides the framework in determining the level of significance relating the magnitude with the sensitivity of the receptor.

The significance of the effect is determined as a function of the sensitivity of the receptor and the magnitude of impact the receptor is exposed. The significance of effects for receptors of high sensitivity are summarised below in Table 12-7.

Table 12-7: Matrix used for the Assessment of the Significance of Effects

		Magnitude of Impact			
		Negligible	**Low**	**Medium**	**High**
Sensitivity of receptor	**Negligible**	Imperceptible	Imperceptible or slight	Imperceptible or slight	Slight
	Low	Imperceptible or slight	Imperceptible or slight	Slight	Slight or moderate
	Medium	Imperceptible or slight	Slight	Moderate	Moderate or major
	High/ Particularly Sensitive	Slight	Slight or moderate	Moderate or major	Major or Profound

In line with the guidance:

- Major adverse effects are considered to be significant and should be prevented;
- Moderate adverse effects are significant and should be mitigated, where possible;
- Minor adverse effects are not significant but should be mitigated where possible; and
- Negligible adverse effects are not significant and should not require mitigation.

Effects are considered to be significant when identified as likely to have a Moderate, Large or Very Large Effect. Following initial assessment, if the impact does not require additional mitigation (or none is possible) the residual impact will remain the same. If, however, additional mitigation is proposed there will be an assessment of the post-mitigation residual impact.

The construction noise assessment has been undertaken primarily as a desk-based assessment. Based on the information presented in Chapter 5, the likely significant noise effects are considered for the construction activities. The assessment is undertaken using noise data sources contained within BS5228 for construction plant.

12.5.3 Construction Phase

Section 12.4 outlined where there is potential for the BS5228 daytime noise threshold limit of 65dB to be exceeded at the nearest noise sensitive properties at a number of the works locations. In order to ensure that the BS5228 guideline limit is not exceeded, mitigation measures will be required. This guidance stipulates noise guideline limits that must be adhered to during the construction phase. As detailed in Section 12.2, the most onerous guideline limits presented in Table 12-1 on the basis that no baseline noise survey was completed.

12.5.4 Operational Phase

As detailed in the preceding sections, an operational phase noise assessment has been scoped out on account of there being no significant operational phase noise sources. On this basis, no rationale has been presented in this section for operational phase noise impact assessment.

12.6 Mitigation Measures

12.6.1 Construction Phase

12.6.1.1 Construction Noise

BS5228 outlines several issues associated with noise effects that influence the community reaction to the noise. The duration of site operations, the hours in which specific activities are carried out, the attitude of the public to the site operator and the use of effective mitigation measures are all important considerations in managing construction noise. Construction mitigation measures will be put in place to ensure construction noise levels are attenuated and reduced where necessary.

The contractor will implement a programme of noise management measures that will include engagement with the community on the activities that need to be carried out, the timing and duration of such activities, commitment to specific hours of work, and the use of quiet work methods such as the selection of low-noise plant and operating methods. PKC and potentially affected residents will be kept informed of the works to be carried out and of any proposals for work outside normal hours.

Sections 12.4 and 12.5 outlined where there is potential for the BS5228 daytime noise threshold limit of 65dB to be exceeded at the nearest noise sensitive properties at a number of the works locations. To ensure that the BS5228 guideline limit is not exceeded, mitigation measures will be required.

A CEMP will be put in place to ensure that the appropriate environmental measures and monitoring are in place during the construction phase. This will be an iterative document and will be revised and updated throughout the construction phase as construction works evolve.

The exact mitigation measures required at each location will be dependent on the exact nature of the activities and use of plant/ equipment at each location. This will be outlined in detailed Method Statements for each element of the works at each location.

Construction best practice measures which will be implemented included below:

- The use of noise mitigation measures will be determined based on the precise nature of the activities and use of plant/ equipment in each area as detailed in the Method Statement. Method Statements will include measures taken to limit noisy activities in the vicinity of adjacent residential properties;
- Noise monitoring will be completed at the nearest properties to the works in each of these sensitive areas to ensure that the 65dB BS5228 limit is not exceeded; and
- Where there is potential for the 65dB BS5228 limit to be exceeded, temporary noise barriers will be deployed to attenuate noise levels at the nearest noise sensitive properties.

Construction noise barriers are an effective method in construction noise management and control and work best when paired with other best practices such as utilisation of quieter construction plant, effective work activity scheduling, working within construction hours, and ensuring construction plant/equipment is maintained and in good repair. While construction site noise cannot be eliminated, communicating with the residents is crucial to increasing awareness and tolerance. The final CEMP will identify construction barrier locations if deemed necessary.

The use of the proposed construction noise mitigation measures will ensure that construction noise levels are controlled to the lowest levels practicable.

12.6.1.2 Specific Construction Mitigation

Construction mitigation measures will be put in place to ensure construction noise levels are attenuated and reduced where necessary. Best practice measures will be employed to ensure that construction phase noise levels are reduced to the lowest possible levels.

BS5228:2009+A1:2014 – Noise and vibration control on construction and open sites outlines a range of measures that can be used to reduce the impact of construction phase noise on the nearest noise sensitive receptors. These measures will be applied by the contractor where appropriate during the construction phase of the Proposed Development.

Specific construction good practice measures from BS5228 will be implemented by the contractor as listed below:

- Ensuring that mechanical plant and equipment used for the purpose of the works are fitted with effective exhaust silencers and are maintained in good working order;
- Careful selection of quiet plant and machinery to undertake the required work where available;
- Machines in intermittent use will be shut down in the intervening periods between work;
- Ancillary plant such as generators, compressors and pumps will be placed behind existing physical barriers, and the direction of noise emissions from plant including exhausts or engines will be placed away from sensitive locations, to cause minimum noise disturbance. Where possible, in potentially sensitive areas, temporary construction barriers or enclosures will be utilised around noisy plant and equipment;
- Handling of all materials will take place in a manner which minimises noise emissions; and

- Audible warning systems will be switched to the minimum setting required by the Health & Safety Executive.

12.6.1.3 Construction Hours

It is proposed that standard construction working hours will apply as follows:

- Monday to Friday: 08:00 to 19:00; and
- No activities will take place on site on Weekends and Bank Holidays.

Deviation from these times will only be allowed in exceptional circumstances where prior written approval has been received from PKC.

12.6.1.4 Construction Vibration

A CEMP will be put in place to ensure that the appropriate environmental measures and monitoring are in place during the construction phase. This will be an iterative document and will be revised and updated throughout the construction phase as construction works evolve.

Where piling activities take place in relatively close proximity to buildings, details will be included within the respective Method Statement to limit and measure vibration levels affecting these buildings. For residential properties, monitoring will be completed to ensure that the relevant vibration guideline limits included in Table 12-2 are not exceeded. For commercial buildings, monitoring will be completed to ensure that the limits for structural damage outlined in Table 12-3 are adhered to.

12.6.2 Operational Phase

12.6.2.1 Operational Noise

No operational noise impacts resulting from the operation of the Proposed Development are anticipated. Therefore, no specific mitigation measures are proposed during the operation of the Proposed Development.

12.6.2.2 Operational Vibration

No operational vibration impacts resulting from the operation of the Proposed Development are anticipated. Therefore, no specific mitigation measures are proposed during the operation of the Proposed Development.

12.7 Residual Impacts

Any potential noise and vibration impacts associated with the proposed development are limited to the construction phase. With the appropriate mitigation measures in place, there will be no significant construction phase noise and vibration impacts.

There will be no operational phase noise and vibration impacts associated with the proposed development and hence, there will be no residual impacts.

12.8 Potential Cumulative Effects

12.8.1 Construction Phase

There are a number of proposed and permitted developments within the Proposed Development. However, due to the distance of the proposed developments it is unlikely that cumulative construction noise impacts will arise. Construction noise mitigation measures are detailed in Section 12.6.1. Cumulative construction impacts are predicted to be temporary **Minor**.

12.8.2 Operational Phase

There are no operational phase impacts predicted with the Proposed Development, therefore cumulative operation noise impacts are not likely.

12.9 Conclusions

An assessment of potential noise effects associated with the Proposed Development has been carried out.

There are no significant noise or vibration generating sources associated with the operational phase of the Proposed Development and therefore, operational phase noise / vibration impact assessment has been scoped out.

Operational phase traffic movements associated with the Proposed Development will be very low and substantially lower than the level that would be required to generate any significant traffic noise increases on the local road network. On this basis, operational phase traffic noise impact assessment has been scoped out.

No residual impacts or residual significant effects are predicted for the operational stage of the Proposed Development.

During the construction phase, there is potential for noise impacts at the nearest noise sensitive properties from construction plant and equipment.

Mitigation by careful scheduling of the works, timing of activities and using best practicable means will be implemented such that no significant effects arise, and levels are as low as possible. Residents will be informed of the timing and duration of activities that may produce high noise or vibration. Elevated levels can be tolerated if prior notification and explanation is given.

With construction mitigation measures in place as proposed through the CEMP, and temporary construction noise barrier the noise impacts of construction activities is predicted to be temporary minor. Construction noise mitigation measures are detailed such that noise targets are met throughout the construction phases.

No residual impacts or residual significant effects are predicted for the construction stage of the Proposed Development.

There are no construction or operational phase impacts predicted with the Proposed Development, therefore cumulative operation noise impacts are not likely.

13 SOILS, GEOLOGY, HYDROGEOLOGY & CONTAMINATION

13.1 Introduction

This chapter provides an assessment of the effects of the existing ground conditions on the Proposed Development and addresses the potential effects of the Proposed Development on the soils, geology and hydrogeology of the site and surrounding areas.

Where potential adverse impacts are identified, the assessment identifies mitigation measures that will be implemented to prevent, reduce or offset potential adverse effects, or enhance potential beneficial effects where possible.

This Chapter is supported Volume III Technical Appendices:

- Appendix L: South Kinross Flood Protection Scheme Preliminary Risk Assessment (Desk Study) – by RPS July 2019; and
- Appendix M: South Kinross Flood Protection Scheme Generic Quantitative Risk Assessment - by RPS May 2023.

A Preliminary Risk Assessment (PRA) and a Generic Quantitative Risk Assessment (GQRA) have been produced by RPS in order to inform this assessment. The PRA and GQRA reports are contained within Appendix L and M respectively.

An intrusive ground investigation was undertaken from 25th November to 5th December 2019 by Dunelm Geotechnical & Environmental Ltd. The ground investigation report (GIR) is contained within Appendix M.

13.2 Assessment Methodology

To aid the environmental assessment process, a PRA was prepared by RPS to examine the potential for ground contamination to be present on the site. The PRA was used to assist in the specification of an intrusive geo-environmental ground investigation which involved advancing boreholes and trial pits across the site to establish the baseline soils, geology and hydrogeology. Soil and groundwater samples were collected during the investigation and sent for laboratory analysis for a wide suite of potential contaminants. The information gathered from the ground investigation was used to undertake a GQRA which quantified the risk to human health and environmental receptors from ground contamination.

The PRA has been prepared in accordance with the following:

- Land contamination risk management (LCRM) - How to assess and manage the risks from land contamination. Environment Agency, October 2020;
- Redeveloping Land Affected by Contamination – A developers Guide to Planning Considerations and Environmental Responsibilities. DAERA, April 2019;

- Underpinning the guidance within LCRM 2020 is a source-pathway-receptor methodology, which is used to identify Significant Pollutant Linkages (SPLs).

The following definitions apply:

1. **Source**: a contaminant or pollutant that is in, on or under the land and that has the potential to cause harm or pollution;
2. **Pathway**: a route by which a receptor is or could be affected by a contaminant; and
3. **Receptor**: something that could be adversely affected by a contaminant, for example a person, controlled waters, an organism, an ecosystem, or Part 2A receptors such as buildings, crops or animals.

An important thread throughout the overall process of risk assessment is the need to formulate and develop a conceptual model for the site, which supports the identification and assessment of pollutant linkages. Development of the conceptual model forms the main part of the preliminary risk assessment, and the model is subsequently refined or revised as more information and understanding is obtained through the risk assessment process. A risk is present only when a source-pathway-receptor linkage is present and active. Without a pollutant linkage, there is not a risk, even if a contaminant is present.

13.2.1 Relevant Guidance

The PRA and GQRA have been undertaken with reference to a number of guidance documents, which deal with the investigation and management of risk associated with contaminated land. This assessment has been prepared in accordance with the following:

- Land contamination risk management (LCRM) - How to assess and manage the risks from land contamination. Environment Agency, October 2020;
- BS 10175:2011 + A2:2017. The Code of Practice for the Investigation of Potentially Contaminated Sites and the framework and technical guidance as outlined within;
- Water Pollution Arising from Land Containing Chemical Contaminants, SEPA, 2nd Edition, 2012.
- Position Statement (WAT-PS-10-01) – Assigning Groundwater Assessment Criteria for Pollutant Inputs, SEPA, V3.0, August 2014;
- Groundwater chemical results have been screened against the following criteria:
  - Minimum Reporting Values (MRV) for Hazardous substances;
  - Resource Protection Values (RPV) for Non-Hazardous substances, and
  - Resource Protection Values for Land Contamination significant pollution.

In order to assess the risk from volatile vapours in groundwater to human health, groundwater chemical results have been screened against the following:

- SoBRA Vapour Risk to Human Health from Contaminants in Groundwater;

- A phased approach in line with LCRM 2020 guidance has been taken with regard to the assessment of contaminated land at the site. As part of this phased approach, the initial PRA (desk study) of available information was carried out which was used to plan and focus the ground investigation; and
- As mentioned previously in the chapter, a ground investigation was undertaken in 2019. The information gathered during the investigation was used to undertake a GQRA and to refine the conceptual site model developed through the PRA.

13.2.2 Human Health Risk Assessment

Guidance provided by the UK Environment Agency (EA) has been utilised to form the basis of this assessment.

The Environment Agency has published guidance in relation to assessing the potential risk from contaminated land to human health. Science Report SR2 'Human Health Toxicological Assessment of Contaminants in Soil' and Science Report SR3 'Updated Technical Background to the CLEA Model', together with Land contamination risk management (LCRM) - How to assess and manage the risks from land contamination. Environment Agency, October 2020, provide the most up to date framework for human health risk assessment within the UK.

In order to assess the human health and environmental risks posed by potential contaminants within the underlying soils, RPS undertook an initial screening of the laboratory results using the 2015 LQM/CIEH (Land Quality Management/Chartered Institute of Environmental Health) Suitable 4 Use Levels (S4ULs) (Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3474, all Rights Reserved) as trigger values. These LQM/CIEH S4ULs replace the second edition of the LQM/CIEH Generic Assessment Criteria (GAC) published in 2009. Differences in modelling assumptions and added land uses and substances create the difference between these S4ULs and the previous GAC. These values are provided for six land use classifications:

- Residential with homegrown produce;
- Residential without homegrown produce;
- Allotments;
- Commercial;
- Public open space near residential housing; and
- Public parks.

For pollutants with no relevant S4ULs, assessment criteria were provided by Soil Guideline Values (SGVs) and CL:AIRE's (Contaminated Land: Applications in Real Environments) GAC. In light of the publication of SR2 and SR3 the Environment Agency published SGVs for a number of contaminants for the following standard land use scenarios assuming a Sandy Loam soil and Soil Organic Matter (SOM) content of 6%:

- Residential;
- Allotments; and

- Commercial.

CL:AIRE in association with The Environmental Industries Commission (EIC) and Association of Geotechnical and Geo-environmental Specialists (AGS) published a set of GAC in 2009 for previously unpublished contaminants which are intended to complement the SGVs derived by the Environment Agency. The GACs have been derived predominantly for VOCs and SVOCs using CLEA v1.06 for a number of different Soil Organic Matter contents (1%, 2.5% and 6%).

Public open space near residential housing screening values have been used in this assessment as they are most pertinent to the Proposed Development.

13.2.3 European Union Legislation

European legislation is a significant consideration in assessing the effects of a scheme on the geological and hydrogeological attributes of a site and is outlined below. Following the exit of the UK from the EU, all EU Legislation has been transcribed into UK law.

The WFD (2000/60/EC) establishes a framework for community action in the field of water policy. The main objective of the Directive is for all groundwater, surface water and coastal water bodies to achieve 'good' status by 2015. The Directive introduced new broader ecological objectives as well as aims to prevent deterioration of all water bodies. The Directive must be considered in any scheme that has the potential to impact on any part of the water environment. Their purpose is to establish a framework of environmental liability based on the 'polluter-pays' principle, to prevent and remedy environmental damage.

13.2.4 Assessment of Significance

13.2.4.1 Sensitivity of Receptor

Effects of the development on soils, geology and hydrogeology receptors have been assessed taking into account sensitivity of the receptor and magnitude of the effect. The sensitivity of the receptors is determined according to the methodology shown in Table 13-1.

Table 13-1: Sensitivity of receptor (Amended from 'NRA Guidelines on procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes')

Sensitivity	Criteria	Typical Examples
Very High	Attribute has a high quality and rarity on regional or national scale.	• Geology: World Heritage Sites; sites protected under EU wildlife legislation (SAC, SPA, SSSI, Ramsar site) or • Geological features that are rare on a regional or national scale. • Surface waters: River, wetland or surface water body ecosystem protected by EU legislation.
High	Attribute has a high quality and rarity on Local scale.	• Geology: Regional important geological sites. • Soils: Well drained and/or high fertility soils. • Surface water: Ecosystem protected by national legislation. • Groundwater: Regionally important potable water source supplying >2,500 homes, groundwater vulnerability is classified as high; principal aquifer providing a regionally or

Sensitivity	Criteria	Typical Examples
		locally important resource or supporting site protected under wildlife legislation. • Future site users: Sensitive land uses proposed such as residential housing with gardens, allotments, schools. • Built Environment: Sites of international Importance, World Heritage Sites, Listed Buildings, and Scheduled Monuments
Medium	Attribute has a medium quality and rarity on local scale.	• Soils: Moderately drained and/or moderate fertility soils. • Groundwater: Local potable water source supplying >50 homes, moderate classification of groundwater vulnerability; secondary aquifer providing water for agricultural or industrial use with limited connection to surface water. • Geology: Regionally Important Geological Sites. • Future site users: Moderately sensitive land uses such as residential housing without gardens, commercial developments and open spaces. Built Environment: Sites with local interest for education or cultural appreciation.
Low	Attribute has a low quality and rarity on local scale	• Soils: Poorly drained and/or low fertility soils. • Groundwater: Local potable water source supplying <50 homes, deep secondary aquifer with poor water quality not providing baseflow to rivers. • Geology: Rock exposures. • Future Site Users: Low sensitivity land use such as Industrial Sites, highways and rail. • Built Environment: Infrastructure (e.g., Roads, railways, tramways).
Neutral	Very low importance and rarity on local scale.	• Geology: No rock exposures. • Soils: Urban classified soils. • Groundwater: Non-aquifer/Unproductive Strata.

For the purposes of this assessment, it is considered that Regionally Important (R) Aquifers are Principal Aquifers; Locally Important (L) Aquifers are Secondary Aquifers and Poor (P) Aquifers are Unproductive Strata. Different classifications exist for each of the aquifer types, as listed below:

- Regionally Important (R) Aquifers;
- Karstified bedrock (Rk) where Rkc represents an aquifer dominated by conduit flow and Rkd represents an aquifer dominated by diffuse flow;
- Fissured bedrock (Rf);
- Extensive sand and gravel (Rg);
- Locally Important (L) Aquifers;
- Bedrock which is generally moderately productive (Lm);
- Bedrock which is moderately productive only in local zones (Ll);
- Sand & gravel (Lg);
- Locally important karstified bedrock (Lk);

- Poor (P) Aquifers;
- Bedrock which is generally unproductive except for local zones (Pl); and
- Bedrock which is generally unproductive (Pu).

13.2.4.2 Impact Assessment

The magnitude of a potential effect is independent of the sensitivity of the feature. The magnitude considers the scale of the predicted change to the baseline condition taking into account its duration (i.e., the magnitude may be moderated by the effects being temporary rather than permanent, short term rather than long term) and whether the effect is direct or indirect. Definitions for impact magnitude are described in Table 13-2.

Table 13-2: Criteria to determine the magnitude of effect (Amended from 'NRA Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes')

Magnitude	Criteria	Typical Examples
Major Adverse	Total loss or major alteration to key features of the baseline conditions such that post development character/composition of baseline condition will be fundamentally changed.	• Irreversible loss of high proportion of local high fertility soils/sediments; • Pollution of potable sources of water abstraction; • Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems; • Loss of, or extensive change, to nationally important geological features; • Sterilisation of high-quality mineral resource; • Long-term (chronic) risk to human health or short-term (acute) risk to human health; • Short- term risk of pollution of sensitive water resources; • Extensive damage to buildings/infrastructure (on or off site); • Generation of significant quantities of waste sediment or soils for landfill; and • Contamination of offsite soils. • Substantial geomorphology changes due to cutting
Moderate Adverse	Loss or alteration to one or more key features of the baseline conditions such that post development character/composition of baseline condition will be materially changed.	• Irreversible loss of moderate proportion of local high fertility soils/sediments; • Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems; • Partial loss or change to an aquifer; • Partial loss of the integrity of groundwater supported designated wetlands; • Permanent loss of, regionally important geological features, or substantial changes to nationally important geological features; • Sterilisation of low quality mineral resources; • Easily preventable, permanent health impacts on humans or medium-term (chronic) risk to human health; • Medium long-term risk of pollution of sensitive water resources; damage to buildings/infrastructure (on or off site); and • Localised damage to buildings/infrastructure (on or off site).

Magnitude	Criteria	Typical Examples
Minor Adverse	Results in some measurable change in attributes quality or vulnerability compared to baseline conditions. Changes arising from the alteration will be detectable but not material; the underlying character/composition of baseline condition will be similar to the pre-development situation.	• Irreversible loss of small proportion of local high fertility soils/sediments and/or high proportion of local low fertility soils/sediments; • Changes to made ground deposits only; • Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems; • Minor effects on groundwater supported wetlands; • Loss of, or extensive change, to locally important geological features; • Easily preventable, non-permanent health impacts on humans; • Minor low-level and localised contamination of on-site soils/sediments; • Pollution of non-sensitive water resource or low long-term risk of pollution to sensitive water resource; and • Easily repairable damage to buildings / infrastructure.
Neutral	Very little change from baseline conditions. Change is barely distinguishable approximately to a “no change” situation.	• No measurable impact upon surface waters or groundwater; • No measurable impact on geological features; • No measurable impact on soils/sediments; and • No discernible change with regards to contaminated land.
Beneficial	Benefit to, or addition of, key characteristics, features or elements compared to baseline conditions.	• Improvement to geological features; • Remediation of widespread high levels of soil/sediment contamination; • Removal of source of groundwater and surface water contamination; and • Re-use of significant quantities of excavated soils on-site to avoid disposal to landfill.

13.2.4.3 Significance Criteria

The significance of a specific potential effect is derived from both the sensitivity of the feature and the magnitude of the effect, and can be then determined using the matrix presented in Table 13-3 (has been amended from ‘NRA Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes’). Effects can be beneficial, adverse or neutral and their significance Very Large, Large, Moderate, Slight or Neutral or an intermediary designation as cases dictate based on professional judgement. The significance of an impact should also be qualified based on the likelihood of an effect occurring (using a scale of certain, likely or unlikely) and the confidence in the accuracy of the assessment.

Professional judgement can be used to vary the category where specific circumstances dictate, for example due to the vulnerability or condition of the receptor.

Table 13-3: Assessment of Significance Matrix (Amended from 'NRA Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes')

		Magnitude of change			
		Major	Moderate	Minor	Negligible
Sensitivity	High	Major	Major/Moderate	Moderate	Minor
	Medium	Major/Moderate	Moderate	Moderate/Minor	Minor
	Low	Moderate	Moderate/Minor	Minor	Minor/Negligible

13.2.4.4 Significance of Residual Effects

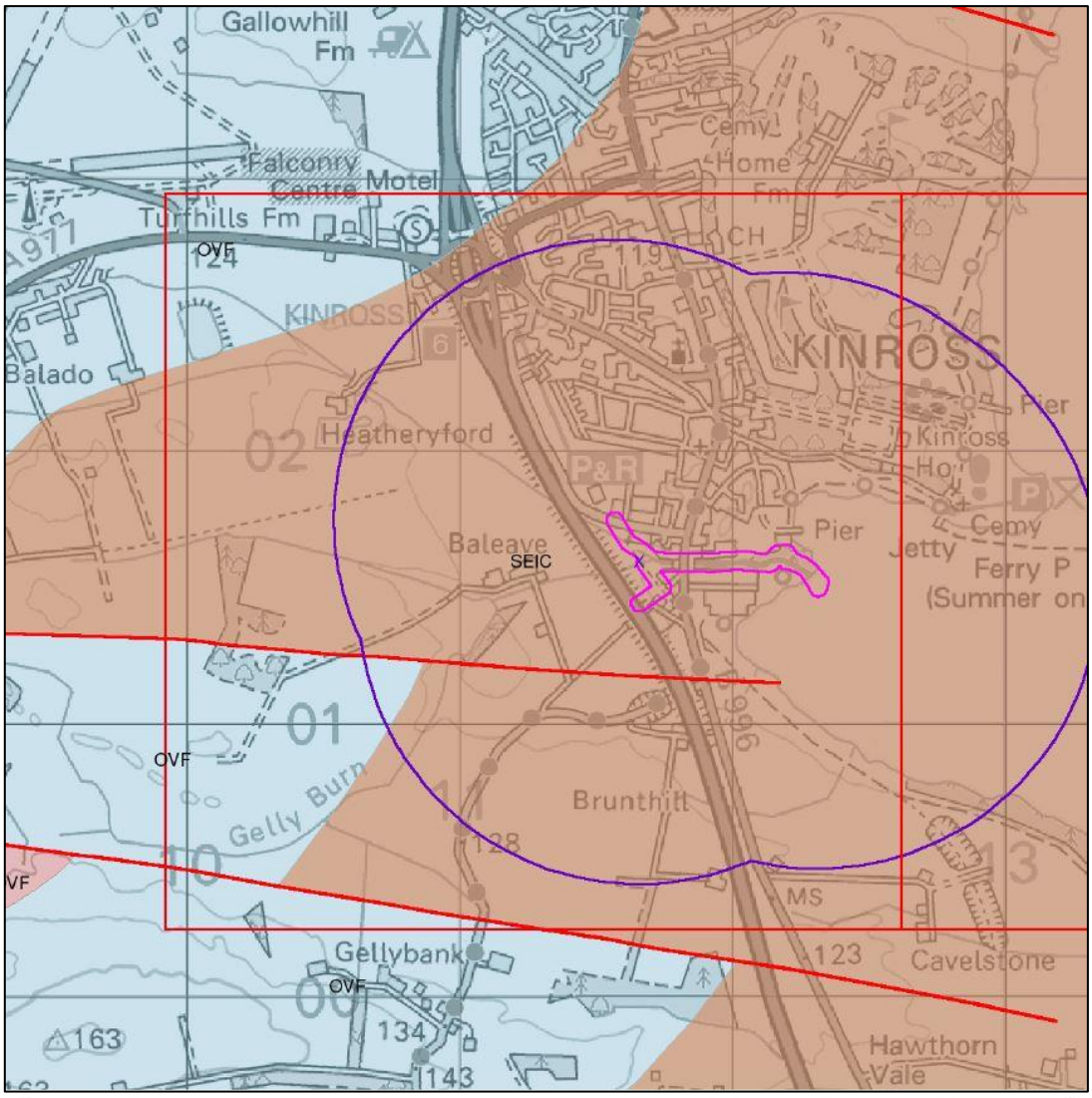
The significance of effects for soils, geology and hydrogeology has been assessed initially without taking mitigation measures into account. Residual effects (effects that remain once mitigation measures are taken into consideration) are then identified. Temporary effects are considered in the construction period whilst permanent effects are discussed in the operational phase, albeit that the effect may first occur during construction.

13.3 Baseline Scenario

A review of the material provided in the Envirocheck report (211428219_1_1), British Geological Survey's (BGS) online 'GeoIndex Onshore' facility and geological map extracts from the digital geological map of Great Britain at 1:50,000 scale has been completed to gain an understanding of the site ground conditions. The findings of this preliminary research, which requires confirmation by ground investigation, are described in the following sub-sections.

13.3.1 Solid Geology

The solid geology map for the area (Figure 13-1) indicates that the site is underlain by sandstone rocks of the Stratheden Group and Inverclyde Group (undifferentiated). Basalt rocks of the Ochil Volcanic Formation are shown west, north and south of the site. Generally, east-west trending faults are shown south and north of the site. Other northeast-southwest trending faults are shown to the south and west.



Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	SEIC	Stratheden Group and Inverclyde Group (Undifferentiated)	Sandstone	Not Supplied - Late Devonian
	OVF	Ochil Volcanic Formation	Andesite, Pyroxene	Not Supplied - Early Devonian
	OVF	Ochil Volcanic Formation	Conglomerate	Not Supplied - Early Devonian
		Faults		

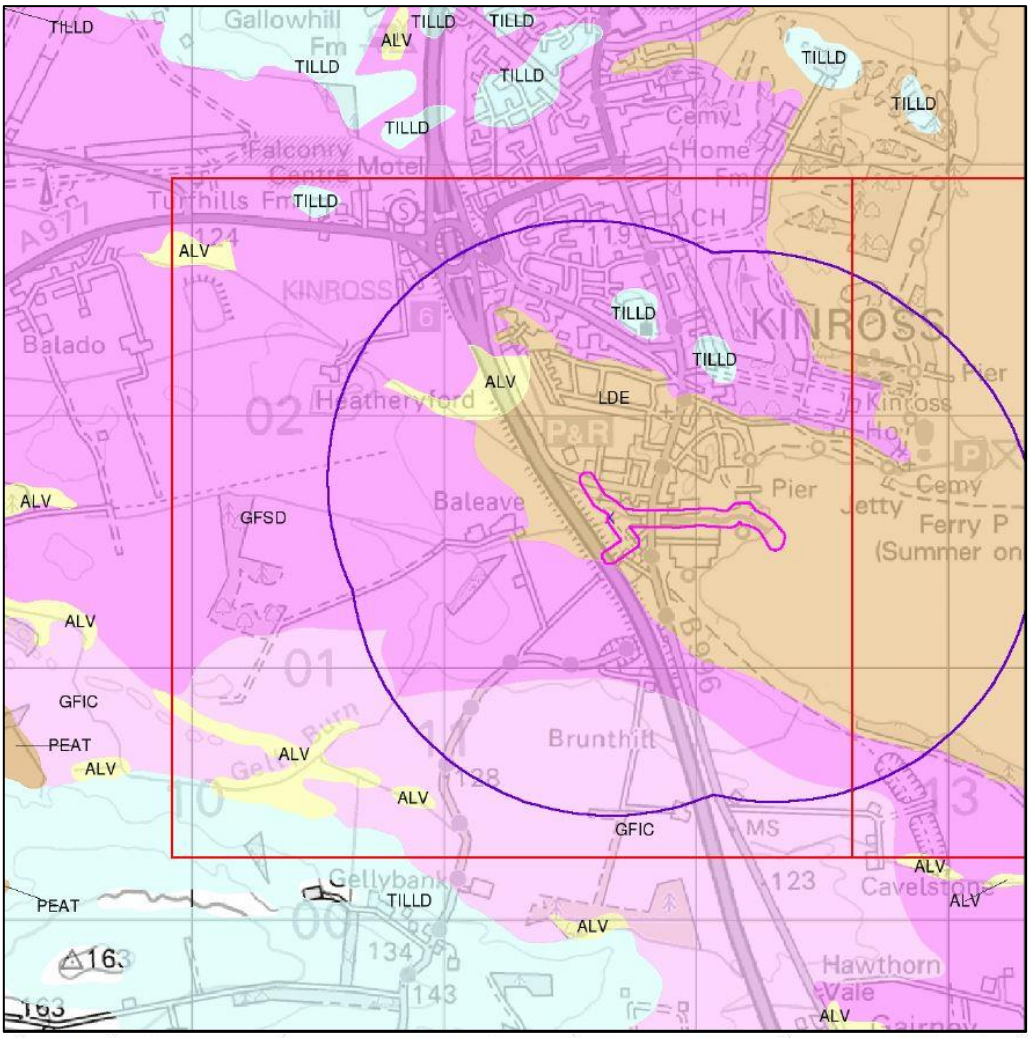
Figure 13-1: Solid Geology (taken from Envirocheck report 211428219_1_1)

13.3.2 Drift Geology

Figure 13-2, which follows, shows the drift (or superficial) geology of the site. This is expected to comprise:

- Artificial ground is shown west of the M90 motorway. This could be worked ground where an area of land (natural or artificial) has been lowered as a result of man-made excavations, or a void. The purpose of such excavations is unspecified;
- Alluvium associated with the South Queich river and Gelly Burn watercourses (i.e. unconsolidated, sorted or semi-sorted, clay, silt, sand and gravel detrital material deposited by a watercourse in its bed, or on its floodplain or delta). Normally soft to firm compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. May include a stronger, desiccated surface zone;
- Lacustrine deposits associated with Loch Leven i.e., clay, silt and sand. Lacustrine deposits are laid down as deltaic, lake bottom and shore sediments in lakes. They include clastic deposits, composed of coarse-grained bedload and suspended fine-grained material brought by streams flowing into the lake. Includes fine-grained sediments i.e., clay and silt, commonly laminated, and can contain thin layers of organic material or sand; and
- Glaciofluvial sheet deposits i.e., sand and gravel, locally with lenses of silt, clay or organic material, of glaciofluvial origin. These deposits are shown west of the site and could underlie the more recent artificial, alluvial and lacustrine deposits.

A glacial meltwater channel is shown in an area of till to the southwest of the site. The thicknesses of the natural superficial deposits and the depth to bedrock are unknown (bedrock is not indicated to be near surface near the site). Given that the site is in the town of Kinross, made ground deposits of perhaps significant extent could also be present.

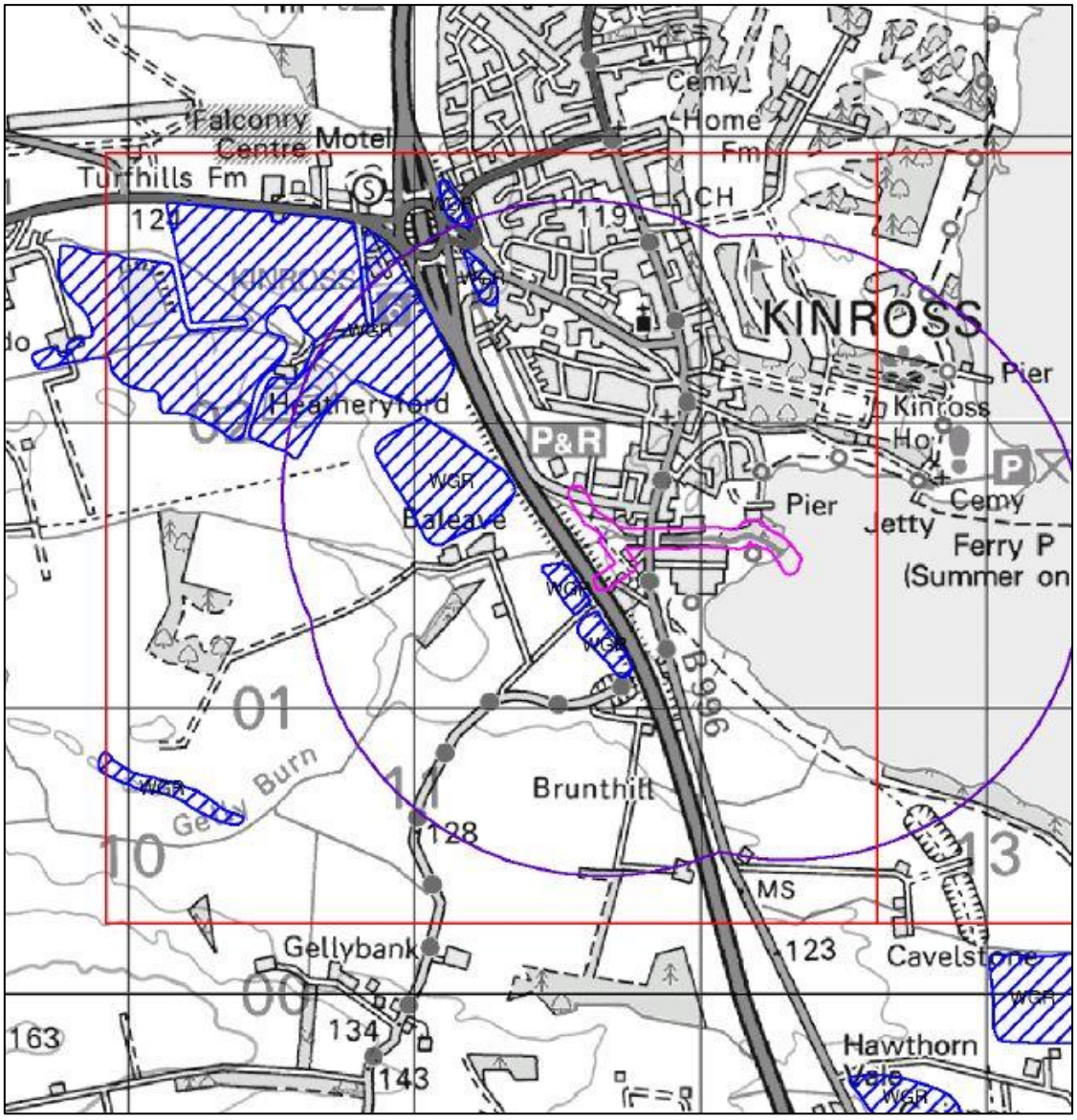


Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Not Supplied - Holocene
	TILLD	Till, Devensian	Diamicton	Not Supplied - Devensian
	GFSD	Glaciofluvial Sheet Deposits	Gravel, Sand and Silt	Not Supplied - Quaternary
	LDE	Lacustrine Deposits	Clay, Silt and Sand	Not Supplied - Quaternary
	GFIC	Glaciofluvial Ice Contact Deposits	Gravel, Sand and Silt	Not Supplied - Quaternary
	PEAT	Peat	Peat	Not Supplied - Quaternary

Figure 13-2: Drift Geology (taken from Envirocheck report 211428219_1_1)

13.3.3 Worked Ground

Worked ground (areas where ground has been cut away, such as quarries and road cuttings) is anticipated in the area of land to the west and northwest of the site where ground has been worked (excavated) for road cuttings, railway lines or quarries.



Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	WGR	Worked Ground (Undivided)	Void	Not Supplied - Holocene

Figure 13-3: Made Ground Desposits (taken from Envirocheck report 211428219_1_1)

13.3.4 Groundwater Vulnerability

In accordance with the WFD (2000/60/EC) it is necessary to understand the groundwater vulnerability of the site, which is defined as the tendency and likelihood for general contaminants to reach the water table after introduction at the ground surface. The site is classified as 'highly permeable' as shown in Figure 13-4.

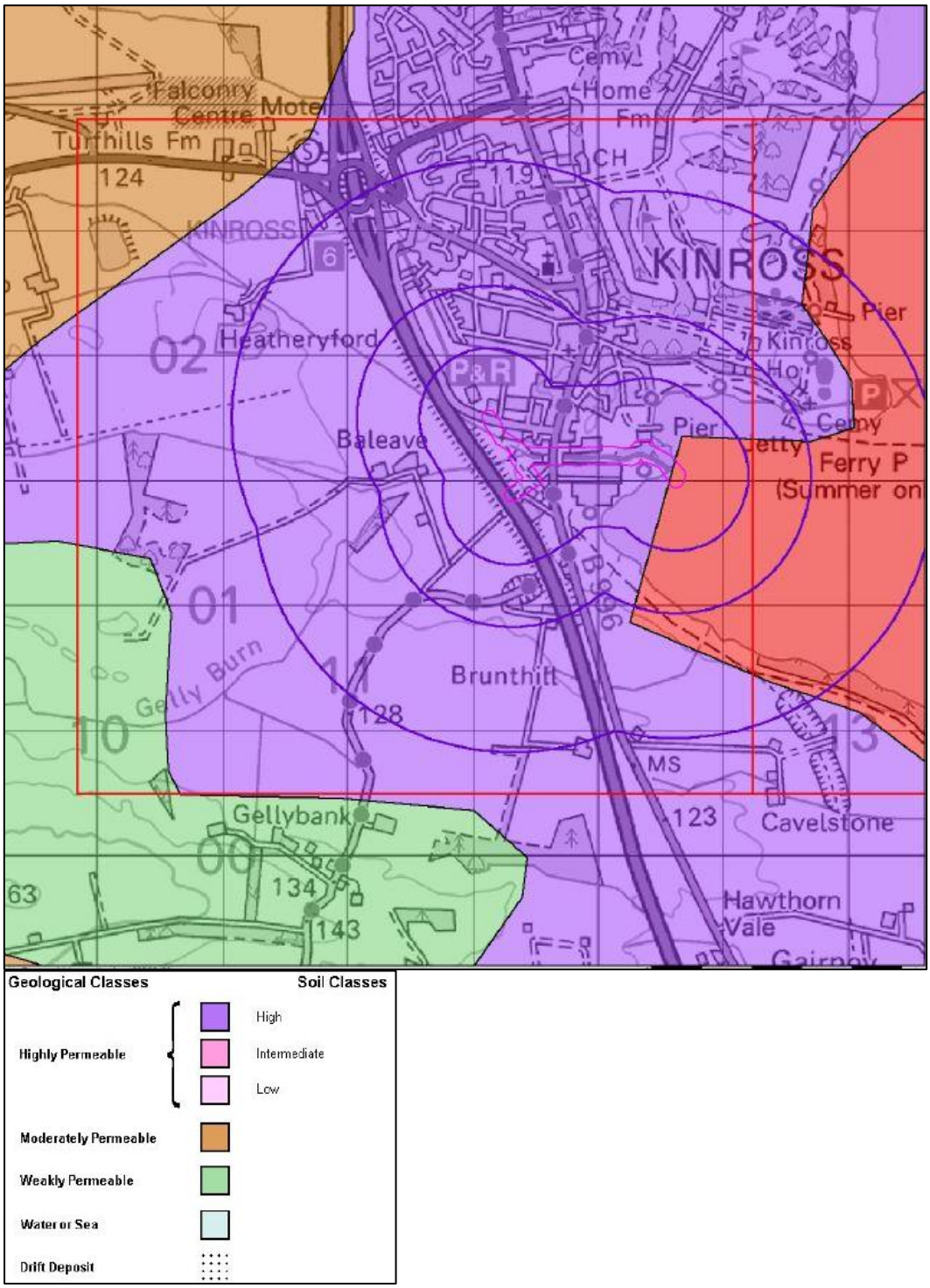


Figure 13-4: Groundwater Vulnerability Classification (taken from Envirocheck Report 211428219_1_1)

13.3.5 Surface Water Hydrology

As can be seen in Figure 13-5, various inland river networks are near the site and several water bodies and drainage networks are within the site boundary and drain into Loch Leven. The South Queich River is in the River Leven (Fife) catchment of the Scotland river basin district. The surface water quality of Loch Leven and of water bodies draining into the Loch was classified as ‘Poor’ in 2014.

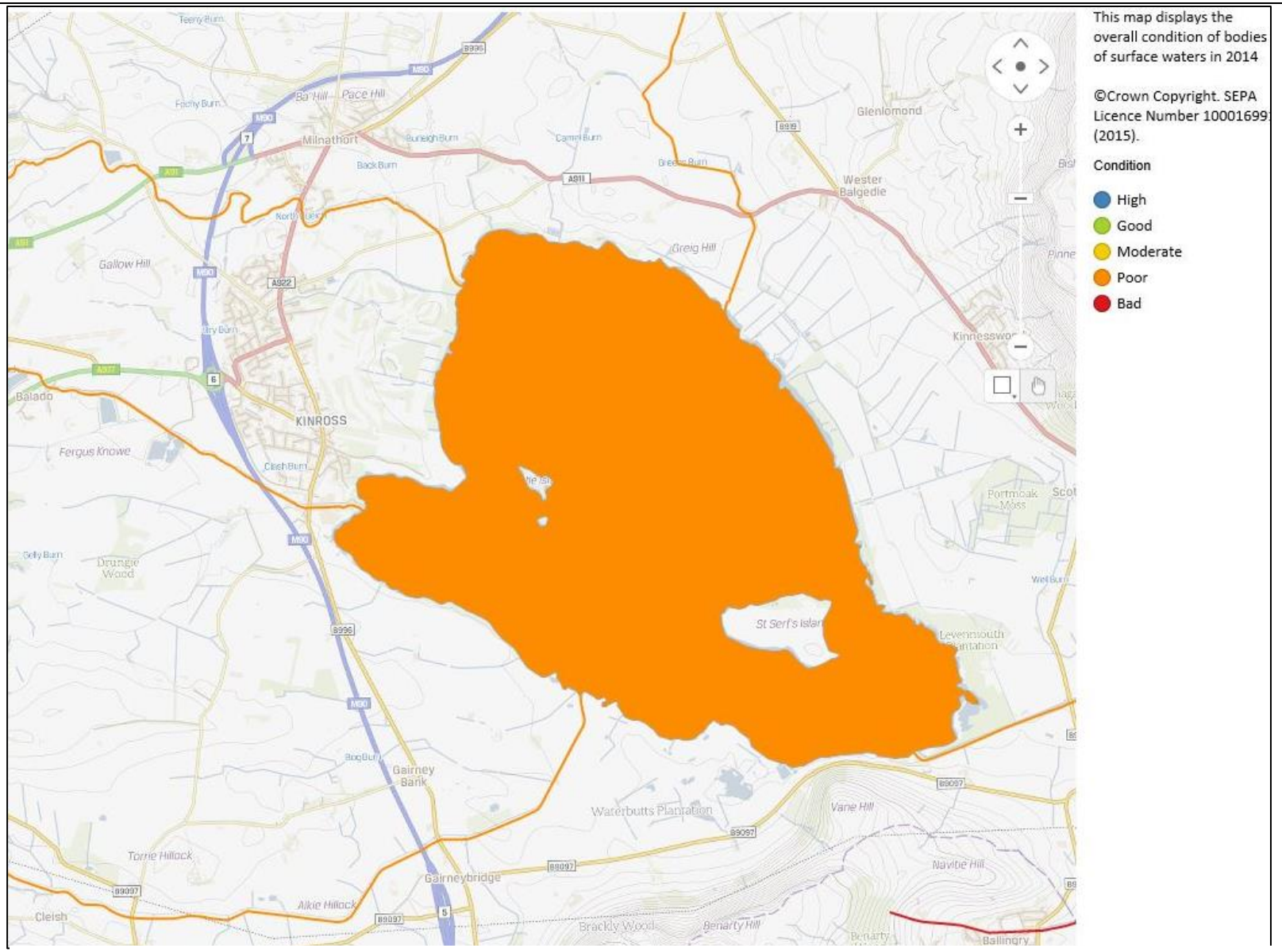


Figure 13-5: Surface Water Hydrology & Quality taken from SEPA https://www.sepa.org.uk/data-visualisation/water-environment-hub/

13.3.6 Hydrological Data

The Flood Map (Figure 13-6 below) in the Envirocheck report (211428219_1_1) shows that an estimated 1 to 2m 100-year flood depth is anticipated for most of the application site with an estimated 0 to 1m 100-year flood depth anticipated in surrounding areas.

The BGS susceptibility to groundwater flooding data classifies the application site as having the potential for groundwater flooding to occur at the surface as shown in Figure 13-7, which follows.

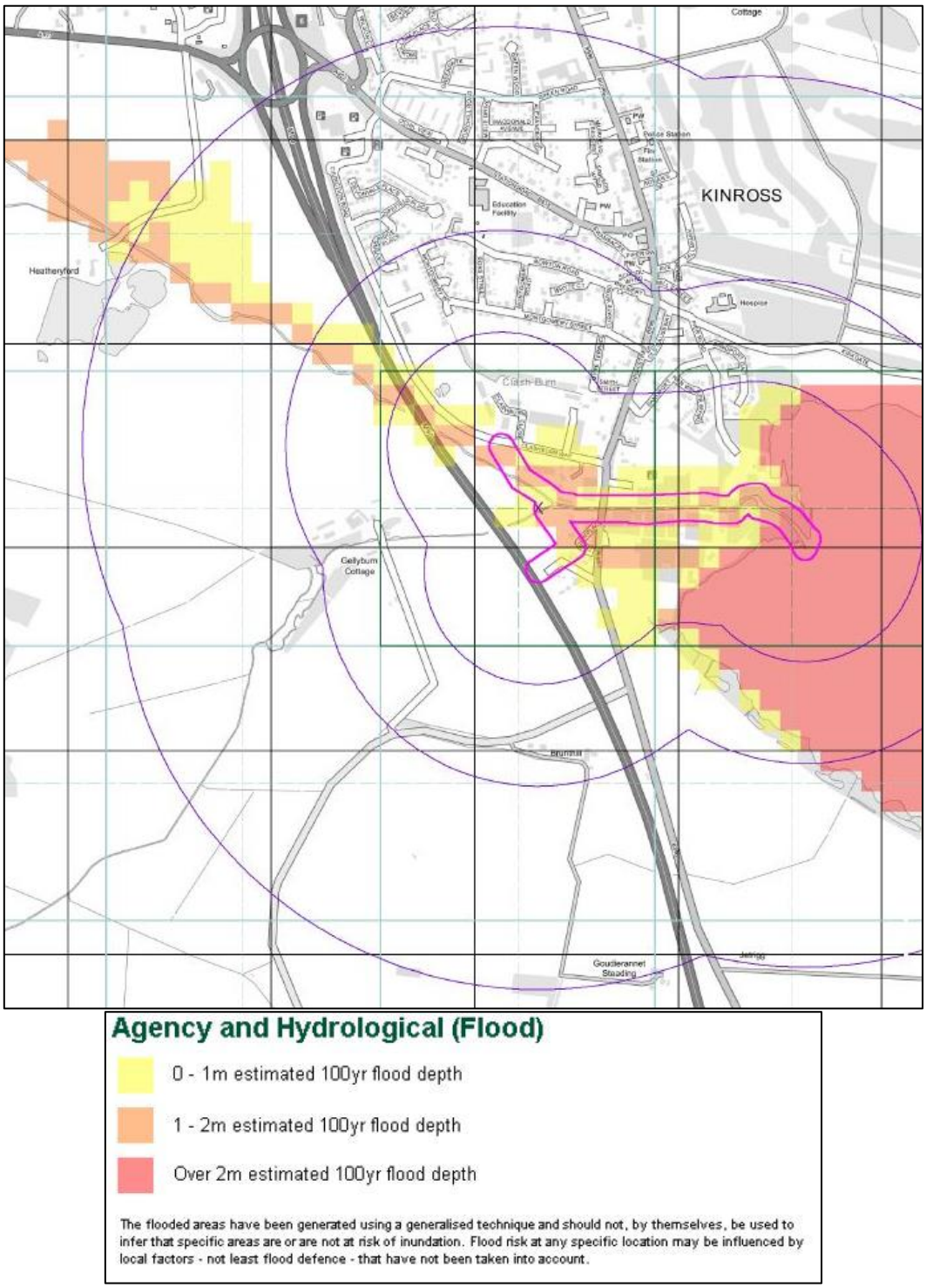


Figure 13-6: Flood risk (taken from Envirocheck Report 211428219_1_1)

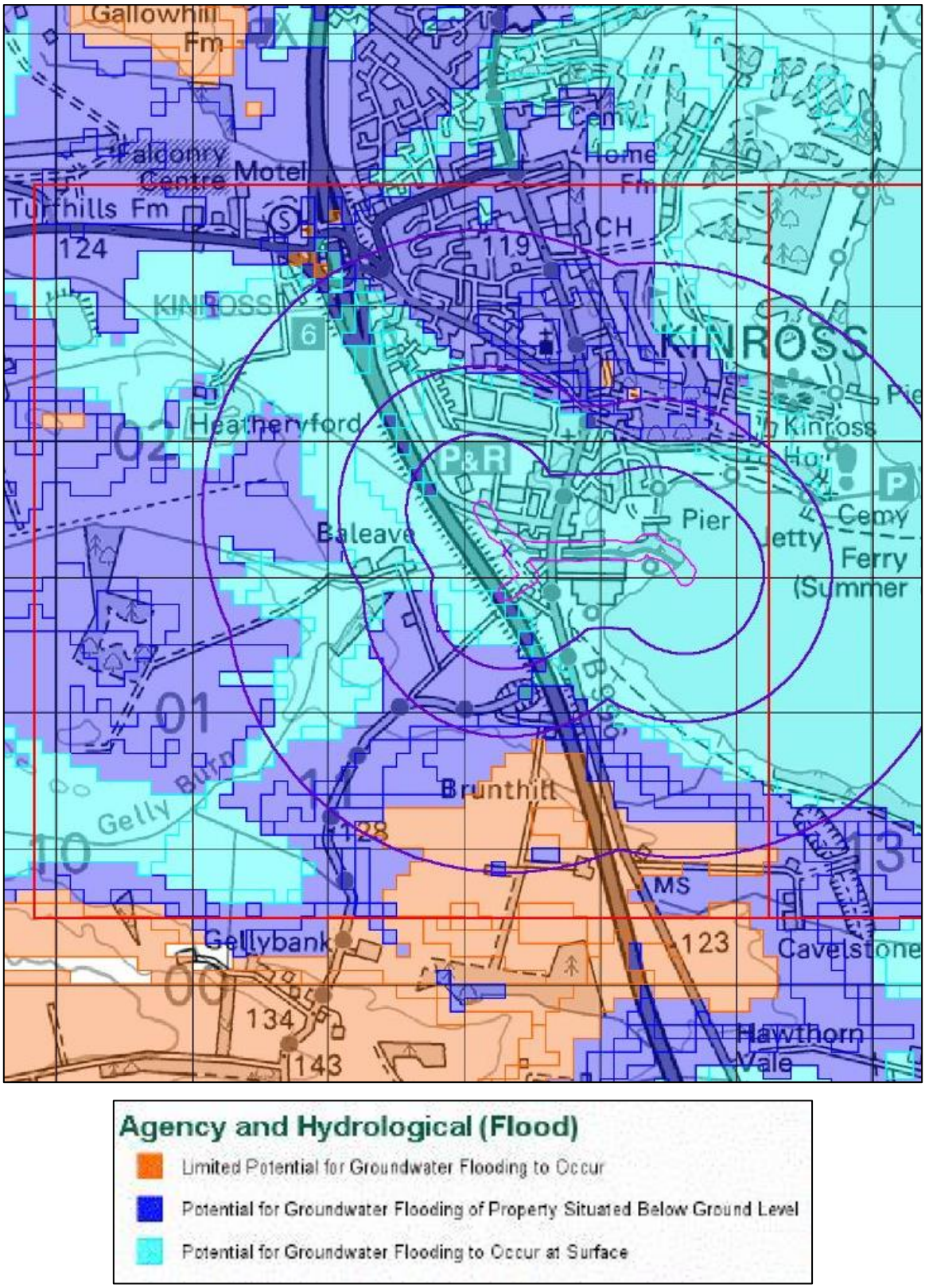


Figure 13-7: Groundwater Flooding (taken from Envirocheck Report 211428219_1_1)

13.3.7 Natural Environment Designations

Loch Leven is east of the site and is designated as an SSSI, an SPA and a Ramsar Site as shown in Figure 13-8, which follows.

Loch Leven also forms the main part of the Loch Leven NNR which is managed by NatureScot. The wetlands on the southern shore of Loch Leven are managed by the Royal Society for the Protection of Birds (RSPB). Areas of ancient woodland are present to the north of the site.

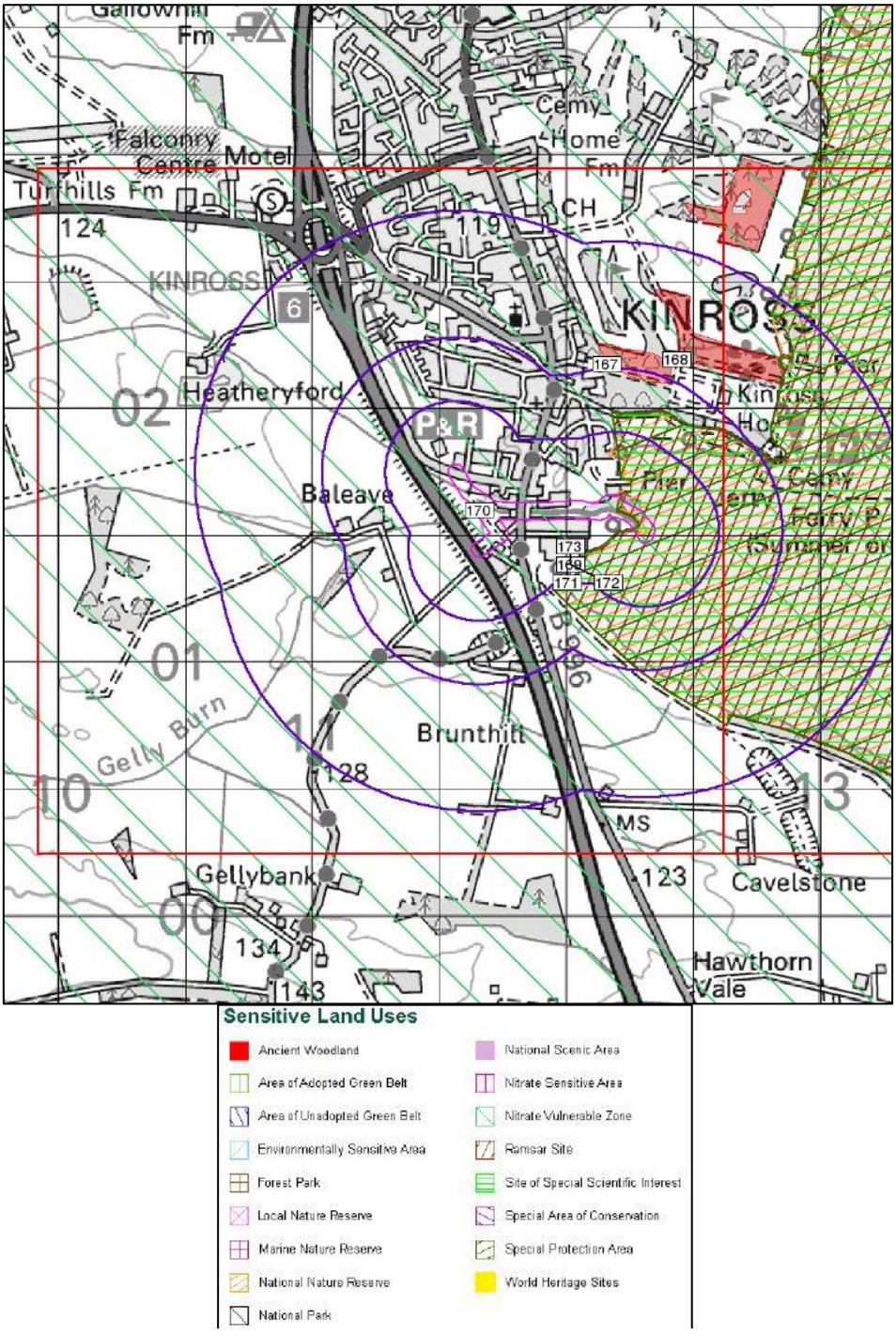


Figure 13-8: Sensitive Land Uses (taken from Envirocheck Report 211428219_1_1)

13.4 Ground Investigation

An intrusive ground investigation was undertaken by Dunelm Geotechnical and Environmental Ltd from 25th November to 5th December 2019. The ground investigation report is included in Volume III, Appendix M South Kinross FPS Generic Quantitative Risk Assessment.

The investigation comprised of:

- Four (4) WS01 – WS04 cable percussive boreholes with dynamic probing follow on to 7m bgl;
- Six (6) BH01 – BH06 cable percussive boreholes to 10m bgl;
- Two (2) Trench 1 and Trench 2 mechanically excavated trenches;
- Thirteen (13) OT01 OT01A-C, OT02 & OT02A-C, OT03, OT04 & OT04 A-B and OT05) mechanically excavated observations trenches within a stockpile.
- Collection of and laboratory analysis of twenty no. (20) soil samples;
- Collection and laboratory analysis of six no. (6) groundwater samples.

13.5 Ground Conditions

This section summarises the ground conditions encountered during the investigation based on the exploratory hole logs provided by Dunelm Geotechnical and Environmental. The logs are contained within the Ground Investigation (GI) report in Appendix A of the GQRA (see Volume III, Appendix M).

A summary of the ground types encountered in the exploratory holes is described in the following sub-sections, in approximate stratigraphic order. The GI locations are shown in Figure 13-9.

Ground conditions on the proposed route of the flood defences have been described in Sections. 13.5.1 to 13.5.11.

It should be noted that the observation trenches, labelled OT01 to OT05, which sample existing stockpiles are not included in the ground conditions.

Strata encountered were generally similar beneath all parts of the site. Ground conditions are described in the Sections. 13.5.1 to 13.5.11

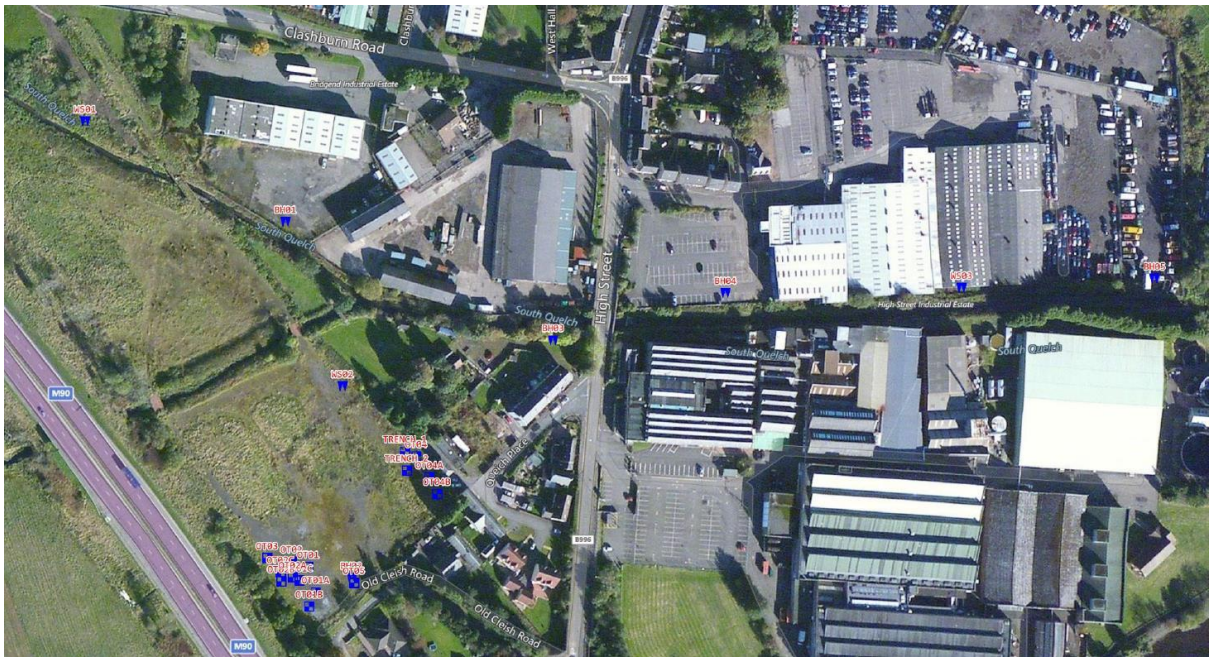


Figure 13-9: GI Location Plan

13.5.1 Topsoil

Topsoil varying in thickness between 0.02m and 0.35m was encountered in the majority of the exploratory positions. The topsoil was noted to be generally free from debris.

13.5.2 Made Ground

Made ground was encountered in a number of the cable percussive and window sample boreholes across the investigation area.

Made ground extended to depths between 0.5m and 1.65m bgl. Made ground typically recorded granular deposits of sandy gravel, ashy sand and gravelly sand.

A sandy gravel of red shale was recorded within BH02 to 1.4m bgl and a layer of ashy sand was noted within BH04 with cobbles and brick recorded within the gravel fraction. Ashy sand was recorded in BH4 to a depth of 1.0m bgl.

SPT testing within the made ground recorded ‘N’ values of 4 and 19 these results were recorded in the deeper made ground in boreholes BH02 and BH04 respectively.

13.5.3 Hardstanding

Macadam hardstanding was noted within two of the boreholes (BH01 and BH04 with recorded thicknesses of 0.20m and 0.09m respectively).

13.5.4 Buried Obstructions

Cobbles and/ or boulders were encountered within the natural strata. As no desk study information is included within this investigation the former land uses are not known.

13.5.5 Natural Soils

The natural soils at the site consisted of granular materials across the extent of the study area with deposits largely comprising sandy gravel and gravelly sand, with discontinuous strata of soft silt in BH03 and BH04.

13.5.6 Groundwater Strikes During Investigation

During the ground investigation, groundwater was encountered during excavation of all six exploratory borehole locations and within Trench 1. None of the Window Samples encountered groundwater strikes. Groundwater strikes are summarised in Table 13-4.

Table 13-4: Groundwater Strikes during Investigation

Location	Groundwater	Strata
BH01	Water Strike at 2.80 m	Medium dense sandy GRAVEL. Sand is medium to coarse. Gravel is subrounded to subangular, fine to coarse of sandstone, quartz and basalt. 1.20 m-1.65 m: Brown very gravelly, very silty,
BH02	Water Strike at 3.00 m	Medium dense grey, slightly silty gravelly SAND. Gravel is subrounded to subangular, fine to coarse of sandstone, quartz and basalt.
BH03	Water Strike at 1.50 m and 8.50 m	Medium dense brown gravelly, slightly clayey, SAND. Gravel is subrounded to rounded, fine to coarse of basalt, quartz and sandstone. Soft brown slightly gravelly, sandy SILT. Gravel is subrounded fine of basalt.
BH04	Water Strike at 2.00 m	Soft locally firm brown sandy slightly gravelly SILT. Gravel is subangular to subrounded, fine to medium of basalt and sandstone.
BH05	Water Strike at 2.10 m	Loose brown gravelly slightly silty SAND. Gravel is subangular to subrounded, fine to medium of basalt, sandstone and quartz.
BH06	Water Strike at 1.20 m	Light brown slightly gravelly silty SAND. Gravel is subangular to subrounded, fine of basalt.

13.5.7 Groundwater Monitoring

Ground gas monitoring was only carried out on one occasion on the 17th December 2019. As a result, standing groundwater levels within installed boreholes were not monitored over an adequate duration to give an insight into the hydrogeological conditions beneath the site.

13.5.8 Laboratory Analysis

Twenty (20) Soil samples were scheduled for laboratory analysis that included testing for the following parameters:

- Heavy metals;
- Speciated total petroleum hydrocarbons (TPHs);
- Speciated polycyclic aromatic hydrocarbons (PAHs);
- Speciated polychlorinated biphenyls (PCBs);
- Phenols;
- Volatile & semi volatile organic compounds (VOCs & SVOCs);
- Inorganics; and
- Asbestos screen.

Six (6) Groundwater samples were collected and sent for laboratory analysis to test for the following parameters:

- Heavy Metals;
- Speciated total petroleum hydrocarbons (TPHs);
- Speciated polycyclic aromatic hydrocarbons (PAHs);
- Speciated polychlorinated biphenyls (PCBs);
- Phenols;
- Volatile & semi volatile organic compounds (VOCs & SVOCS); and
- Inorganics.

13.5.9 Summary of Soil Results

All soil samples recorded concentrations below the generic assessment criteria for public open space near residential housing end use.

13.5.10 Asbestos in Soils

A total of 20 no. environmental soil samples were screened for the presence of asbestos. Laboratory analysis confirmed that asbestos fibres in the form of Chrysotile was recorded in four of the observation trenches including, OT01B at 1.00m bgl, OT02B at 0.70m bgl, OT03 at 0.80m bgl and OT05 at 0.80m bgl. No Asbestos Detected (NAD) was recorded in all boreholes.

13.5.11 Summary of Groundwater Chemical Results

Table 13-5 summaries the exceedances identified in groundwater samples.

Table 13-5: Summary of Groundwater Exceedances

Site Investigation Point ID	Exceeding Contaminant	Concentration (µg/L)	Screening Value (µg/L)
BH01	Copper	3.5	1.0 EQS WFD UK Specific Pollutants
BH02	Copper	2.9	1.0 EQS WFD UK Specific Pollutants
BH05	Copper	3.4	1.0 EQS WFD UK Specific Pollutants
BH06	Copper	1.6	1.0 EQS WFD UK Specific Pollutants
BH02	Manganese	110	50 Resource protection values – non-hazardous substances
BH03	Manganese	400	50 Resource protection values – non-hazardous substances
BH04	Manganese	1900	50 Resource protection values – non-hazardous substances
BH05	Manganese	190	50 Resource protection values – non-hazardous substances
BH06	Manganese	610	50 Resource protection values – non-hazardous substances
BH01	Zinc	49	10.9 EQS WFD UK Specific Pollutants
BH02	Zinc	63	10.9 EQS WFD UK Specific Pollutants
BH03	Zinc	73	10.9 EQS WFD UK Specific Pollutants
BH04	Zinc	75	10.9 EQS WFD UK Specific Pollutants
BH05	Zinc	54	10.9 EQS WFD UK Specific Pollutants
BH04	Zinc	59	10.9 EQS WFD UK Specific Pollutants
BH04	Iron	2200	200 Resource protection values – non-hazardous substances
BH05	Chromium	7.4	4.7 EQS WFD UK Specific Pollutants

As groundwater in the vicinity of the site is not used as a potable water supply, no risk to human health exists through ingestion and as such, drinking water standards are not considered as part of the assessment.

Chemical parameters for heavy metals Copper, Zinc and Chromium were found to exceed the EQS WFD UK Specific Pollutants at a number of sample locations.

Chemical parameters for heavy metal Iron and Manganese were found to exceed the Resource protection values – non-hazardous substances at a number of sample locations.

The exceedances of heavy metal parameters are observed in boreholes which were installed within glacial sands, silts and gravels.

Chemical parameters for heavy metals Copper, Zinc and Chromium were found to exceed the EQS WFD UK Specific Pollutants at a number of sample locations. Chemical parameters for heavy metal Iron and Manganese were found to exceed the Resource protection values – non-hazardous substances at a number of sample locations. The exceedances recorded for Copper, Zinc, Iron and Manganese are likely natural and a result of the wider site area groundwater chemistry.

The exceedance recorded for Chromium is likely attributed to an anthropogenic source as high levels were recorded in BH05 alone. In addition, BH05 is located in an area of the site which is occupied by BCA Kinross (a used vehicle dealership), which may be attributed to the isolated contamination in this area of the site.

13.6 Significance of Effects

13.6.1 Construction Impacts

The impact to land, soils and geology from demolition work is considered to be **Neutral** as there will be no measurable impact on geological features, no measurable impact on soils and no discernible change with regards to contaminated land.

Construction impacts may also include noise, dust, odour and site traffic generation problems as well as potential contamination issues arising with the use of fuel storage tanks, vehicles and the use of paints and oils.

13.6.2 Operational Impacts

The operational impact to soils and geology is considered to be **Neutral**. As there will be no measurable impact upon surface waters or groundwater, no measurable impact on geological features and no measurable impact on soils/sediments.

13.7 Mitigation Measures

A total of 20 no. environmental soil samples were screened for the presence of asbestos. Laboratory analysis confirmed that asbestos fibres in the form of Chrysotile was recorded in four of the observation trenches including, OT01B at 1.00m bgl, OT02B at 0.70m bgl, OT03 at 0.80m bgl and OT05 at 0.80m bgl. No Asbestos Detected (NAD) was recorded in all boreholes.

Soil sources of contamination were identified in the form of asbestos fibres in the western portion of the site. However, the risk associated with this is minimal. As part of the flood protection scheme an embankment is proposed in this western portion of the site where this asbestos is located. The embankment requires earthworks in the form of excavations (currently to an unknown depth) which is anticipated to remove the shallow asbestos fibres from this area of the site. Due to the unknown depth of the excavations, it is possible for asbestos fibres to remain at greater depths such as in OT01B at 1.00m bgl. If asbestos fibres do remain in situ a human health exposure pathway is unlikely to exist as at least 300mm of screened topsoil will be imported to the site and a geotextile membrane is proposed which will provide further mitigation against human health exposure.

No other mitigation measures are recommended for the Proposed Development in relation to soils, geology, hydrogeology and contamination.

13.8 Residual Impacts

The impact of the development on soils and geology is considered to be **Neutral** as there will be minimal impact on geological conditions.

Earthworks may be carried out for a range of utility and service runs across the Proposed Development.

The impact of the Proposed Development site on groundwater is considered to be **Neutral** as there will be no significant earthworks which would impact groundwater.

13.9 Potential Cumulative Effects

No cumulative impacts are expected between the proposed development and other projects listed due to their minor nature and the fact that they will have little to no impact on the soils, geology, hydrogeology and contamination of the site and surrounding area.

13.10 Inter-relationships

The Proposed Development may interact with other environmental considerations such as the creation of dust, construction noise, waste and impacts on ecology.

13.11 Conclusions

The assessment of soils, geology and hydrogeology was based on a desk study of publicly available information such as geological maps, historical borehole logs and maps, a site walkover survey and an intrusive ground investigation. The investigation identified that the site is underlain by made ground, sands and gravels.

Hydrogeology is the study of groundwater, including its origin, occurrence, movement and quality. The site falls within an area of high groundwater vulnerability. Groundwater was encountered within the made ground deposits and at greater depth within the sand and gravel deposits. The conceptual site model developed in the assessment has not identified any potential significant relevant pollutant linkages (RPLs) for the site.

The Proposed Development will have a **Neutral** impact on the soils, geology and hydrogeology of the area.

14 WASTE

14.1 Introduction

This chapter assesses the waste management aspect of the Proposed Development.

Regulation 5(2) of The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 sets out the minimum information that is required in an Environmental Impact Assessment Report (EIAR). Regulation 5(2)(f) states than an EIAR must include at least –

"...any other information specified in Schedule 4 relevant to the specific characteristics of the works of the development and to the environmental features likely to be significantly affected."

Under Paragraph 1 of Schedule 4 of the Regulations, applicants are required to be included in the Environmental Impact Assessment, "an estimate…[of] quantities and types of waste produced during the construction and operation phases."

Effects from the forecasted waste generation from the construction and operational phases of the Proposed Development have been assessed in the context of the effects on regional waste management treatment and landfill infrastructure capacity, legislation, policy and strategy targets. Mitigation measures are proposed to reduce the impact of waste generated by the Proposed Development.

14.1.1 Waste

Waste is defined as *"any substance or object which the holder discards or intends or is required to discard"* under the Waste Framework Directive (European Directive 2006/12/EC as amended by Directive 2008/98/EC).

Once a substance has become waste it will remain waste until it has been fully recovered and no longer poses a potential risk to the environment or human health. From that moment onwards, the material ceases to be waste, and it is no longer subject to the same legislative controls.

This applies to waste used as aggregate or construction material in civil engineering applications. Waste recovery can be achieved when such waste is incorporated into a road, building or other infrastructure works, or in the case of inert waste, after processing if such a process is conducted following the criteria specified in the relevant quality protocols.

The principal objective of sustainable resource and waste management is to use material resources more efficiently, where the value of products, materials and resources are maintained in the economy for as long as possible and the generation of waste is minimised. To achieve resource efficiency there is a need to move from a traditional linear economy to a circular economy as set out in Scotland's Circular economy policy 'Making Things Last' (2016) (see Figure 14-1).

Figure 14-1: Circular Economy

The Waste (Scotland) Regulations 2011 and the Waste Management Licensing (Scotland) Regulations 2011 places a duty on all persons who produce, keep or manage waste to take all reasonable steps to apply the waste hierarchy (Figure 14-2). Therefore, where residual waste is generated, there is a requirement to deal with it in a way that follows the waste hierarchy and actively contribute to the development of sustainable waste management in Scotland and the ambition of a zero-waste society.

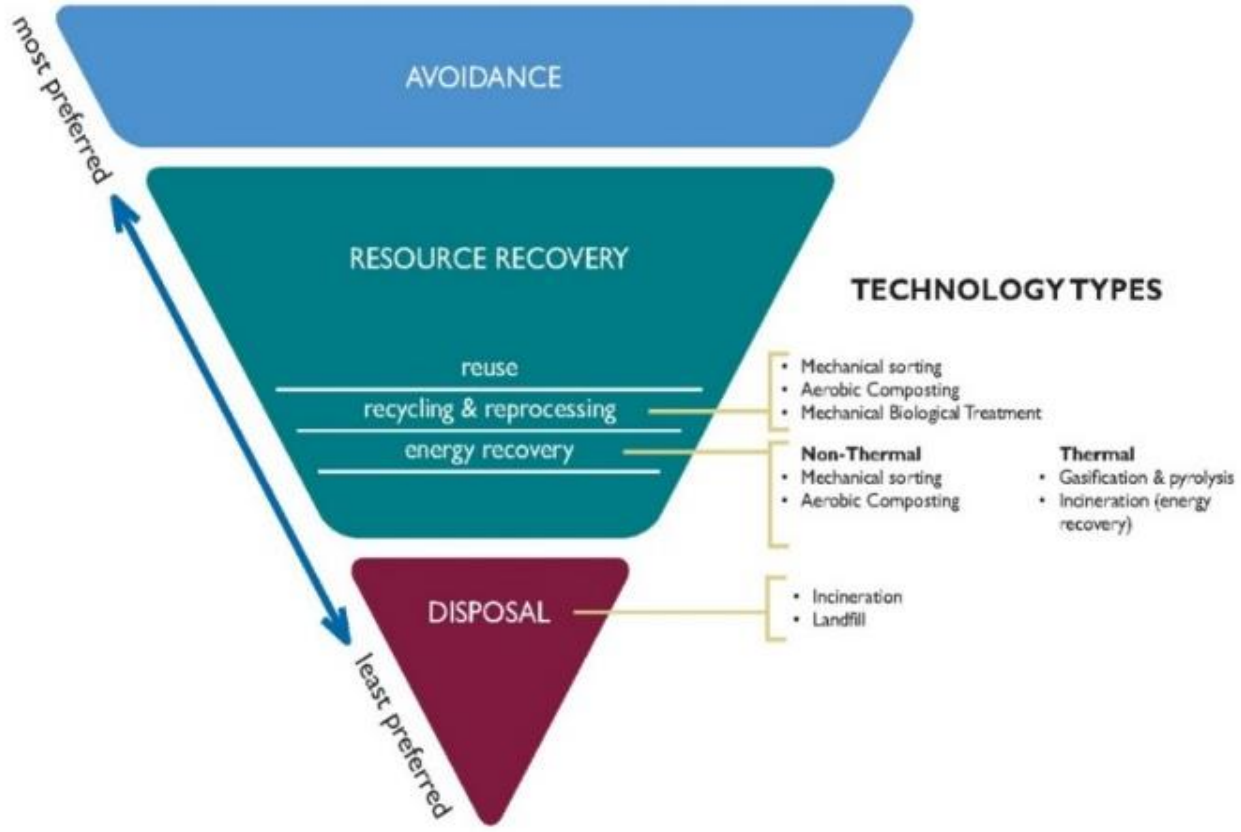


Figure 14-2: Waste Management Hierarchy[9]

14.2 Assessment Methodology

A quantitative assessment of the potential effects in relation to waste will be undertaken. The assessment comprises the following stages:

- A review of applicable legislation and policy;
- A review of the Proposed Development design, undertaken in consultation with the project design team to estimate the waste generation during the various phases of construction;
- Determining waste arisings from the Proposed Development once operational;
- Consideration of potential interactions between proposals and the current site conditions;
- Identification of possible impacts;
- Assessment of impacts;
- Identification of measures and solutions to avoid, reduce or remedy potential impacts; and,

[9] The 'waste hierarchy' ranks waste management options according to what is best for the environment. It applies the following as a priority order in waste prevention and management policy— (a) prevention; (b) preparing for re-use; (c) recycling; (d) other recovery (for example energy recovery); and (e) disposal.

- Assessment of residual impacts, taking account of mitigation measures.

An assessment will be made of the potential environmental effects that are associated with the production, movement, transport, processing, and disposal of arisings from site during the construction phase of the Proposed Development.

14.2.1 Review of Legislation & Policy

A comprehensive legislative review has been undertaken as part of this assessment. This includes a review of applicable waste and environmental European Directives, National Regulations, National Policies and Strategies.

14.2.1.1 National and European Legislation

National and European Legislation includes the following:

- The Environmental Protection (Duty of Care) (Scotland) Regulations 2014;
- The Waste (Scotland) Regulations 2012;
- The Waste (Scotland) Regulations 2011;
- The Waste (Scotland) Regulations 2005;
- The Waste Management Licensing (Scotland) Regulations 2011;
- The Waste Batteries (Scotland) Regulations 2009;
- The Criteria and Procedures for The Acceptance of Waste at Landfills (Scotland) Direction 2005;
- The Criteria and Procedures for the Acceptance of Waste at Landfills (Mercury) (Scotland) Direction 2013;
- Environment Act 1995;
- Environmental Protection Act 1990;
- Environment Protection (Waste Recycling Payments) (Scotland) Regulations 2000;
- The Climate Change (Scotland) Act 2009;
- The Landfill (Scotland) Regulations 2003;
- The Landfill (Scotland) Amendment Regulations 2003;
- The Landfill (Scotland) Amendment Regulations 2013;
- The Special Waste Regulations 1996;
- The Controlled Waste Regulations 1992;
- The Special Waste Amendment (Scotland) Regulations 2004;
- The Special Waste Amendment (Scotland) Amendment Regulations 2004;
- Pollution Prevention and Control Act 1999;

- The Pollution Prevention and Control (Scotland) Regulations 2012;
- Waste and Emissions Trading Act 2003;
- The Landfill Allowances Scheme (Scotland) Regulations 2005;
- The Producer Responsibility Obligations (Packaging Waste) Regulations 2007;
- The End-of-Life Vehicles (Storage and Treatment) (Scotland) Regulations 2003;
- The Litter (Fixed Penalties) (Scotland) Order 2013;
- The Litter (Fixed Penalty Notices) (Scotland) Order 2014;
- The Controlled Waste (Fixed Penalty Notices) (Scotland) Order 2014;
- European Communities (Waste Directive) Regulations, 2011;
- Industrial Emissions Directive (2010/75/EU);
- Waste Framework Directive (2008/98/EC);
- The Landfill Directive (1999/31/EC).

Other guidelines from Scottish Natural Heritage such as 'A handbook on Environmental Impact Assessment' (2013) have been referred to also in the preparation of this EIAR Waste chapter.

14.2.1.2 National and Regional Waste Policies and Strategies

The statutory basis for waste management policy in Scotland comes from the revised Waste Framework Directive (rWFD). (2008/98/EC). The main impact on waste management in Scotland arising from the rWFD was the transposition and implementation of a new waste hierarchy and its application as a priority order in waste prevention, waste management licensing and waste policy.

- The Zero Waste Plan, launched in June 2010, set out actions to deliver important changes to how Scotland treats and manages waste and the Government's vision of a zero-waste society with a circular economy. The Plan is an economic strategy and a resource strategy - not simply a waste strategy. The Plan focuses on making the most efficient use of resources by reducing demand on primary resources and maximising the reuse, recycling and recovery of resources, instead of treating them as waste. To support this aim, the plan includes ambitious targets including:
    - 70% recycling, composting and preparing for reuse for household waste by 2025; and
    - 70% recycling and preparing for reuse of construction and demolition waste by 2020.

    These Regulations set in place statutory measures to support delivery of the Zero Waste Plan:
    - Prevention;
    - Preparing for re-use;
    - Recycling;
    - Other recovery, e.g., energy recovery; and

- Landfill diversion targets.

The Zero Waste Plan emphasises that sustainable waste management is considered in the design of new developments and the development of Site Waste Management Plans for developments.

In Scotland, the Scottish Government is responsible for the regulatory and legislative framework and providing policy advice and guidance. The Scottish Environment Protection Agency (SEPA) can take enforcement action on large scale and hazardous fly-tipping and Local Authorities will investigate small scale incidents. Local Authorities and the Police can issue fixed penalty notices to offenders, they can also report incidents directly to the Procurator Fiscal for further action if the fine isn't paid.

- In addition to the Waste (Scotland) Regulations 2012 the Scottish Government launched a consultation, **'Safeguarding Scotland's Resources - A Programme for the Efficient Use of our Materials'**, which acts as Scotland's Waste Prevention Programme and sought views on a range of proposals to reduce waste and promote resource efficiency. This proposed an overall target of a 5% reduction in all waste by 2015, and a longer-term vision of a 15% reduction in all waste by 2025.
- The **Environment Strategy for Scotland: Vision and Outcomes (2020)** provides an overarching framework for Scotland's existing environmental strategies and plans, including the Climate Change Plan which will be reviewed overtime to consider developments in international targets and policies. The Plan outlines Scotland's long-term ambitions and priorities for action. The Plan aims to deliver six shared outcomes which includes 'We use and re-use resources wisely and have ended the throw-away culture' and 'Our thriving, sustainable economy conserves and grows our natural assets' which both support the transition to a circular economy.
- The **Circular Economy Bill** will establish a legislative framework to support the transition to a zero waste and circular economy. The Bill involves new enforcement powers for the offence of littering from vehicles, proposals to strengthen household recycling collections, tackle reliance on single-use items and set statutory targets in relation to circular economy. A consultation on proposals for a Circular Economy Bill took place between 30th May 2022 and 22nd August 2022. The Circular Economy Bill was presented for debate before parliament in June 2023 and is at Stage 1.
- **Extended Producer Responsibility (EPR)** requires producers to bear responsibility for the environmental impacts of products they place on the market and provides an incentive to reduce these impacts. EPR focuses on the consideration of the whole lifecycle of a product or building by influencing design, maximising product lifespan through reuse, repair and durability and recyclability when products reach the end of their lives. 'Making Things Last – a Circular Economy Strategy for Scotland' was published in 2016 which aims to take a more comprehensive approach to EPR by encouraging reuse, repair and remanufacture as well as addressing the costs of recycling and disposal. Schemes such as UK Packaging EPR scheme, review of Waste Electrical and Electronic Equipment, Batteries and End of Life Vehicles Regulations, an EPR scheme for mattresses and a Deposit Return Scheme (DRS) for single-use containers are being considered or implemented.
- The **Deposit and Return Scheme Regulations 2020** set out the legal requirements for drinks producers and retailers as part of a Deposit Return Scheme (DRS). DRS requires consumers to pay a deposit of 20p

when they purchase a drink in a single-use container made of PET, steel, aluminium or glass who will then receive the deposit back when they return the empty single-use container to a return point. Under The Deposit and Return Scheme for Scotland Regulations (2020), retailers are required to operate a return point where sales of scheme products are made, deliver back deposits for the packaging and store the packaging for collection by/on behalf of producers. The scheme was due to be introduced in Scotland in 2023 but has been delayed until October 2025 at the earliest to align with schemes in the rest of the UK.

- Zero Waste Scotland have published a **'Construction Resources for a Circular Economy'** (Zero Waste Scotland, 2020) guidance document which emphasises the need for collaboration, smart construction, material recoverability and management, designing out waste and circular products/services in construction projects. A **'Best practice guide to improving waste management on construction sites'** (Resource Efficient Scotland) was produced by Resource Efficient Scotland, a programme delivered by Zero Waste Scotland. The guide provides advice to help prevent and reduce waste as well as recycle materials on construction sites.

14.2.1.3 Perth and Kinross Waste Management Plan

Perth and Kinross Waste Management Plan 2010-2025 was produced in November 2010 which provides the strategic direction for municipal waste management in Perth and Kinross taking into consideration Scotland's Zero Waste Plan. The Plan highlights how construction and demolition wastes account for around half of controlled waste managed in Scotland and 36% of waste in Tayside in 2006/07. In the plan, PKC commit to halving the amount of construction, demolition and excavation waste going to be landfill by 2012 and aim to implement standard for good practice in reducing waste, recycling more and increasing the use of recycled and recovered materials in new and refurbishment construction activities. In order to deliver this, PKC will:

- Commit to sign up to the Zero Waste Scotland 'Construction Commitment: Halving Waste to Landfill';
- Set a target for reducing waste to landfill;
- Embed the target within corporate policy and processes;
- Set corresponding requirement in project procurement and engage with our supply chain; and
- Measure performance at a project level relative to a corporate baseline; and report annually on overall corporate performance.

14.3 Baseline Scenario

14.3.1 Characteristics of Current Wastes

The current operational overview of the Proposed Development along the South Queich encompass a mixture of apparent waste ground, residential, industrial, commercial and essential infrastructure (wastewater treatment works) as well as Loch Leven National Nature Reserve. The current operational land uses where culvert diversion works are proposed at Smith Street and Clash Burn comprise mainly residential areas. The M90 upstream storage area is currently an agricultural field with commercial properties to the south.

Current wastes arisings are a typical mix of recyclable and residual material generated from the residential and commercial properties and urban spaces. Sludges and solid wastes including biosolids, screenings and grit will be produced from the wastewater treatment works. As a public urban space, local authority bins are provided, resulting in municipal wastes, accompanied by mixed litter, consistent with urban footfall. There are two vegetated stockpiles up to c. 3m high in the southwestern corner of a former car park located between Gelly Burn tributary and Old Cleish Road which appear to comprise construction and demolition material.

14.3.2 Baseline Surveys

Baseline studies comprised a review of current waste management capacity in the region including operational landfills and waste management sites.

14.3.2.1 Waste Management Infrastructure

The SEPA ‘Scottish waste sites and capacity tool’ (SEPA, 2023) provides data about licensed and permitted waste management sites holding a Waste Management Licence (WML) or Pollution Prevention Control (PPC) permit issued by SEPA. It also provides the sites annual capacity, which is the tonnage of waste a regulated site is licensed or permitted to handle in a given year and the remaining capacity for landfills.

Table 14-1 lists information on operational landfill sites in the vicinity of the development. Landfill site and capacity data in Table 14-1 is for reporting years 2014-2021 and was last updated in April 2022 at the time of writing.

Table 14-1: Capacity of Authorised Operational Landfills (SEPA, 2023)

Permit or Licence Number	Operator Organisation	Local Authority of Site	Type of Site	Capacity on Permit		Capacity as of 31st December 2021		
				Annual Capacity on Permit (tonnes)	Total Capacity on Permit (tonnes)	Remaining Capacity as at 31/12/21 (tonnes)	Rate of Infill as at 31/12/21 (tonnes)	Estimated date for ceasing infill as at 31/12/21 (tonnes)
PPC/A/1010943	WILLIAM HAMILTON & SONS (CONTRACTORS) LIMITED	South Lanarkshire	Inert	230,000	740,000	200,000	47,063	01/01/2025
PPC/A/1008897	LEVENSEAT LIMITED	West Lothian	Inert	75,000	1,500,000	93,600	26,405	03/01/2027
PPC/A/1150034	NWH WASTE SERVICES LIMITED	Midlothian	Inert	300,000	1,200,000	610,000	87,042	01/01/2030
PPC/A/1009964	D GEDDES (CONTRACTORS) LIMITED	Angus	Inert	75,000	1,875,270	1,843,473	13,906	12/01/2034
PPC/A/1008691	JOSS (ABERDEEN) LIMITED	Aberdeenshire	Inert	100,000	1,500,000	126,356	10,582	01/01/2035
PPC/A/1008878	D GEDDES (CONTRACTORS) LIMITED	Angus	Inert	75,000		1,040,961	25,908	12/01/2035
PPC/A/1024099	JOHN GUNN & SONS LIMITED	Highland	Inert	25,000	85,000	46,433	2,999	01/01/2040
PPC/A/1038061	W H MALCOLM LIMITED	North Ayrshire	Inert	500,000	7,200,000	5,500,000	169,262	12/01/2045
PPC/A/1008876	D GEDDES (CONTRACTORS) LIMITED	Angus	Inert	24,999		343,813	813	12/01/2050
PPC/A/1010715	ORKNEY ISLANDS COUNCIL	Orkney	Inert	5,000	125,000	78,646	584	12/01/2080
PPC/A/1008856	CHAP QUARRIES (ABERDEEN) LIMITED	Aberdeenshire	Inert	75,000		658,105	65,716	12/31/2025
PPC/N/0020028	MORAY COUNCIL	Moray	Non-Hazardous	120,000	1,320,000	129,000	40,464	05/01/2024
PPC/E/0020001	LEVENSEAT LIMITED	West Lothian	Non-Hazardous	400,000	1,900,000	54,000	129,556	12/01/2024

Permit or Licence Number	Operator Organisation	Local Authority of Site	Type of Site	Capacity on Permit		Capacity as of 31st December 2021		
				Annual Capacity on Permit (tonnes)	Total Capacity on Permit (tonnes)	Remaining Capacity as at 31/12/21 (tonnes)	Rate of Infill as at 31/12/21 (tonnes)	Estimated date for ceasing infill as at 31/12/21 (tonnes)
PPC/E/0020083	FIFE COUNCIL	Fife	Non-Hazardous	382,500	7,946,400	259,031	137,956	12/01/2024
PPC/A/1004251	THE HIGHLAND COUNCIL	Highland	Non-Hazardous	25,000	126,000	30,000	8,135	10/01/2025
PPC/A/1008888	ARGYLL & BUTE COUNCIL	Argyll & Bute	Non-Hazardous	1,000	27,000	12,800	37	12/01/2025
PPC/E/0020007	FCC ENVIRONMENT LIMITED	Midlothian	Non-Hazardous	250,000	1,815,000	1,128,163	82,701	12/01/2025
PPC/N/0020010	STONEYHILL WASTE MANAGEMENT LIMITED	Aberdeenshire	Non-Hazardous	355,000	5,400,000	1,051,267	228,908	12/01/2025
PPC/W/0020008	SMITH SKIP LIMITED	North Ayrshire	Non-Hazardous	75,000	750,000	120,000	40,443	12/01/2025
PPC/W/0020046	PATERSONS OF GREENOAKHILL LIMITED	Glasgow City	Non-Hazardous	500,000	1,800,000	810,000	163,612	02/01/2026
PPC/A/1004280	SHANKS ARGYLL & BUTE LIMITED	Argyll & Bute	Non-Hazardous	20,515	398,000	37,317	9,131	07/01/2026
PPC/A/1004281	SHANKS ARGYLL & BUTE LIMITED	Argyll & Bute	Non-Hazardous	36,500	720,000	136,667	14,930	12/01/2028
PPC/A/1020313	BAE SYSTEMS PROPERTIES LIMITED	Renfrewshire	Non-Hazardous	100,000		73,680	239	12/01/2034
PPC/W/0020041	FCC WASTE SERVICES (UK) LIMITED	North Lanarkshire	Non-Hazardous	1,300,000	35,000,000	16,159,334	158,698	05/01/2038
PPC/N/0050031	LOCHIEL LOGISTICS LIMITED	Highland	Non-Hazardous	24,000	590,000	417,610	11,206	06/01/2040
PPC/N/0020026	EASTER HATTON ENVIRONMENTAL (WASTE AWAY) LIMITED	Aberdeenshire	Non-Hazardous	190,000	3,850,000	1,780,000	69,818	12/01/2044

Permit or Licence Number	Operator Organisation	Local Authority of Site	Type of Site	Capacity on Permit		Capacity as of 31st December 2021		
				Annual Capacity on Permit (tonnes)	Total Capacity on Permit (tonnes)	Remaining Capacity as at 31/12/21 (tonnes)	Rate of Infill as at 31/12/21 (tonnes)	Estimated date for ceasing infill as at 31/12/21 (tonnes)
PPC/A/1022141	ARGYLL & BUTE COUNCIL	Argyll & Bute	Non-Hazardous	8,230	90,000	18,450	2,550	12/01/2063
PPC/A/1025163	ARGYLL & BUTE COUNCIL	Argyll & Bute	Non-Hazardous	9,815	90,000	62,705	2,746	12/01/2063
PPC/A/1004252	SCOTTISH WATER	Falkirk	Non-Hazardous	45,000	320,000	308,502	0	01/01/2074
PPC/E/0020058	VIRIDOR WASTE MANAGEMENT LIMITED	East Lothian	Non-Hazardous	500,000	13,601,000	167,000	136,183	10/30/2024
PPC/E/0020085	FIFE COUNCIL	Fife	Non-Hazardous	282,500	2,701,000	63,680	85,906	12/31/2024
PPC/A/1004300	CENTRAL DEMOLITION (RECYCLING) LIMITED	Falkirk	Non-Hazardous	77,400	5,000,000	256,733	42,984	12/31/2027
PPC/A/1003256	SAVOCH QUARRY & RECYCLING LIMITED	Aberdeenshire	Non-Hazardous	24,999	100,000	59,589	424	12/31/2069

The location of operational landfills in Table 14-1 is presented in Figure 14-3.

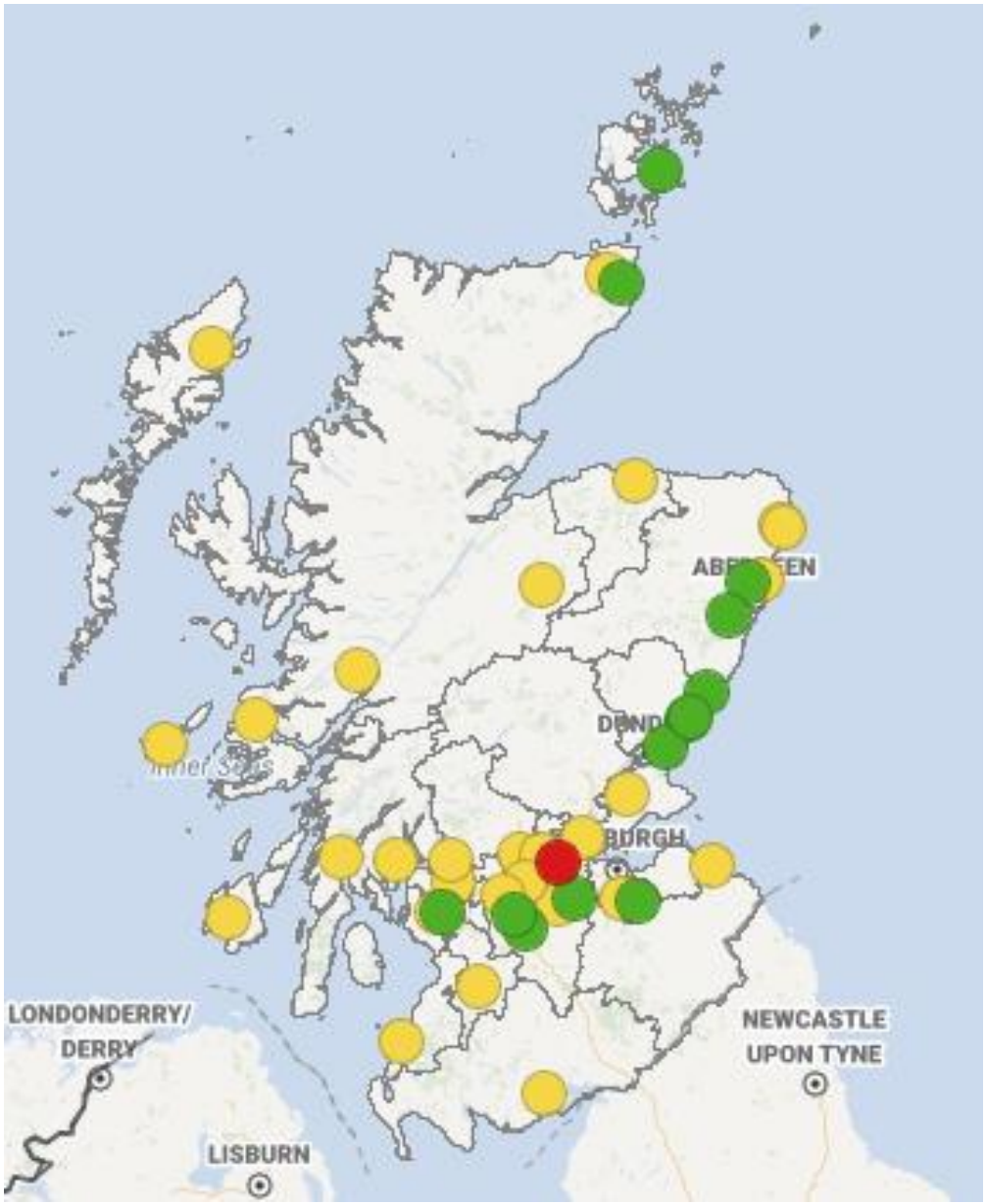


Figure 14-3: Landfill Sites and Capacity Map (SEPA, 2023)

Table 14-2 lists information on waste management sites in PKC. This licence waste site and capacity data is for reporting years 2014-2021 and was last updated in April 2022 at the time of writing.

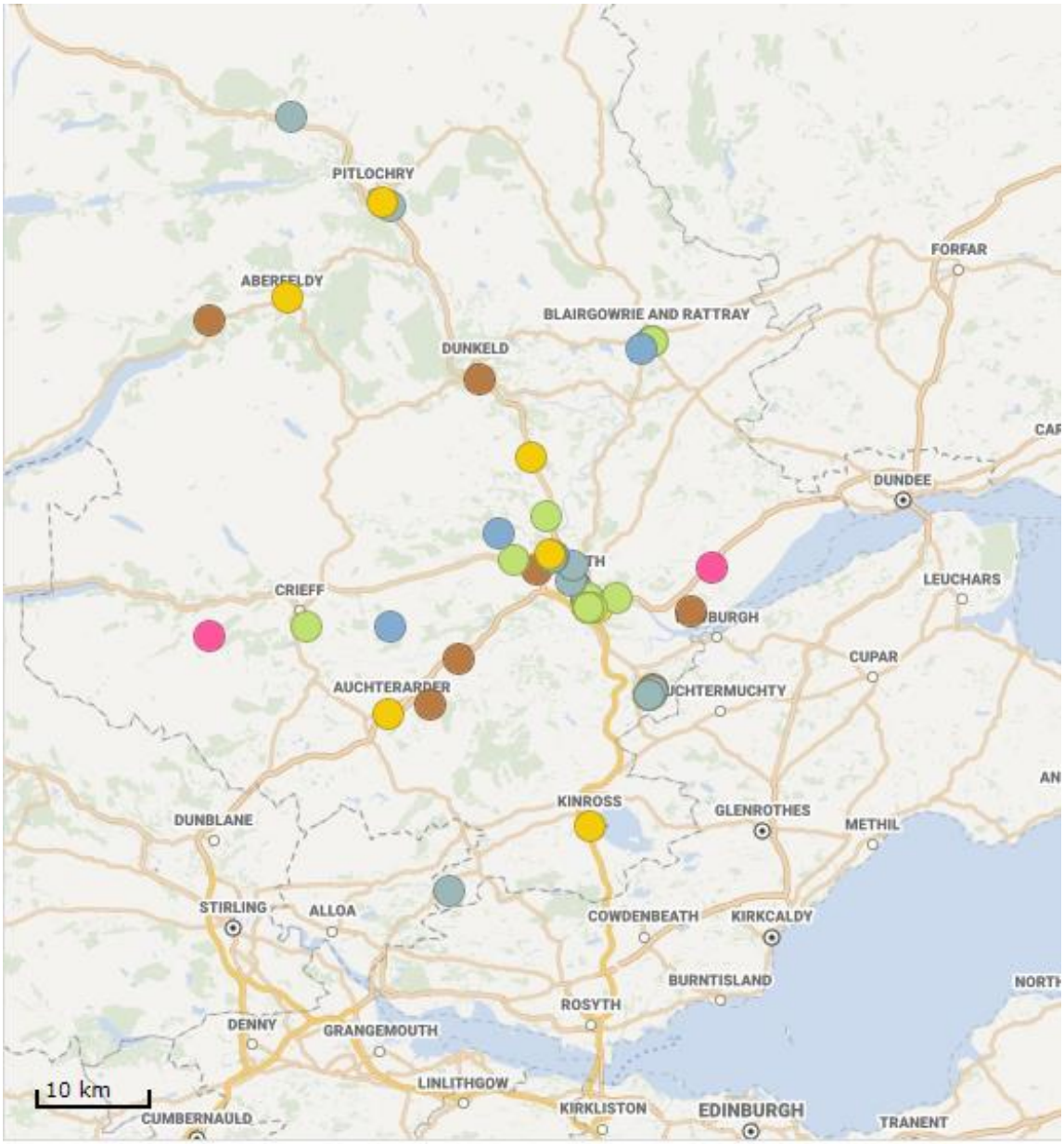
Table 14-2: Capacity of Waste Management Sites (SEPA, 2023)

Permit or Licence Number	Operator Organisation	Site Activity	Licenced Waste Type	Annual Waste Capacity on permit (tonnes)	Total Waste Handled 2021 (tonnes)		
					Waste Inputs to Site	Waste Treated/ Recovered on Site	Waste Outputs from Site
WML/E/0020049	PERTH AND KINROSS COUNCIL	Civic amenity	Commercial	2,450	983		983
WML/E/0020141	PERTH AND KINROSS COUNCIL	Civic amenity	Household/Commercial	2,450	1,258		1,258
WML/L/1106110	PERTH AND KINROSS COUNCIL	Civic amenity	Household/Commercial	8,340	3,472		3,472
WML/L/1025103	PERTH AND KINROSS COUNCIL	Civic amenity	Household/Commercial/ Industrial/Other special	7,499	2,403		2,403
WML/L/1063124	PERTH AND KINROSS COUNCIL	Civic amenity	Household/Commercial/ Industrial/Other special/Inert	2,499	1,597		1,597
WML/L/1030917	PERTH AND KINROSS COUNCIL	Civic amenity / Transfer station	Household/Commercial/ Industrial/Inert	16,400	8,465		8,465
WML/L/1082282	PERTH AND KINROSS COUNCIL	Civic amenity / Transfer station	Household/Commercial/ Industrial/Other special	74,256	66,045		66,045
WML/E/0020059	PERTH AND KINROSS COUNCIL	Civic amenity / Transfer station / Landfill (not operational)	Household/Commercial/ Industrial	7,000	6,817		6,817
PPC/A/1004887	EARNSIDE ENERGY LIMITED	Composting / Anaerobic digestion	Household / Commercial / Industrial	97,620	42,437	37,596	12,282

Permit or Licence Number	Operator Organisation	Site Activity	Licenced Waste Type	Annual Waste Capacity on permit (tonnes)	Total Waste Handled 2021 (tonnes)		
					Waste Inputs to Site	Waste Treated/ Recovered on Site	Waste Outputs from Site
PPC/E/0020056	SUEZ RECYCLING AND RECOVERY UK LIMITED	Landfill	Household / Commercial / Industrial / Special asbestos	372,000			5,414
WML/E/0000312	DAVID BAND (METALS) LIMITED	Metal recycler	Commercial	4,999	1,845		1,953
WML/E/0000313	DALCRUE AUTO SALVAGE LIMITED	Metal recycler	Commercial	4,999			
WML/E/0000314	J R JENKINS	Metal recycler	Industrial	4,999	79	79	281
WML/E/0000316	BINN SKIPS LIMITED	Metal recycler / Transfer station	Household / Commercial / Industrial / Other special / Special asbestos / Inert	29,750	18,431	6,065	18,933
PPC/A/1138879	BINN WASTE MANAGEMENT LIMITED	Other treatment	Household / Commercial	60,000			
PPC/A/1035205	SHORE RECYCLING LIMITED	Other treatment	Household / Commercial / Other special	30,000	22,976	22,651	22,831
WML/L/1105142	SUEZ RECYCLING AND RECOVERY UK LIMITED	Transfer station	Commercial	160,000	53,727	53,727	58,397
WML/L/1113890	BARNHILL ESTATES	Transfer station	Commercial	45,000	20,300		22,170
WML/L/1037193	WYLLIE RECYCLING LIMITED	Transfer station	Household/Commercial	24,999	22,125	21,421	26,304
WML/E/0000319	TAYSIDE CONTRACTS	Transfer station	Industrial	5,000	115		305

Permit or Licence Number	Operator Organisation	Site Activity	Licenced Waste Type	Annual Waste Capacity on permit (tonnes)	Total Waste Handled 2021 (tonnes)		
					Waste Inputs to Site	Waste Treated/ Recovered on Site	Waste Outputs from Site
WML/E/0020051	PERTH AND KINROSS COUNCIL	Transfer station	Industrial	9,000	4,308		4,308
WML/E/0020124	CO-AN	Transfer station	Industrial	2,600	176		176
WML/E/0120008	SCOTTISH WATER	Transfer station	Special asbestos	700	1		9
WML/E/0220286	BINN SKIPS LIMITED	Transfer station / Composting	Household/Commercial/ Industrial/Inert	225,000	86,644	63,931	87,302
WML/E/0020218	SCOTTISH WATER	Transfer station / Other treatment	Household/Commercial/ Industrial	150,000	88,947	88,947	13,565
WML/L/1018791	CASTLECROFT SECURITIES LIMITED	Transfer station / Other treatment	Household/Commercial/ Industrial/Other special	75,000	14,260	13,927	13,054
WML/E/0020200	TAYSIDE CONTRACTS	Transfer station / Other treatment	Industrial	4,500	568	556	315

The location of licenced waste sites in Table 14-2 is presented in Figure 14-4.



Color by:
Site Type

- Civic amenity / recycling centre
- Landfill
- Metal recycler
- Multiple activity site
- Other treatment
- Pet cemetery
- Transfer station

SR02 Boundary Line Scotland - Web Mercator

Data table:
SR02 Boundary Line Scotland

Figure 14-4: Landfill Sites and Capacity Map (SEPA, 2023)

The data in Table 14-1 and Table 14-2 is extracted from SEPA's public register (Waste Sites and Capacity Tool) of licensed/ permitted sites which is based on the latest information (2021) supplied by the site operators in quarterly or annual licensed/ permitted site return form.

14.4 Likelihood of Significant Effects

14.4.1 Assessment Criteria

The Institute of Environmental Management and Assessment (IEMA) published guidance in March 2020 which sets out criteria for determining the value (sensitivity) of material resources and waste (including waste infrastructure).

The determination of significance, in most cases, will be the product of professional judgement of the Waste Topic Lead and EIA Co-ordinator, with specific regard to the sensitivity or importance (value) of receptors and the magnitude of impact on these receptors; and the extent to which primary, secondary and tertiary measures are expected to minimise impacts and effects.

Table 14-3: Importance or Sensitivity Matrix Definitions[10]

Importance/Sensitivity of Resource or Receptor				
Across construction and or/operation phases, the baseline/future baseline (i.e., without development) or regional inert and non-hazardous landfill void capacity is expected to…				
Negligible	**Low**	**Medium**	**High**	**Very High**
Remain unchanged or is expected to increase through a committed change in capacity.	Reduce minimally: by <1% as a result of wastes forecast.	Reduce noticeable: by 1-5% as a result of wastes forecast.	Reduce considerably: by 6-10% as a result of wastes forecast.	Reduce very considerably (by >10%); end during construction or operations; is already known to be unavailable; or would require new capacity or infrastructure to be put in place to meet forecast demand.

14.4.2 Assignment of Magnitude

Where the construction phase is being assessed, the magnitude of impact is considered from the point at which the site access is gained, through site remediation, enabling works, and construction, to development commissioning.

Where the operational phase is being assessed, the magnitude of impact is assessed over the course of any one full and justifiably representative year within the first three years of commissioning.

[10] Assessing sensitivity of waste (Section 10.2.2) IEMA Guide to Materials and Waste Environmental Impact Assessment, March 2020.

Table 14-4: Magnitude of Impacts Definition

Assessment of Magnitude				
Inert and Non-Hazardous Void Capacity				
No change	**Negligible**	**Minor**	**Moderate**	**Major**
Zero waste generation and disposal from the development	Waste generated by the development will reduce regional landfill void capacity baseline by <1%	Waste generated by development will reduce regional landfill void capacity baseline by 1-5%	Waste generated by the development will reduce regional landfill void capacity baseline by 6-10%.	Waste generated by the development will reduce landfill void capacity baseline by >10%.
Hazardous Void Capacity				
No change	**Negligible**	**Minor**	**Moderate**	**Major**
Zero waste generation and disposal from the development	Waste generated by the development will reduce national landfill void capacity baseline by <0.1%	Waste generated by development will reduce national landfill void capacity baseline by <0.1-0.5%	Waste generated by the development will reduce national landfill void capacity baseline by >0.5-1%	Waste generated by the development will reduce national landfill void capacity baseline by >1%.

14.4.3 Significance of Effects

The assessment of significance will be based on the matrix outlined in Table 14-5 below.

Table 14-5: Assessment of Significance Matrix

		Magnitude of Impacts				
Sensitivity (or value)		No Change	Negligible	Minor	Moderate	Major
	Very high	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

14.4.4 Determining Whether an Effect is Significant or Not

Once the effect threshold has been determined, Table 14-6 provides how the Waste Topic Leads may determine whether environmental effects are potentially significant, or not.

Where a threshold is 'slight of moderate', i.e., transcends the significant – or not- effect boundary, professional judgement is used in combination with documented justification, to determine a final outcome. The cautious significant boundary applied responds to the need to developers and EIA practitioners to – in unison – continue to take an increasing responsibility for managing materials and wastes sustainably, with a view to incentivising sustainable resource management and (ultimately) a circular economy.

Table 14-6: Overall Significance of Effect[10]

Effect	Waste
Neutral	Not significant
Slight	
Moderate	Significant
Large	
Very Large	

14.5 Description of Likely Significant Effects

The predicted waste management impacts of the Proposed Development are assessed in accordance with Table 14-5 and Table 14-6. The potential effects of the Proposed Development associated with waste generation and management are considered for two distinct phases:

- Section 14.5.1 Construction Phase; and
- Section 14.5.2 Operational Phase.

14.5.1 Assessment of Construction Effects

14.5.1.1 Demolition and Site Clearance Effects

Waste materials will be generated as a result of the proposed demolition of unused buildings at BCA and parts of the Todd and Duncan site to facilitate access for construction. Waste arising from the proposed demolition is typically made up of several sub-waste streams, which are often mixed, depending on the amount of selective demolition and separate collection that has taken place.

Demolition waste can also contain hazardous substances such as Asbestos Containing Materials (ACMs) that are present in buildings when demolished or renovated. The proposed buildings to be demolished were constructed before 2000 and therefore may contain ACMs. An asbestos survey will be carried out on the buildings to be demolished. The Control of Asbestos Regulations 2012 provides the legislative backdrop to all aspects of asbestos control in construction. Any actions related to ACMs must be in accordance with these regulations.

Topsoil will be stripped and stored onsite for reuse as reinstatement on completion of the works. Waste will arise from site clearance including the removal of tarmac surfaces, boundary fences and vegetation clearance to establish a working strip to facilitate the construction of flood defences and site traffic movement. Invasive non-native plant species are present on some of the lands to be cleared and clearance of this land without the proper measures in place has the potential to cause the spread of invasive non-native plant species. Excavation of invasive species should be handled and managed in accordance with the Invasive Non-Native Plant Species Management Plan that has been prepared for the Proposed Development and is included as an appendix to Chapter 8 of this EIAR (see Volume III, Appendix H).

Construction waste can also include waste materials generated as a result of excavations, typically consisting of materials, for example, soil and made ground removed as a function of design to create trenches for culverts, flood wall construction and flood embankment construction. Excavated material for culvert trenches will be reused as backfill where possible. Some existing culverts and gully pipes will also be excavated for disposal offsite. Depending upon the previous use of the site, this material may, or may not be contaminated. An estimate of material arisings from above ground demolition works plus material arising from excavation works is provided in sections below.

Stockpiles Waste Classification

There are two vegetated stockpiles up to c. 3m high in the southwestern corner of a former car park located between Gelly Burn tributary and Old Cleish Road, near the M90, which appear to comprise construction and demolition material. The stockpiles will need to be removed in order to facilitate the construction of the flood wall.

Dunlem Geotechnical and Environmental Ltd carried out a site investigation on site between 25th November and 5th December 2019. As part of the site investigation, nine trial trenches (OT01, OT01A-C, OT02, OT02A-C and OT03) were undertaken in the stockpiles. A total of five (5 no.) samples (OT01 0.8m, OT01B 1.0m, OT02 0.3m, OT02B 0.7m and OT03 0.8m) from the stockpiles were submitted to a UKAS accredited laboratory (Derwentside Environmental Testing Services Limited, Consett, Co Durham, DH8 5PY) for analysis to be used for waste classification. Two samples; OT04B 0.25m from a bund in the east of the carpark and OT05 0.8m to the south of the carpark were also included in the waste classification report.

The appropriate Chemical Abstracts Service number (CAS) for the parameters in Table 14-7 below were not recognised by the HazWasteOnline waste classification tool. As the reported concentrations for these parameters were below the laboratory Limit of Detection (LOD), they have been removed from the waste classification.

Table 14-7: Parameters Removed from Waste Classification

Parameter analysed	Removed from waste classification
Trimethylphenols	Removed from waste classification. CAS not recognised. All concentrations below laboratory Limit of Detection (LOD).
Bis(2-Chloroisopropyl) ehter	Removed from waste classification. CAS not recognised. All concentrations below laboratory Limit of Detection (LOD).
2,3,5,6-Tetrachlorophenol	Removed from waste classification. CAS not recognised. All concentrations below laboratory Limit of Detection (LOD).
Naphthols	Removed from waste classification. CAS not recognised. All concentrations below laboratory Limit of Detection (LOD).
Xylenols & Ethylphenols	Removed from waste classification. CAS not recognised. All concentrations below laboratory Limit of Detection (LOD).

All of the concentrations reported by the laboratory were provided on a dry weight basis, with the exception of organic soil analysis which were subsequently corrected by the laboratory to a dry weight basis.

Category of Material

The source of the stockpile material is unknown. The Dunelm trial pit logs for trial pits (OT01, OT01A-C, OT02, OT02A-C and OT03) described the material, in general, as Made Ground comprising bricks, ceramic shards, macadam, tree roots/branches, geotextile fabric pieces and wire mesh.

Laboratory analysis confirmed that asbestos fibres in the form of Chrysotile were detected in three of the samples analysed (OT01B 1.0m, OT02B 0.7m and OT03 at 0.8m) from the stockpiles at a former car park near the M90. Concentrations were less than the 1,000mg/kg (0.1%) hazardous waste classification threshold.

It is determined that the material falls under LoW Code 17: Construction and Demolition Wastes (including excavated soil from contaminated sites), Chapter 05 04: Soil and Stones other than those mentioned in 17 05 03 (**17 05 04**).

Classification of Material

The commercially available HazWasteOnline tool was used to complete the classification of the trial pit samples i.e., proposed material using the chemical analysis results from the five (5 no.) samples. Where sufficient data is not available, assumptions have been made based on the information supplied and using professional judgement. It should be noted that:

- The classification of waste as either Hazardous or Non-Hazardous is based on the percentage of dangerous substances within the waste. The laboratory reported the determinands as 'dry weight'.
- The hazardous properties 'Flammable' and 'Highly Flammable' require specific testing. Certain determinands, in particular petroleum hydrocarbons, are classified as potentially hazardous within the HazWasteOnline tool due to this hazardous property. It is our opinion that there is a low flammability risk and a flash point / flammability test is unlikely to produce a positive result given the concentrations of hydrocarbons displayed. As such the Hazardous Property (HP) 3 results have been forced to Non-Hazardous within the assessment.
- The laboratory analysis of metals reports the total concentration of the metal ion i.e., arsenic and does not indicate the metal speciation i.e., arsenic acid and its salts. In the absence of further information, we have made assumptions relating to metal speciation, usually utilising the worst-case scenario, or in some instances the most reasonable case species based on the site and surrounding historical and present day land uses. Rationale regarding the metal speciation's chosen for this classification are included in Appendix B of the HazWasteOnline report in Volume III, Appendix N of this EIAR.

The HazWasteOnline classification report is included in Volume III, Appendix N. All five (5 no.) samples in the stockpiles as well as the sample from the bund in the east of the carpark (OT04B 0.25m) and to the south of the carpark (OT05 0.8m) were determined to be **Non-Hazardous**.

Waste Acceptance Criteria Testing (WAC)

A total of five (5 no.) samples (OT01 0.8m, OT02 0.3m, OT03 0.8m, OT04B 0.5m and OT05 0.8m) were submitted to a UKAS accredited laboratory (Derwentside Environmental Testing Services Limited, Consett, Co Durham, DH8 5PY) for analysis for WAC. If material is classified as non-hazardous, there is a choice of sending the material to a non-hazardous or an inert landfill. The WAC results for all five (5 no.) samples indicate that the material would be suitable for disposal at an inert landfill.

Summary of Site Clearance and Demolition Effects

A summary of site clearance and demolition effects is provided in Table 14-8.

Table 14-8: Demolition and Site Clearance Phase Effect Summary

Activities	Description	Potential Significance of effect prior to mitigation
Demolition of buildings at BCA site	Concrete /Bricks – 7685 tonnes Timber – 1117 tonnes Plasterboard – 2794 tonnes Metals - 1397 tonnes Glass – 698 tonnes Asphalt, Tar and Tar products – 0 tonnes ACMs – 279 tonnes	**Slight** Potential to require offsite reuse/recovery/disposal if reuse option onsite cannot be utilised. Possible offsite recovery end of waste decision for concrete.
Demolition of buildings at Todd and Duncan site	Concrete /Bricks – 111 tonnes Timber – 6 tonnes Plasterboard – 37 tonnes Metals – 18 tonnes Glass – 9 tonnes Asphalt, Tar and Tar products – 0 tonnes ACMs – 3 tonnes	**Slight** Potential to require offsite reuse/recovery/disposal if reuse option onsite cannot be utilised. Possible offsite recovery end of waste decision for concrete.
Flood walls & embankments: Construction of working strip, reinforced concrete walls, sheet piling and erosion protection on banks of South Quiech	Vegetation/tree clearance – 134 tonnes Asphalt, Tar and Tar products – 55 tonnes Excavated soil & stones – 716 tonnes Metal Bridge – 9 tonnes	**Neutral** or **Slight** Potential to require offsite reuse/recovery/disposal if reuse option onsite cannot be utilised.
Culvert upgrades at Hopefield Place, Smith Street & Myre Playing fields,	Vegetation clearance – 41 tonnes Boundary fence removal – 87 tonnes Removal of existing culverts/gully pipes – 25 tonnes Excavated soil & stones – 77 tonnes	**Neutral** or **Slight** Potential to require offsite reuse/recovery/disposal if reuse option onsite cannot be utilised.
M90 storage area	Site clearance – 381 tonnes Excavated soil & stones - 64 tonnes	**Neutral** or **Slight** Potential to generate green materials and soils that require disposal to licenced landfill.

Activities	Description	Potential Significance of effect prior to mitigation
Stockpiles in former car park located between Gelly Burn and Old Cleish Road	Made ground – 133 tonnes	**Neutral or Slight** Potential to require offsite disposal to landfill if reuse option onsite cannot be utilised.
Excavated invasive species plants and soil	Soil and invasive species Japanese rose and Himalayan Balsam stocks.	**Neutral or Slight** Potential to generate green materials and soils that require disposal to licenced deep fill landfill. Potential to spread invasive species if not correctly managed in accordance with the Invasive Non-Native Plant Species Management Plan.

14.5.1.2 Construction Phase Effects

Construction and demolition waste (CDW) will arise from the construction phase. Typical waste materials arise from site management practices during the construction phase, for example, excess materials and packaging, over-ordering materials, off-cuts, damaged materials and poor storage during the construction phase as well as waste arisings from site compound offices, canteens and cabins. Waste may arise from the removal of site facilities and temporary access routes if materials are not reused onsite.

The European Waste Codes (EWC) for typical waste materials that may possibly be generated during the construction phase are outlined in Table 14-9.

Table 14-9: Applicable List of Waste (LoW) Summary

Waste Material	LoW
Packaging	15 01
Concrete, bricks, tiles and ceramics	17 01
Wood, glass, plastic	17 02
Bituminous mixtures, coal tar and tarred products	17 03
Metals	17 04
Soil, stone and dredge spoil	17 05
Insulation materials and asbestos-containing materials	17 06
Gypsum-based construction materials	17 06
Separately collected fractions	20 01
Waste hydraulic oils*	13 01
Wastes of liquid fuels*	13 07
Mixed municipal waste	20 03

Correct segregation, storage, handling and transport of all waste will be required to ensure there are no adverse effects on human health and that litter is not generated. The use of non-permitted waste contractors or unlicensed facilities could give rise to inappropriate management of waste and result in environmental

impacts / pollution. It is essential that all waste materials are dealt with in accordance with regional policies and national legislation and that time and resources are dedicated to ensuring efficient waste management practices.

Fuels and hydraulic oils / lubricants that will be used during the construction phase are classed as hazardous. There will be fuels stored on site for machinery and construction vehicles along with oils and lubricants. Should any spillages, waste or surplus liquids be disposed of incorrectly it could cause serious harm to the surrounding environment. If asbestos materials are not correctly identified, segregated and appropriately managed, there may be incorrect handling of the material which could have negative impacts on workers as well as environments both onsite and offsite.

There is the potential for significant quantities of materials to be deposited in landfill sites unless proper management plans are implemented. Further breakdown of potential waste streams that may arise during the construction phases of the development and the proposed management routes are set out in Table 14-10.

Table 14-10: Potential Materials Management during the Construction Phase

Material Type	LoW	Management Option	Management Destination
Concrete	17 01 01	Recycled or reused off site	Off site to specialist contractor
Bricks	17 01 02	Recycled or reused off site	Off site to specialist contractor
Tiles and ceramics	17 01 03	Recycled or reused off site	Off site to specialist contractor
Wood	17 02 01	Recycled or reused off site	Off site to specialist contractor
Glass	17 02 02	Recycled or reused off site	Off site to specialist contractor
Plastics	17 02 03	Recycled or reused off site	Off site to specialist contractor
Bitumen macadam	17 03 02	Recycled or reused off site	Off site to specialist contractor
Metals	17 04 07	Recycled or reused off site	Off site to specialist contractor
Stone and soil	17 05 04	Materials deemed unsuitable or not required for reuse on site and require management offsite	Off site to specialist contractor
Insulation materials containing asbestos	17 06 01	Asbestos containing materials require careful removal and segregation and will be disposed of at a specialist hazardous waste landfill	Disposal at a licensed specialist hazardous waste landfill
Construction materials containing asbestos	17 06 05	Asbestos containing materials require careful removal and segregation and will be disposed of at a specialist hazardous waste landfill	Disposal at licensed specialist hazardous waste landfill
Gypsum based construction materials	17 08 02	Materials deemed unsuitable for reuse or recycling and require disposal to suitably licensed landfill	Disposal at licensed landfill
Deleterious demolition materials	17 09 04	Materials deemed unsuitable for reuse or recycling and require disposal to suitably licensed landfill	Disposal at licensed landfill
Plastic packaging	15 01 02	Recycled or reused offsite	Offsite to specialist contractor
Discarded electrical and electronic equipment other	20 01 36	Recycled or reused offsite	Offsite to specialist contractor

Material Type	LoW	Management Option	Management Destination
than those mentioned in 20 01 21, 20 01 23 and 20 01 35			
Iron and steel	17 04 05	Recycled or reused off site	Offsite to specialist contractor

A summary of construction phase effects is provided in Table 14-11.

Table 14-11: Construction Phase Effect Assessment Summary

Activities	Description and quantities	Potential significant of effect prior to mitigation
Construction related waste generated from the construction works	Surplus construction/excavation materials including: metals, waste packaging, wrapping, waste cabling, pipework, ductwork etc	**Neutral or Slight** - Likely to require disposal to landfill if segregation and recycling initiatives not put in place on site during construction.

14.5.2 Assessment of Operational Effects

Occasional minor repair and maintenance works of the Proposed Development will be undertaken during the operational phase. Low quantities of waste are anticipated to be generated during the operational phase.

Table 14-12: Operational Phase Effect Assessment Summary

Activities	Description and quantities	Potential significant of effect prior to mitigation
Minor repair and maintenance works	Low quantities of waste are anticipated to be generated during the operational phase.	**Neutral** - Likely to require disposal to landfill if segregation and recycling initiatives not put in place on site during opertational maintenance works.

14.6 Mitigation Measures

14.6.1 Construction Phase Mitigation Measures

14.6.1.1 Design Principles

One of the design principles of the Proposed Development was to minimise waste material during the construction phase by ‘designing out waste’ in line with the waste hierarchy by reusing topsoil and excavated material where possible during the construction phase. Materials that cannot be reused onsite will be recycled or recovered offsite where possible. The main FPS structural elements have been designed for a minimum working life of 100 years with maintenance activities included in the whole life cost of the scheme in accordance with the Circular Economy principles outlined in Zero Waste Scotland’s ‘Construction Resources for a Circular Economy’ guidance document (Zero Waste Scotland, 2020).

14.6.1.2 Duty of Care

Contractors working on site during the works will have a duty of care and be responsible for the collection, control and disposal of all wastes generated by their works. Perth and Kinross Council and their appointed contractor will ensure that all waste materials leaving the site will be transported via a registered and licensed carrier and disposed or recovered at a licensed/ permitted site in accordance with national waste legislation including the Waste Management Licencing (Scotland) Regulations 2011, The Waste (Scotland) Regulations 2012 and The Environmental Protection (Duty of Care) (Scotland) Regulations 2023.

14.6.1.3 Site Waste Management Plan (SWMP)

Construction waste will be managed as part of a SWMP, prepared and implemented by the appointed contractor for the duration of the construction works. The SWMP will contain procedures for the management of waste and assist with providing a complete audit trail. The SWMP will be a live document and will be subject to revision throughout the course of the construction phase.

The SWMP will:

- Include specific details on the projected waste types and subsequent management;
- Identify and capture the decisions made in the design process to reduce waste generation;
- Identify the methodologies for waste management at each stage of the project;
- Identify how the waste will be dealt with (i.e. disposal, re-use on/ off site etc.); and
- Identify potential end markets e.g., reuse, recycling facilities, waste treatment facilities and disposal sites.

The SWMP will specify procedures for:

- On-site segregation of waste at source where practical;
- On-site segregation of waste materials into appropriate categories;
- On-site segregation of non-hazardous waste materials into appropriate categories such as:
    - Metals; and
    - Timber.
- On-site segregation of any hazardous waste materials into appropriate categories such as:
    - Any contaminated soils;
    - Waste oil and fuels; and
    - Paints, glues, adhesives and other known hazardous substances.

The SWMP will additionally specify:

- Measures to ensure monitoring and updating of records under Duty of Care requirements;
- Measures to avoid over-ordering and generation of surplus waste materials;

- Measures to ensure appropriate staff training and levels of awareness in relation to waste management;
- Measures and procedures to monitor waste flows on site;
- Steps to be taken with materials suppliers to reduce the amount of packaging or to participate in a packaging take-back scheme;
- Implement a 'just in time' materials delivery systems to avoid materials being stockpiled, which increases the risk of the damage and disposal as waste; and
- All waste materials will be stored in skips or other suitable receptacles in designated areas of the site as recommended in the 'Waste Classification and Permitting in Construction: Guidance for the construction industry on the Waste Permitting Regime' (CECA, 2018). The waste storage area(s) will be assigned, and all construction staff provided with training regarding the waste management procedures on commencement of the project.

All waste leaving site will be recycled, recovered or reused where possible, with the exception of those waste streams for which appropriate facilities are currently not available.

Waste streams will be collected by an appropriately licensed and permitted private waste contractor, appointed by the contractor for recycling, recovery or disposal at suitably licensed facilities in accordance with national waste legislation.

14.6.1.4 Construction Environmental Management Plan (CEMP)

A CEMP was produced at the design stage to guide principles and contains measures and procedures for the management of construction waste. Contractors will be contractually obligated to comply with the requirements of the CEMP and should be adhered to by all parties with any involvement in construction, including main contractors, sub-contractors and visitors to the site.

The CEMP will address specific waste management requirements:

- Identifying how the waste will be dealt with (i.e. disposal, re-use on/off site etc.);
- All waste leaving site will be recycled, recovered or reused where possible, with the exception of those waste streams for which appropriate facilities are currently not available. On-site segregation of non-hazardous waste materials into appropriate categories;
- Control measures and attention to materials quantity requirements to avoid over-ordering and generation of waste materials;
- Implement a 'just in time' materials delivery systems to avoid materials being stockpiled, which increases the risk of damage and the disposal as waste;
- All waste materials will be stored in skips or other suitable receptacles in designated storage areas within compounds. The waste storage area(s) will be assigned, and all construction staff provided with training regarding the waste management procedures on commencement of the project;
- Ensure appropriate staff training and levels of awareness in relation to waste management;

- Waste streams will be collected by an appropriately licensed and permitted private waste contractor, appointed by the contractor for recycling, recovery or disposal at suitably licensed facilities;
- Monitoring and updating of records under Duty of Care requirements;
- Sewage effluent from the temporary site compound will be removed using a vacuum tanker by a suitable licensed waste contractor.

14.6.1.5 Construction Phase Monitoring

Records will be kept for each waste material which leaves the site, whether for reuse on another site, recovery, recycling or disposal. A system will be put in place to record the waste arising on site during the construction phases. The following should be recorded:

- Waste taken off-site for reuse;
- Waste taken off-site for recovery;
- Waste taken off-site for recycling; and
- Waste taken off-site for disposal.

For each movement of waste off-site a signed waste collection docket will be obtained from the contractor. This will be carried out for each material type. This system will also be linked with the delivery records. A signed waste acceptance docket will be issued for each movement of waste on-site.

If waste movements are not accounted for, the reasons for this shall be established in order to see if and why the record keeping system has not been maintained. Each material type will be examined in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved.

The contractor will be responsible for conducting an audit of the waste practices at the site during the construction phase of the development.

Upon completion of the construction phase, a final report will be prepared summarising the outcomes of waste management processes adopted and the total recycling/ reuse/ recovery figures for the Proposed Development.

14.6.2 Operational Phase Mitigation Measures

No preliminary waste management mitigation measures are currently proposed for the operational phase of the Proposed Development as negligible waste is anticipated to be produced from minor repair and maintenance works. Waste should be managed in accordance with the aims of the Perth and Kinross Waste Management Plan to reduce waste, recycle and recover more materials. Waste should only be transported and disposed or recovered through licenced operators and in accordance with national waste legislation.

14.7 Residual Impacts

Residual impacts of the Proposed Development considering the mitigation measures are presented in Table 14-13.

Table 14-13: Summary of Impacts

Phase	Receptor	Sensitivity of Receptor	Assessment of Magnitude	Predicted Effect	Adverse/ Beneficial	Permanent /Temporary	Mitigation Measures	Residual Effect
Construction Phase	Inert and Non-Hazardous Landfill Void Capacity	**Low**	**Minor**	**Neutral** or **Slight**	Adverse	Temporary	14.6.1	**Not Significant**
	Hazardous Landfill Void Capacity	**Low**	**Negligible**	**Neutral** or **Slight**	Adverse	Temporary	14.6.1	**Not Significant**
Operational Phase	Inert and Non-Hazardous Landfill Void Capacity	**Low**	**Negligible**	**Neutral** or **Slight**	Adverse	Permanent	14.6.2	**Not Significant**

14.8 Potential Cumulative Effects

Chapter 18 of this EIAR identifies all those projects which have been considered and assessed with regards to cumulative impacts. No cumulative impacts are expected between the Proposed Development and other projects listed in Table 18-1 due to their minor nature and associated likely neutral impact on baseline waste management infrastructure.

14.9 Conclusions

A carefully planned approach including asbestos surveys to the demolition of buildings and adherence to a SWMP and CEMP during the Construction Phase will ensure that the waste effects on the environment and on landfill void space capacity will not be significant. Circular Economy principles have been implemented during the design of the Proposed Development to design out waste and consider the whole life cycle of the development. There are proposals to reuse excavated material in the Proposed Development which would facilitate less waste requiring off-site management and these materials would be a substitute for virgin aggregates which is a more sustainable use of resources. Invasive species should be handled and managed in accordance with the Invasive Non-Native Plan Species Management Plan (Volume III, Appendix H). Materials not suitable for reuse onsite will go offsite for recycling, reuse or recovery as a priority over disposal to landfill. All waste materials leaving the site will be transported via a registered and licensed carrier and disposed or recovered at a licenced site in accordance with national waste legislation. Therefore, the effect of

the Construction Phase in relation to waste management is predicted to be **Neutral** or **Slight** with the residual effect outcome being **Not Significant**.

Low quantities of waste are anticipated to be generated from occasional minor repair and maintenance works to the Proposed Development during the Operational Phase. Waste should be managed in accordance with the aims of the Perth and Kinross Waste Management Plan and waste should be transported and disposed or recovered through licenced operators in accordance with national waste legislation. Therefore, the potential effect is **Neutral** or **Slight** and the residual effect on landfill void capacity being **Not Significant**.

The residual effects of the Proposed Development considering the mitigation measures presented in Section 14.6 are **Not Significant**.

No cumulative impacts are expected between the Proposed Development and other projects listed in Table 18-1.

15 FLOOD RISK, HYDROLOGY & DRAINAGE

This chapter of the EIAR considers the potential impact of the Proposed Development on flood risk within the study area. This section sets out the methodology employed in the assessment, defines the baseline flood risk from a desk-based assessment and consultation, and then assesses the potential impact of the Proposed Development and the residual impact following mitigation. The assessment was carried out in accordance with National Planning Framework 4, SEPA guidance and the Perth & Kinross Local Development Plan.

15.1 Assessment Methodology

The proposed works include flood defence measures to prevent against flooding in South Kinross.

The following tasks were undertaken to complete the assessment:

- Consideration of the flood maps from South Kinross Flood Protection Scheme study to determine the existing flood risk to the site;
- Appraisal of the proposed development with respect to the main sources of flooding;
- Consideration of the impact of the proposed development on flooding;
- Identification of any mitigation measures required;
- Assessment of any residual impacts;
- Evidence of compliance with applicable national and local planning policies and guidance.

15.1.1 Legislation and Guidance

National Planning Framework 4 (NPF4) sets out policies and proposals for the development and use of land.

Policy 22 of NPF4 ‘Flood risk and water management’ states that development proposals at risk of flooding or in a flood risk area will only be supported if they are for:

i. essential infrastructure where the location is required for operational reasons;

ii. water compatible uses;

iii. redevelopment of an existing building or site for an equal or less vulnerable use; or.

iv. redevelopment of previously used sites in built up areas where the LDP has identified a need to bring these into positive use and where proposals demonstrate that long-term safety and resilience can be secured in accordance with relevant SEPA advice.

A number of SEPA guidance documents have been used in the assessment. **Technical Flood Risk Guidance for Stakeholders** outlines what information SEPA requires to be submitted as part of a Flood Risk Assessment. **Flood Risk and Land Use Vulnerability Guidance** assists in the assessment of the vulnerability to flooding of different types of land use.

Perth & Kinross Local Development Plan 2 is the land use plan which sets out the policies and proposals which the Council wishes to use to guide development across the area up to 2029 and beyond. Within the parameters as defined by Policy 52 'New Development and Flooding' the Council supports the delivery of the actions and objectives to avoid an overall increase, reduce overall, and manage flood risk as set out within the relevant SEPA Flood Risk Management Strategies and the Local Flood Risk Management Plans. A supplementary guidance document on flooding and drainage has been prepared by Perth & Kinross Council's (PKC) Flooding Team to inform developers, their consultants and all stakeholders involved in the planning process about the Council's requirements. It is based on other existing legislation, planning policy and technical guidance. Compliance with the guidance will serve to meet the requirements of the Council's Local Development Plan.

15.2 Baseline Scenario

South Kinross is located at the downstream extent of the South Queich river, where it discharges into Loch Leven. The study area includes the South Queich, the Gelly Burn and the Clash Burn watercourses. The locations of the watercourses are shown in Figure 15-1.

Historically, fluvial flooding has presented the greatest risk of flooding to Kinross, with the majority of flooding associated with the South Queich and the Gelly Burn watercourses. Along the Clash Burn both fluvial and surface water flooding are a potential risk. Most of this watercourse is culverted and floods as a result of exceeding capacity and flooding out of manholes. As part of the South Kinross FPS study, RPS reviewed historical flood records in the vicinity of Kinross. Sources of information on events include internet searches, local news articles, and information provided by SEPA and PKC. Table 15-1 provides a summary of the reported historic events record.

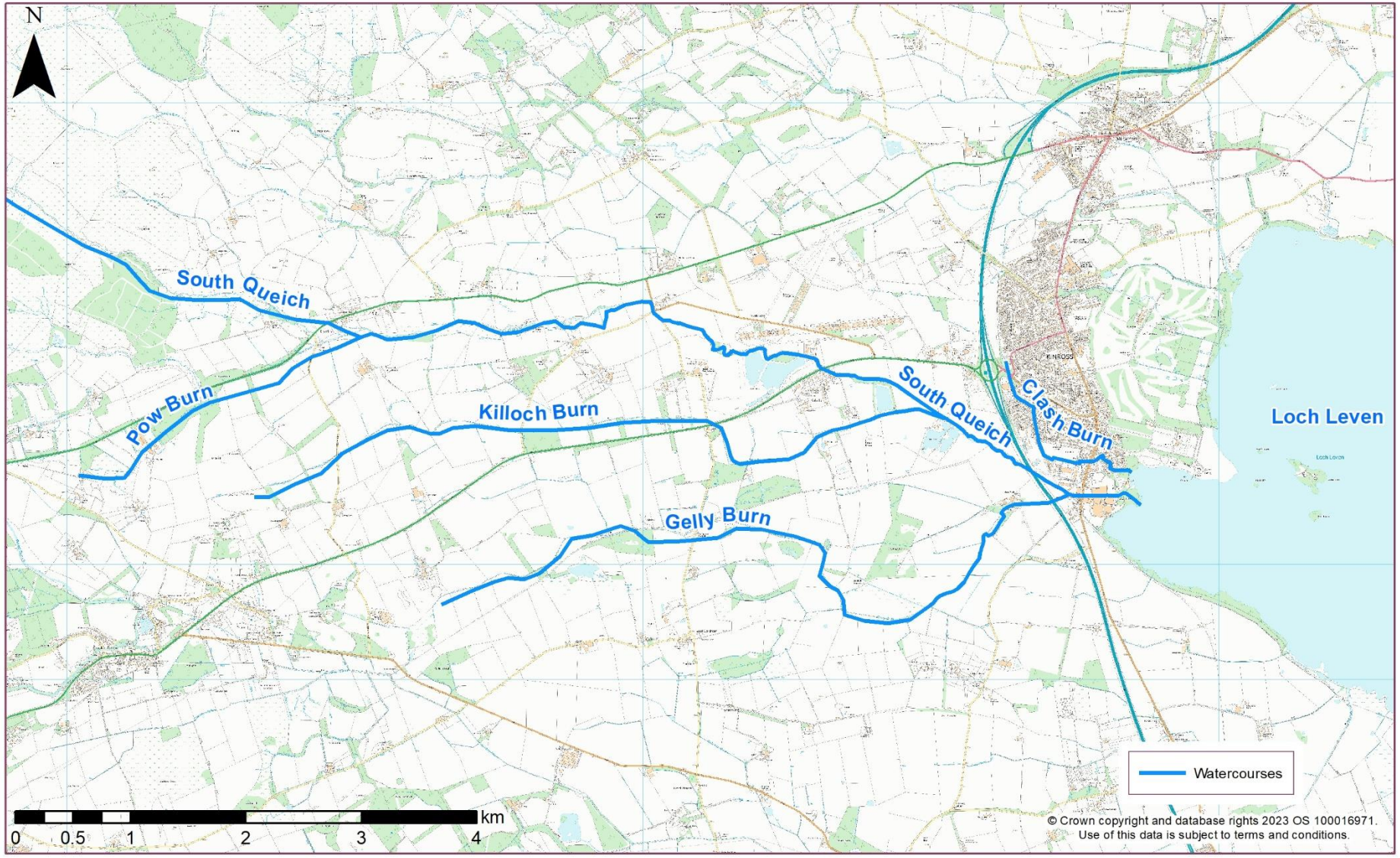


Figure 15-1: Locations of watercourses

Table 15-1: Summary of historic fluvial flood records in the Kinross area

Event date	Description	Source
10th December 1868	North and South Queich flooded causing extensive damage through the South Kinross town as trees, paling rails and other infrastructure were swept downstream toward Loch Leven	Scotsman Archive
31st October 1872	South Queich flooded and overtopped its banks at numerous locations, including the flooding of the local railway line	Scotsman Archive
8th February 1903	Gelly Burn water levels rose to the top of the bridge in South Kinross town with regional flooding through the town and many acres of agricultural land east of Loch Leven flooded	Scotsman Archive
26th July 1985	Local news article detailed how fluvial flooding in South Kinross town centre at the junction between Swans Acre and High Street led to basement flooding of commercial property in the town; described the 'worst flooding in 70 years'.	Local news article (from SEPA)
16th January 1993	Reported flooding in the general area of South Kinross, emanating from and impacting multiple places around the South Queich	SEPA
22nd January 1999	Reported flooding to property caused by fluvial flooding from the Clash Burn	SEPA
13th December 2006	Flood event that originated from the South Queich that impacted on the Koronka, Bridgend and Kinross area. SEPA notes that sandbags were requested by property owners.	SEPA
25th and 26th January 2008	Flooding from the South Queich impacting South Kinross town	SEPA
7th August 2008	Flooding from the South Queich impacting South Kinross town	Perth and Kinross Council
6th July 2009	Fluvial flooding in the South Queich led to minor flooding on Montgomery Road within South Kinross town centre. This also caused a number of instances of pluvial flooding including at Myre Terrace and Smith Street	SEPA
19th November 2009	Intense rainfall event led to flooding of South Queich	SEPA
23rd July 2011	Capacity of the culverted sections of the Clash Burn exceeded affecting at Myre Terrace and Smith Street	Perth and Kinross Council
10th & 11th January 2020	A local business owner reported flooding of car parking with flood waters from the South Quiech overtopping a small protection embankment.	Perth and South Kinross Council
22nd – 23rd February 2020	Intense storm event led to South Queich Flooding and impacting local properties.	Perth and Kinross Council

Event date	Description	Source
11th August 2020	Extensive rainfall, thunder, and lightning for 6 hours resulted in widespread flooding. Several properties flooded on Queich Place, Todd and Duncan, BCA Site, High Street and Bridgend Industrial Estate	Perth and Kinross Council

As part of the South Kinross FPS study, RPS undertook numerical modelling of all the watercourses. Simulations were carried out using the model to determine water levels for a range of flood events, with flood extent and depth maps being generated for each return period for the design scenario. The present-day 0.5% AEP fluvial flood extents are shown in Figure 15-2, and the climate change fluvial flood extents are shown in Figure 15-3.

For planning purposes, the NPF4 defines at risk of flooding or in a flood risk area as lands with an annual probability of being flooded of greater than 0.5% which must include an appropriate allowance for climate change. As Figure 15-3 shows, the site can therefore be considered to be in a flood area.

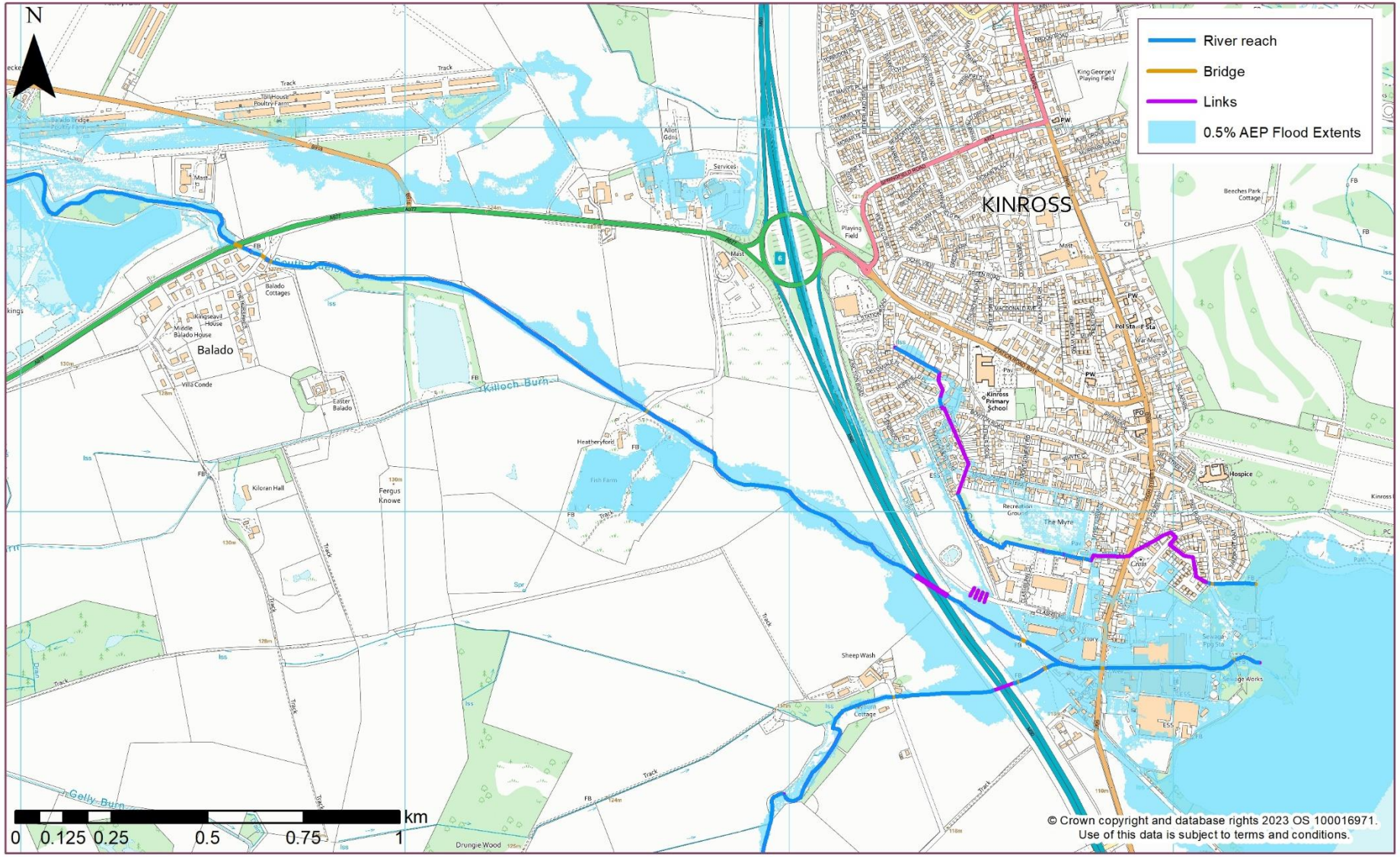


Figure 15-2: 0.5% AEP fluvial flood event extent (Present day) **note final scheme alignments shown in Figure 3-2*

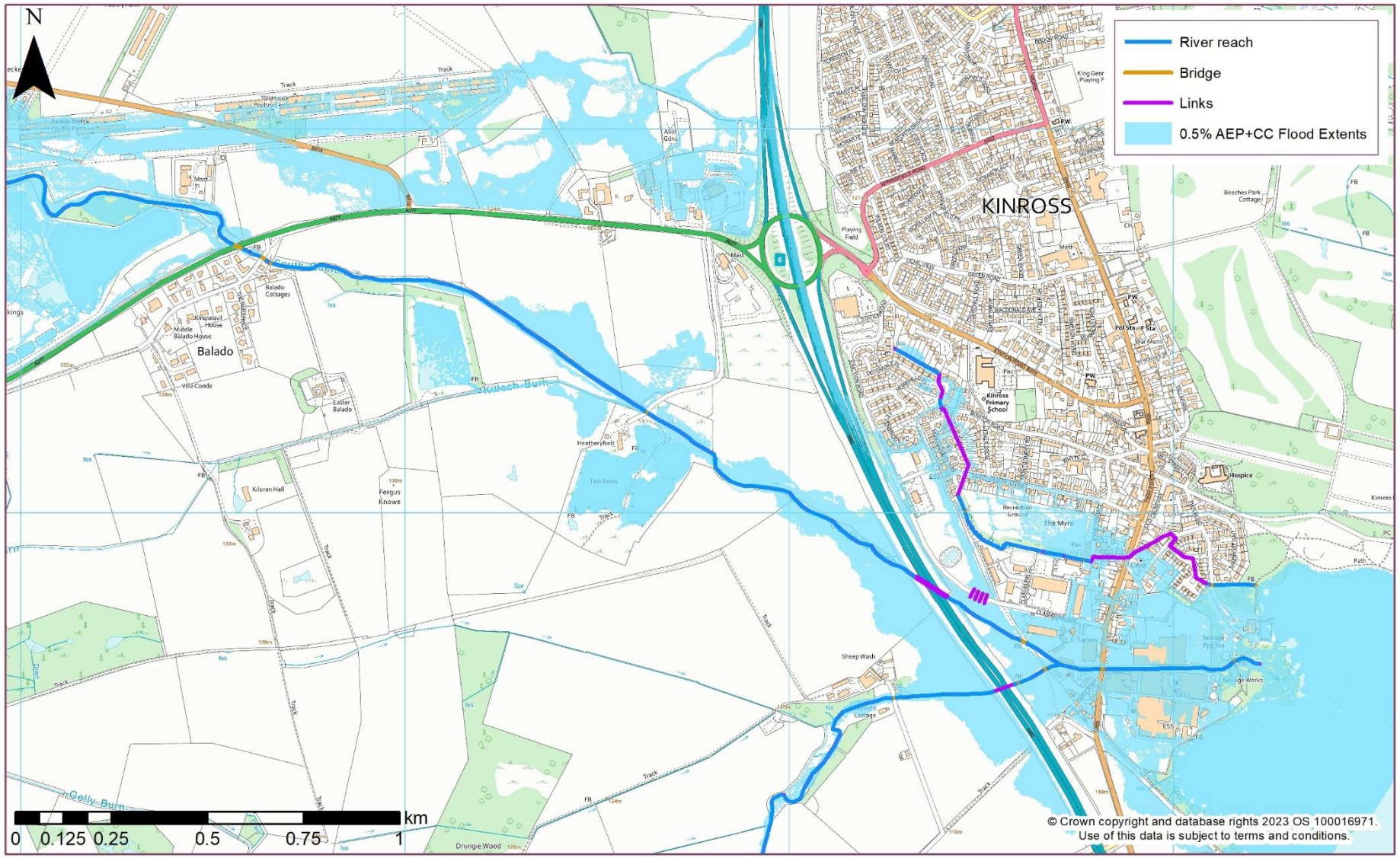


Figure 15-3: 0.5% AEP fluvial flood event extent (Climate change)

15.3 Description of Likely Significant Effects

15.3.1 Classification of Proposed Development

As described in the SEPA 'Flood Risk & Land Use Vulnerability Guidance', the proposed works can be classified as 'Water Compatible Uses' (flood control infrastructure). Under Policy 22 of NPF4, 'water compatible uses' is one of the proposals that will be supported in a flood risk area. There are no elements of the proposal that would be considered as unsuitable in terms of flood risk.

15.3.2 Assessment of Construction Effects

As the construction works will be in the vicinity of watercourses, there is a risk of flooding to the works from extreme events that will need to be managed. Impacts would include flooding of the site compound, flooding of plant and machinery, and a risk to construction workers.

15.3.3 Assessment of Operational Effects

15.3.3.1 River Flooding

One of the objectives of the Proposed Development is to reduce the flood risk in the area. Policy 52 'New Development & Flood Risk' of the Perth & Kinross Local Development Plan 2 (2019) states that all development within areas of low to high flood risk must incorporate a suitable climate change allowance as well as a 'freeboard' allowance.

The Proposed Development has been designed to provide a 1 in 200 year return period SoP, which is also described as an 0.5% AEP. This means that the Proposed Development protects against a flood event that has a 0.5% chance of occurring in any given year. The flood defences have been designed to be adaptable to allow future raising of defences in response to climate change. An allowance has also been included for climate change for the culvert and upstream storage areas of the scheme. This is the standard for flood relief schemes in Scotland.

Freeboard is a height added to the predicted level of flood to take account of the uncertainty in estimating the probability of flooding. A freeboard allowance of 300mm has been included in the design of the proposed embankments, and an allowance of 600mm has been included in the design of the proposed floodwalls. These allowances are what is generally accepted for flood relief schemes.

It is necessary to determine that the Proposed Development whilst providing protection to some areas will not increase the risk from flooding elsewhere. This was done by assessing the results of the hydraulic modelling completed as part of the South Kinross FPS study. Figure 15-4 shows that pre- and post-scheme flood extents for the climate change scenario. There are some areas where there is an increase in flood risk, and the mitigation measures to deal with these increases are described in Section 15.5.2.1.

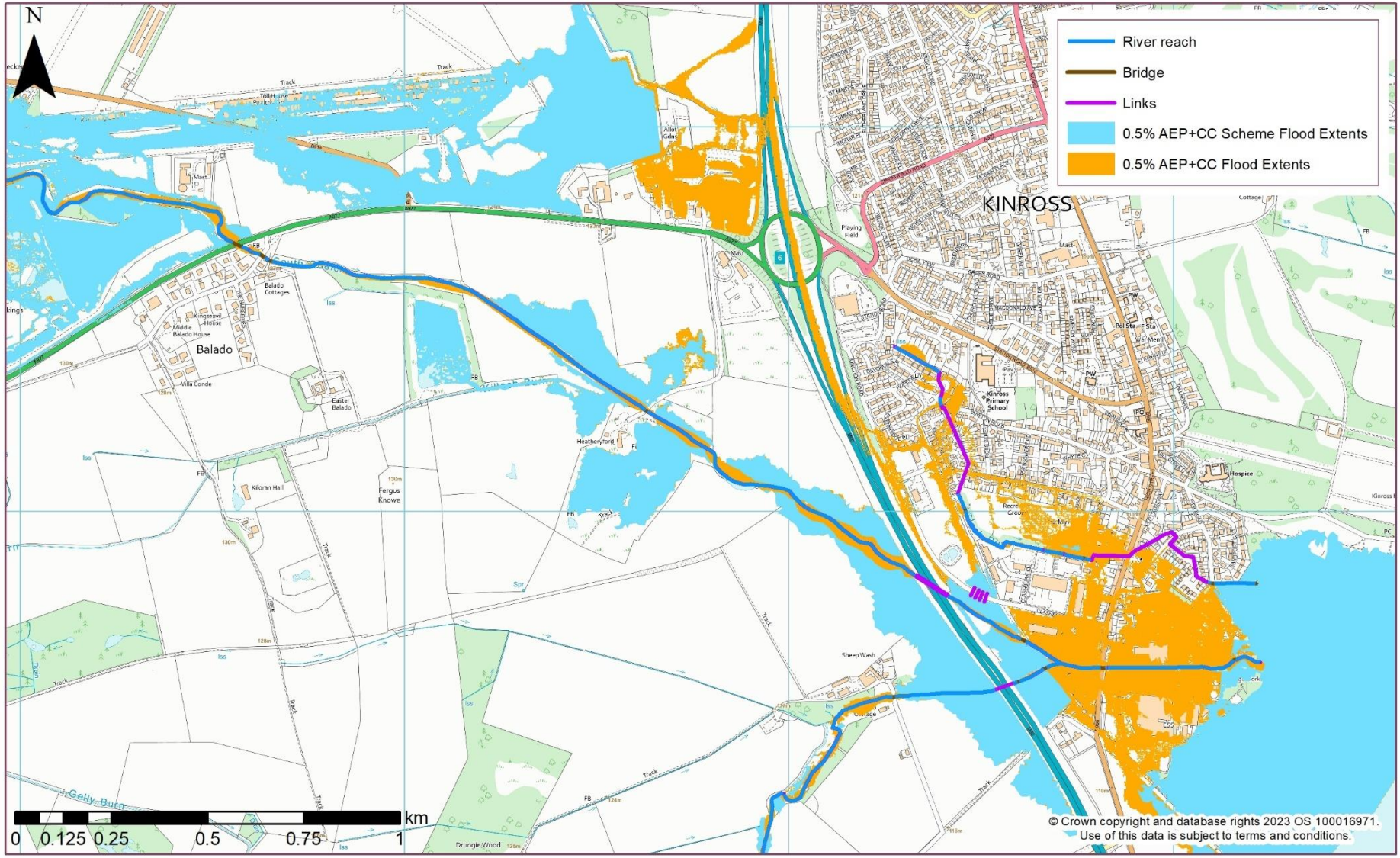


Figure 15-4: River flood extents (Climate change) from hydraulic modelling - pre and post development **note final scheme alignments shown in Figure 3-2*

An assessment has been carried out as part of the South Kinross FPS study which determined that the scheme will create minimal increase in surface water flood risk through cutting off flow paths. The mitigation measures to deal with this are described in Section 15.5.2.2.

15.4 Significance of Effects

This section outlines the significance of effects on material assets that could arise due to the construction and operation of the Proposed Development.

The significance of effects are described in terms of:

- Sensitivity/ Importance of the receptors – including factors such as the vulnerability, recoverability and value/importance of the receptor; and
- Magnitude of the impact – including factors such as the extent, duration, frequency and reversibility of the impacts.

The matrix as shown in Table 15-2 was used for the determination of significant effects.

Table 15-2: Matrix for the Determination of Significant Effects

		Magnitude of change			
		Major	Moderate	Minor	Negligible
Sensitivity	High	Major	Major/Moderate	Moderate	Minor
	Medium	Major/Moderate	Moderate	Moderate/ Minor	Minor
	Low	Moderate	Moderate/Minor	Minor	Minor/Negligible

Significant impacts are in dark shading

15.4.1 Construction Phase

The vulnerability of the construction works to flooding is considered to be High and the recoverability of any affected receptors is considered to be High. The impacted receptors are of High value/ importance. The overall sensitivity is therefore considered to be **High**.

The duration of impact is only expected during the construction phase, in the short-term. The effects are not expected to occur often, and any longer-term impacts are considered to be reversible. Therefore, the overall magnitude of effects is likely to be **Negligible**.

Therefore, according to the matrix in Table 15-2, the overall significance of effects on settlement is considered to be **Minor**.

15.4.2 Operational Phase

15.4.2.1 River Flooding

The sensitivity of the floodplain to an increase in flood risk is considered to be **High**.

The extent of the potential effect is relatively small as areas impacted by the Proposed Development only cover a small geographical area and the duration of impacts are short-term. The effects are not expected to occur often, and any longer-term impacts are considered to be reversible. Therefore, the overall magnitude of effects is likely to be **Negligible**.

Therefore, according to the matrix in Table 15-2, the overall significance of effects on river flood risk is considered to be **Minor**.

15.4.2.2 Surface Water Flooding

The sensitivity of increased surface water runoff is considered to be **High**.

The extent of the effect is relatively small as areas impacted by the Proposed Development only cover a small geographical area and the duration of impacts are short-term. The effects are not expected to occur often, and any longer-term impacts are considered to be reversible. Therefore, the overall magnitude of effects is likely to be **Negligible**.

Therefore, according to the matrix in Table 15-2, the overall significance of effects on surface water flooding is considered to be **Minor**.

15.5 Mitigation Measures

15.5.1 Construction Phase

During construction, there is a risk of flooding to the works from extreme river events. Floodline is operated by SEPA. It provides live flooding information and advice on how to prepare for or cope with the impacts of flooding 24 hours a day, 7 days a week. The contractor can sign up to the service and get notified when the area is at risk of flooding.

The Scottish Flood Forecast is a new 3-day flood forecast which is produced by the Scottish Flood Forecasting Service (SFFS) daily. The SFFS is a partnership between SEPA and the Met Office. It is available on SEPA's website. The Scottish Flood Forecast complements the existing regional flood alerting and local flood warning services.

The use of these services can ensure that the risk of flooding to the construction works is minimised.

15.5.2 Operation Phase

The main objective of the Proposed Development is to reduce the flood risk in the area from fluvial flooding. Flood protection can therefore be considered as 'Primary mitigation' which is modifications to the location or design of the Proposed Scheme made during the pre-application phase that are an inherent part of the project.

Mitigation measures have been proposed to deal with increases in flood risk as a result of the Proposed Development and also to deal with any potential surface water flooding behind the proposed defences as described in the followings sections.

15.5.2.1 River Flooding

It is necessary to determine that the Proposed Development whilst providing protection to some areas will not increase the risk from flooding elsewhere. There are some areas where there is an increase in flood risk. This impacts already flooded areas affected by significant flood extents and depths in current conditions and areas of open green space only. Some examples of mitigation measures required to deal with the increased river flood risk are described below.

Clash Burn

Sections of the Clash Burn will be upsized or diverted resulting in increased flow. Downstream of the proposed culvert upgrade, water levels at Boathouse Access Road are increased because of the Proposed Development by 380mm due to increased culvert capacity upstream. To mitigate this, it is proposed that the footbridge is replaced, and the culvert extended to act as the footbridge to maintain consistent flow capacity.

M90 Storage

The M90 storage impact will alter flood risk upstream by design. The proposed upstream storage area will capture an overland flow path from agricultural land, blocking it from reaching the Kinross surfaces. This will require the flooding of a less vulnerable field area for which the landowner will be compensated.

South Queich

Direct defences along the South Queich have the potential to push flood risk downstream by canalising watercourses. Hydraulic modelling was reviewed and showed a minor increase on flood risk downstream. Flood extents within green space to the east of the Scottish Water assets on the left and right banks of the South Queich are increased. It is recommended that signage is adopted in this area to inform of the potential risk during extreme rainfall events.

15.5.2.2 Surface Water Flooding

The Proposed Development will create minimal increase in surface water flood risk through cutting off flow paths with flood extents largely unchanged and flood depths increase by generally less than 20mm. To manage this, back drainage will be constructed behind defences to capture flow paths and ensure the land behind the defences does not become waterlogged. This will consist of a series of perforated pipes bedded in no fines granular material and laid parallel to the defences. Precast concrete manholes will be provided at regular intervals to facilitate access for maintenance or changes in direction. At suitable locations the drainage pipe will need to be cored through the flood wall or laid underneath the flood embankment and outfall to the river via a flapped discharge. It will be necessary to provide a precast concrete headwall at all discharge location points.

15.6 Residual Impacts

Residual flood risk is the risk that remains after all mitigation measures have been taken to reduce the frequency of flooding.

There will be a residual flood risk as the flood defences may be exceeded by a flood event that is greater than that which they were designed to resist. However, the defences have been designed to a good standard of protection and include allowances for freeboard. Future adaptability has also been designed into the scheme in response to climate change. The residual risk can therefore be considered to be low.

15.7 Potential Cumulative Effects

For flood risk, any cumulative effects would come from developments that impact the floodplains that affect the site. This is likely to be a development that takes place within the floodplain in the vicinity of the proposed works. In order to gain planning permission, all new developments must show that they do not increase flood risk elsewhere in compliance with national and local planning policies. There will be no cumulative impacts on flood risk as a result of neighbouring developments.

15.8 Conclusions

The flood risk to the application site has been assessed and the predominant source of flood risk emanates from river flooding. For planning purposes, the NPF4 defines at risk of flooding or in a flood risk area as lands with an annual probability of being flooded of greater than 0.5% which must include an appropriate allowance for climate change. The site can therefore be considered to be in a flood area. As described in SEPA 'Flood Risk & Land Use Vulnerability Guidance', the Proposed Development can be classified as 'Water Compatible Uses'. Under Policy 22 of NPF4, 'water compatible uses' is one of the proposals that will be supported in a flood risk area. There are no elements of the proposal that would be considered as unsuitable in terms of flood risk.

The Proposed Development has been designed to provide a 1 in 200 year return period SoP, which is also described as an 0.5% AEP. An allowance has also been included for climate change for the culvert and upstream storage areas of the scheme. The defences have been designed to be adaptable to climate change in future through oversized foundations to support potential raising of defence heights if needed. A freeboard allowance of 300mm has been included in the design of the proposed embankments, and an allowance of 600mm has been included in the design of the proposed floodwalls. These allowances are what is generally accepted for flood relief schemes.

During construction, there is a risk of flooding to the works from extreme river events that will need to be managed. Floodline operated by SEPA and the SFFS, which is a partnership between SEPA and the Met Office, can be used by the Contractor to ensure that the risk of flooding to the construction works is minimised.

One of the objectives of the Proposed Development is to reduce the flood risk in the area from fluvial flooding. Flood protection can therefore be considered as 'Primary mitigation' which is modifications to the location or design of the Proposed Development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken. Mitigation measures have been proposed to deal with increases in flood risk as a result of the Proposed Development and also to deal with any potential surface water flooding behind the proposed defences.

This assessment has demonstrated that:

a) all sources of flood risk to and from the Proposed Development have been identified; and
b) there are adequate measures to manage and mitigate any increase in flood risk arising from the development.

16 WATER QUALITY

This chapter of the EIAR assesses the potential impact of the Proposed Development on water quality within the receiving environment. Existing water quality in the vicinity of the Proposed Development is established based on available water quality information. The assessment of impacts includes analysis and interpretation of baseline data acquired from existing water quality monitoring stations included in the SEPA WFD monitoring programme. The potential impacts related to the construction and operational phases of the Proposed Development have been assessed and mitigation measures proposed to reduce significant environmental impacts on the receiving water environment. The assessments are based on the project description detailed in Chapter 3.

The main aspects of the Proposed Development that have the potential to impact on water quality and the overall status of water bodies in the vicinity of the Proposed Development are from physical changes to the water bodies and/ or construction activities. In general terms, the construction and operation of the Proposed Development could have the following impacts:

- Short term construction impacts particularly due to sediment release and/or contaminant dispersal;
- Pollution from accidental spillage / leakage;
- Changes to the hydromorphological supporting conditions affecting the hydromorphological status and the biological elements which it supports, and
- Impacts on biodiversity.

The assessment presented is informed by and inclusive of information further described in the following EIA chapters:

- Chapter 8 – Biodiversity – Terrestrial and Aquatic;
- Chapter 13 - Soils, Geology, Hydrogeology & Contamination; and
- Chapter 15 - Flood Risk, Hydrology & Drainage.

16.1 Assessment Methodology

16.1.1 International Policy Context

The WFD (Council Directive 2000/60/EC establishing a framework for community action in the field of water policy) was adopted by the European Commission in December 2000. The WFD requires that all European Union Member States prevent deterioration and protect, enhance and restore all bodies of water. This means that Member States must ensure that new schemes do not adversely impact upon the status of aquatic ecosystems, and that they must address historical modifications that are already impacting a water body. Whilst the WFD originates from the EU it has been retained in UK law following the UK's exit from Europe. The Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019 is the implementing legislation which ensures principals of the Directive are largely retained with Scottish legislation.

The WFD applies to all water bodies, including those that are both natural and man-made. The consideration of the proposals under the WFD and the Environmental Standards Test will apply to the South Queich (ID6302) as this is the water body that is reported under the WFD. The Gelly Burn and the Clash Burn surface water bodies are not reported under the WFD but have been considered as they have the potential to be impacted by the Proposed Development.

The key focus of the water quality assessment is to ensure that the Proposed Development is undertaken in a manner which is consistent with the objectives of the Water Framework Directive (2000/60/EC) (WFD). The WFD is the European legislation which was developed to establish systems to manage Europe's water environment - rivers, lochs, estuaries, coastal waters and groundwater; a fundamental requirement of the WFD is to attain good ecological and chemical water quality status and ensure that any deterioration in the status of waters is prevented. Any new development must ensure that these two fundamental requirements of the Directive are not compromised, nor are there any detrimental impacts to the protected area objectives of water dependent protected areas that are associated with the water body e.g., nearby designated European Sites on the national site network.

16.1.2 National Policy Context

The Proposed Development will be undertaken in line with the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 and the Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Regulations 2010, as amended.

The following relevant national legislation was also considered during the preparation of this chapter:

- The Water Environment and Water Services (Scotland) Act 2003 – this Act transposes the requirement of the WFD into Scottish law;
- The Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019; and
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) – these regulations were introduced under the 2003 Act to specify the control regimes for discharges to, abstractions from and impoundments and engineering activities affecting the water environment (i.e., rivers, lochs, transitional waters (estuaries), coastal waters groundwater, and groundwater dependant wetlands).

16.1.3 Relevant Guidance

Guidance relevant to the EIA for the water quality chapter is as follows:

- Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the EIA process in Scotland (SNH, 2018);
- Regulatory Method (WAT-RM0-02);
- Supporting Guidance (WAT-SG-21);

- Guidelines on Pollution Prevention 1 (GPP1): Understanding your environmental responsibilities – good environmental practices;
- Guidelines on Pollution Prevention 5 (GPP5): Works and maintenance in or near water;
- Guidelines on Pollution Prevention 6 (GPP6): Working at construction and demolition sites;
- Guidelines on Pollution Prevention 21 (GPP21): Pollution incident response planning;
- Guidelines on Pollution Prevention 22 (GPP22): Dealing with spills;
- Engineering in the water environment: good practice guide – Sediment Management (WAT-SG-26);
- Engineering in the water environment: good practice guide – Temporary Construction Methods (WAT-SG-29);
- Engineering in the water environment: good practice guide – Bank Protection (WAT-SG-23);
- Engineering in the water environment: good practice guide – Riparian Vegetation Management (WAT-SG-44); and
- Watercourses in the Community: A Guide to Sustainable Watercourse Management in the Urban Environment.

16.1.4 Water Framework Directive Assessment

16.1.4.1 Introduction

An important element of WFD ecological status is the supporting hydromorphological conditions which considers elements such as flow regime, riverbank and bed structure, sediment composition and movement, continuity, and structure of the habitat all of which can affect the ecology of aquatic ecosystems. It is essential that any changes to the physical conditions of a water body that could have the potential to affect morphological conditions or the capacity of a water body to assimilate these pressures are assessed to ensure that the biological elements and the water body environmental objectives are not compromised.

The objective of the WFD is to maintain "high and good status" of waters where it has that status currently; prevent any risk of deterioration in the existing status of waters; and restore at least "good status" in relation to all waters, by 2027. A Morphological Risk Assessment within the WFD is undertaken with the objective of classifying waterbodies as having a ‘High’, ‘Good’, ‘Moderate’, ‘Poor’, or ‘Bad’ morphological risk status, or for those waterbodies designated as ‘Artificial’ or ‘Heavily Modified’ to ‘Good Ecological Potential’.

Where a proposed development or engineering activity has the potential to adversely impact compliance with the WFD, an assessment will be required. Each component of a development or works, i.e., enabling works, construction, operation and decommissioning, where applicable, must be assessed in the context of achieving the WFD environmental objectives. Each component of the works must also

achieve the core environmental objectives outlined in the River Basin Management Plan (RBMP), including the achievement of water related objectives for designated protected areas.

SEPA has developed a methodology for the regulation of licence-level engineering activities, Regulatory Method WAT-RM-02 (SEPA, 2020) which provides an approach to be followed in the technical assessment of all licence application under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) or CAR for engineering works. The technical Assessment consists of up to four tests, which if passed will ensure the protection of the water environment from deterioration. The tests are:

- Environmental Standards Test (EST) for Morphology;
- Conservation i.e., to protect designated sites;
- Good Practice – for applications that fail the EST; and
- Derogation – for applications that fail the EST.

The process is designed to allow low risk activities to pass at an early stage and to identify projects that require more detailed assessment. Figure 16-1, taken from the WAT-RM-02, outlines the assessment required under CAR.

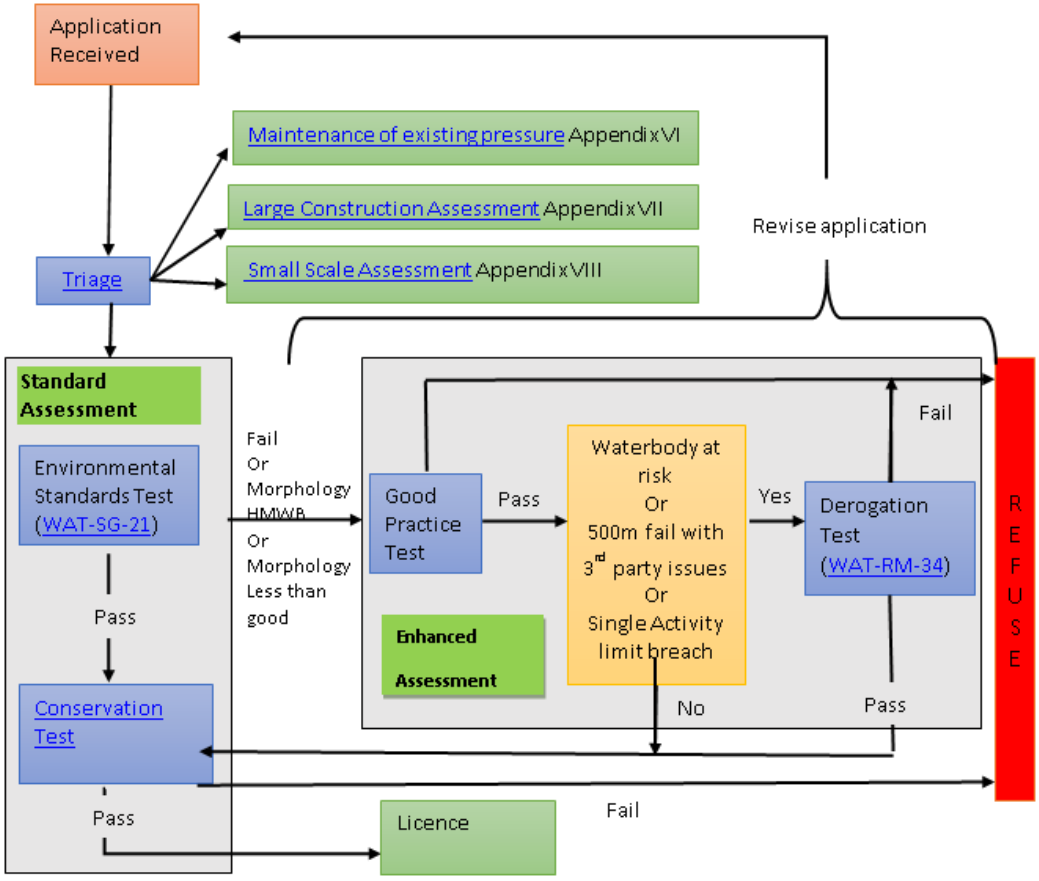


Figure 16-1: Engineering Licence Assessment Summary

A WFD Assessment Report was completed for the Proposed Development, which covered the EST for Morphology. This report is included in Volume III, Appendix O.

16.1.4.2 Environmental Standards Test

An Environmental Standards Test (EST) was carried out to determine whether the Proposed Development or activities associated with the Proposed Development will result in deterioration in morphological quality and thereby have the potential to result in a deterioration in the WFD status of the water bodies affected. The EST for rivers is undertaken using an impact assessment tool called MImAS (Morphological Impact Assessment System). The approach to the EST is set out in Supporting Guidance (WAT-SG-21), Environmental Standards for River Morphology (SEPA, 2012).

MImAS works by determining the likely morphological impact resulting from a single activity, or from combinations of activities within a given length of channel. Impacts are measured by how much 'system capacity (%)' they use up within two zones (channel zone and banks/riparian zone), the assumption being that rivers have a fixed amount of 'capacity' to absorb engineering pressures and different engineering activities consume different amounts of available capacity. In addition, the amount of capacity used by a pressure will vary depending on the channel's sensitivity, or type, with a pressure of a given size using less capacity in a lower sensitivity type than in a higher sensitivity type. To run MImAS, a user must enter information on engineering pressures, modifications to the riparian vegetation and channel type. Using this information, MImAS calculates how much system capacity has been used in each zone and predicts WFD status.

Environmental Standards (also referred to as Morphological Condition Limits or MCL) define permissible levels of impact on a systems available capacity within each zone. It is believed that these limits, which are expressed as different percentages of total system capacity, are compliant with WFD status classification objectives, such that development beyond these limits could compromise ecological and/or morphological conditions and result in deterioration in status.

The environmental standards test is a three-step process, a summary of which is provided in Figure 16-2 (taken from WAT-SG-21).

16.1.4.3 Running MImAS

The process for running MImAS to assess whether a new activity, in combination with existing activities, threatens WFD status is summarised in Figure 16-2.

MImAS was used to first assess the current status of the site. Once this had been determined, the new activity/activities were entered to determine if a drop in status is likely to occur.

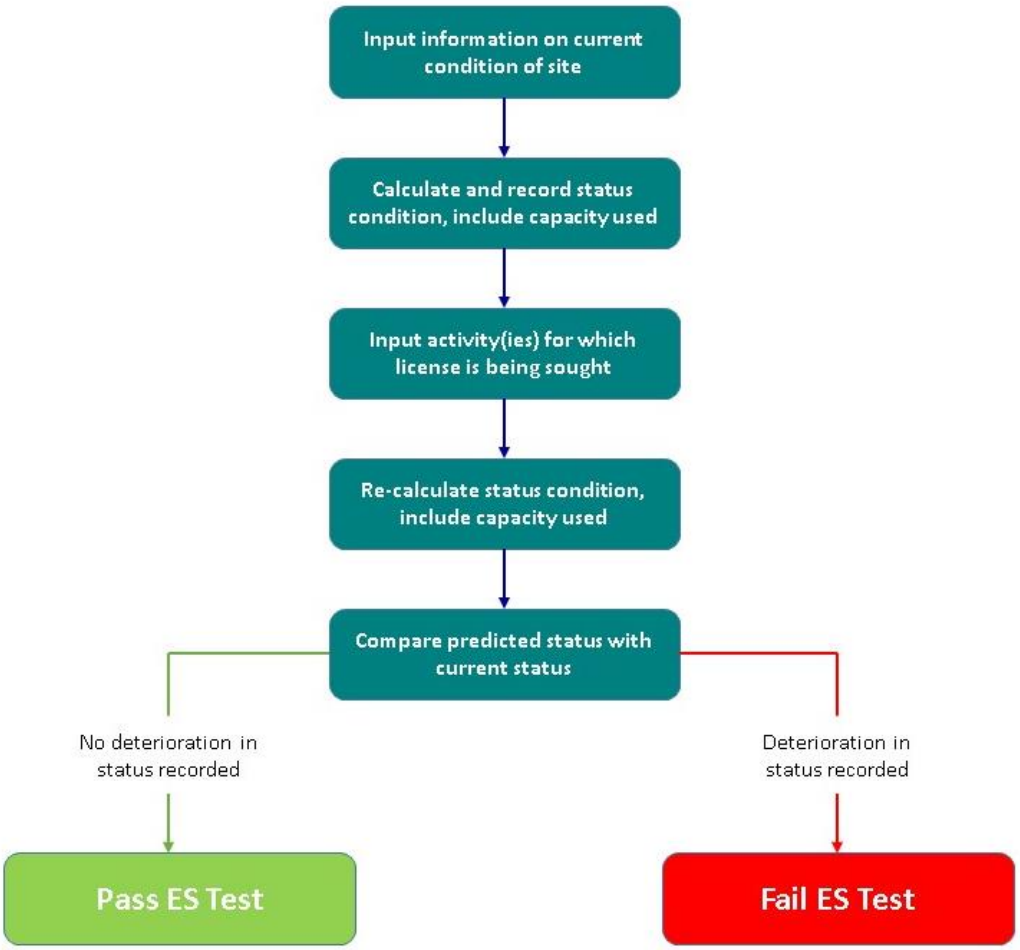


Figure 16-2: Summary of process for running MImAS

For further details on MImAS and EST, please refer to Volume III, Appendix O.

16.1.4.4 Information Sources

The information used in the MImAS Assessment is set out in Table 16-1.

Table 16-1: Information sources consulted during the preparation of the WFD Assessment

Source	Data	Information consulted/provided
Ordnance Survey (OS)	OS Mapping 1: 50,000 Sheets NN80, NO00, NS88, NT08	Area information, rivers and other watercourses, general site environs, built environment, catchment information
	OS Mapping 1: 10,000 Sheets NN90NE, NN90SE, NO00NE, NO00NW, NO00SW, NO00SW, NO10NW, NO10SW, NS99NE, NS99SE, NT09NW, NT09NW, NT19NW	
SEPA	SEPA water environment hub	Water body classification, overall status, ecological status, biological elements, physico-chemical elements, hydro-morphology and chemical classification
		WFD objectives for water bodies
	WFD Classification Information	Up to date classification information for all elements of ecological and chemical status, along with previous year's data.
	Morphological Pressures Database	SEPA database of physical modifications to water bodies, e.g., impoundments, embankments, realignment, riverbed reinforcements
	Water body spatial data	River water body layers, catchment boundaries
	Data from SEPA Hydromorphology Team	Morphological condition scores for the water bodies affected
		MImASv1_Tool for manual calculations
	Update to the river basin management plan for the Solway Tweed river basin district	Physical condition of the water environment Programme of measures
	Regulatory Method (WAT-RM-02)	Guidance on Regulation of Licence-level Engineering Activities
	Supporting Guidance (WAT-SG-21)	Guidance on Environmental Standards for River Morphology
Project Data	Morphological Pressures Survey	Field survey of existing morphological pressures along the reach of the rivers affected including embankments, floodwalls, bridge structures, culverts, outfalls, bank reinforcement
	Preferred option for South Kinross FPS	Proposed design detailing proposed physical modification of the FPS

16.2 Baseline Scenario

The South Queich flows west to east through the south of the town and draining to Loch Leven. The water bodies that have the potential to be directly affected by the Proposed Development are the South Queich (ID 6302) and the Gelly Burn. There are some smaller culverted burns in Kinross which are not reported under the WFD or RBMP, such as the Clash Burn and Ury Burn which also flow east and drain to Loch Leven.

While there are no designated sites directly within the development area, there are a number of designated sites nearby which cover Loch Leven including:

- Loch Leven SPA – designated as it supports a population of whooper swan, shoveler as well as wintering populations of cormorant, gadwall, teal, pochard, tufted duck and goldeneye;
- Loch Leven SSSI – designated for its freshwater habitat (Eutrophic loch), fens, vascular plants and bird species; and
- Loch Leven Ramsar site – designated as Loch Leven is the largest eutrophic loch in the British Isles, with a diverse aquatic flora and shoreline vegetation. The site supports internationally important wintering populations of pink-footed geese and shoveler, as well as an assemblage of over 20,000 wintering waterfowl.

Figure 16-3 shows the location of the proposed development and the surrounding designated sites.

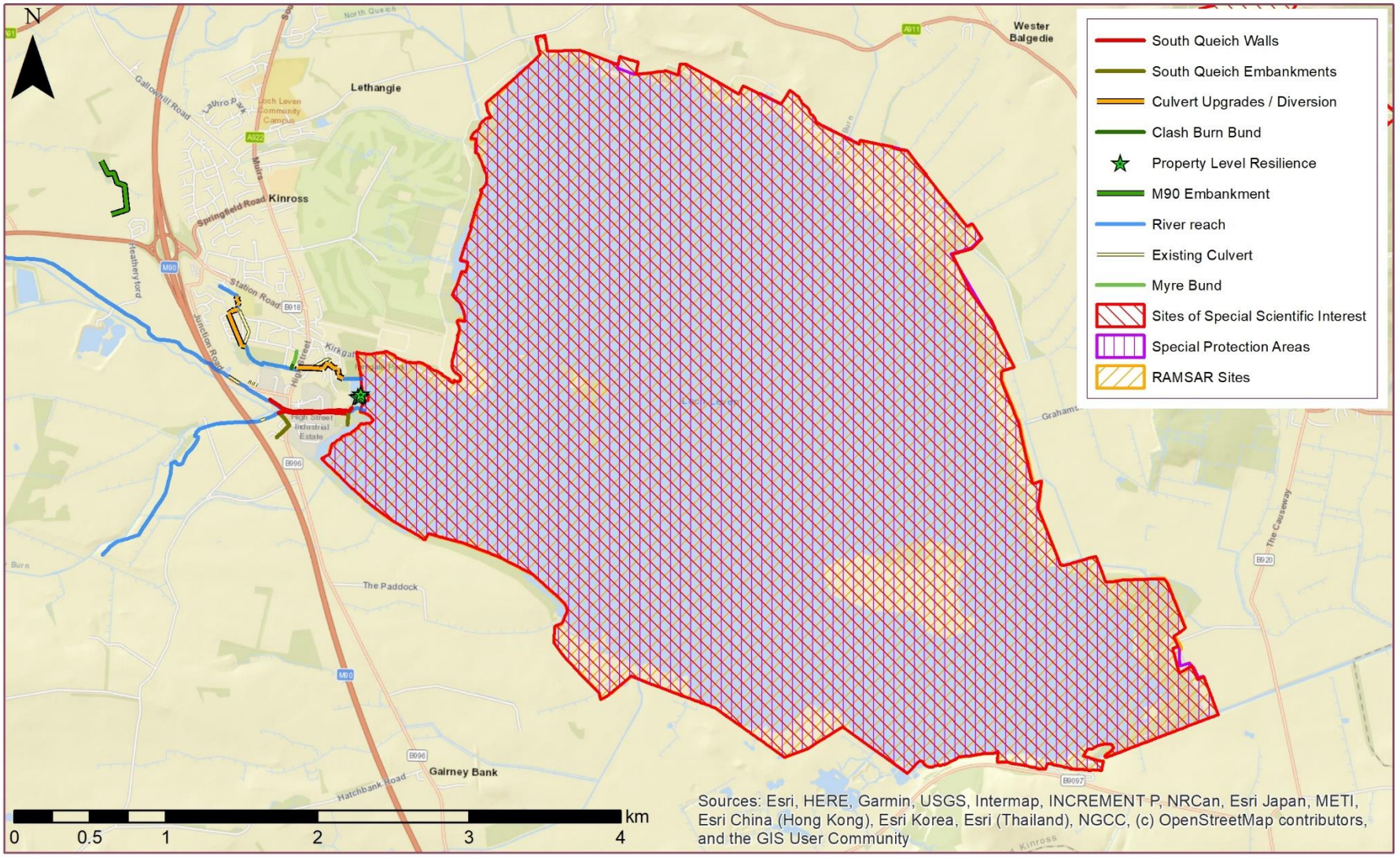


Figure 16-3: Designated sites nearby the Proposed Development

16.2.1 Consultation

The EIA scoping report identified potential impacts to water quality and has proposed that further assessment is required in line with the WFD. The source of these impacts has been identified as construction activities, particularly with regard to run-off and sedimentation, and physical changes to the affected waterbodies, resulting in a deterioration in morphological supporting conditions and a possible deterioration in WFD status. Consultations were undertaken with relevant parties in order to determine the existing water quality status in the context of the WFD and to establish a scope for the assessment of water quality impacts, thereby enabling an appropriate assessment of the impact of the development to be made. A summary of the relevant issues identified and how these have been addressed are included in Table 16-2.

Table 16-2: Scoping responses for water quality from relevant consultees

Date	Consultee	Issue raised	How/where addressed
09 March 2022	SEPA	The EIA should identify all aspects of site work that might have an impact on the environment, potential pollution risks and identify the principles of preventative measures and mitigation.	See Section 16.3, 16.4 and Section 16.5
		A draft Schedule of Mitigation should be produced covering all the environmental sensitivities, pollution prevention and mitigation measures identified.	See Chapter 18 of the EIAR
		A construction run off licence under CAR may also be required for the management of surface water runoff during construction.	See Section 16.5.1 Construction Mitigation
		There may be water quality issues (via increased suspended loading) in Loch Leven, given that out-of-bank storage will be lost in upstream locations. We assume this will be addressed in the Water Quality Section.	See Section 16.4.1 Significance of Effects - Operation
		It is unclear whether the proposed scheme will include measures to manage surface water drainage. Please note that any discharge of surface water to the environment from drainage associated with the works must be in accordance with principles of the SUDS Manual (C753) and comply with CAR.	Back Drainage will be required behind the defences see Chapter 3 Project Description, Section 3.3.5.3 Drainage
16 March 2022	NatureScot	Potential impacts for construction on Loch Leven SPA, Ramsar and SSSI that could impact on water quality should be addressed in the EIAR.	Significant Impacts are addressed in Section 16.4

Date	Consultee	Issue raised	How/where addressed
		The proposed works include construction of embankments, retaining walls and sheet piling along the South Queich downstream of where it flows under the M90 to where it enters Loch Leven SPA, Ramsar, SSSI and NNR. The protected interests of Loch Leven include eutrophic loch, overwintering geese, swans and waterfowl, and breeding ducks. As identified in the Scoping Report there is the potential for sediments from construction to enter Loch Leven SPA, Ramsar, SSSI and NNR. The loch is highly sensitive to nutrient enrichment, having suffered historically and more recently from algal blooms. During construction sediments must be prevented from entering the loch to ensure no net increase in nutrients from the proposal and no additional impacts on water clarity for example from any pollution events.	with Mitigation proposed in Section 16.5.1
25 March 2022	Scottish Water	There are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the proposed activity.	n/a
19 March 2022	Perth & Kinross Council	Scoping in water quality is appropriate due to the importance to all biodiversity interests. Also, as storm events increase in intensity it is essential that the main impacts on Loch Leven caused by increased erosion and runoff are addressed in tandem with hard protections.	Significant Impacts are addressed in Section 16.4 with Mitigation proposed in Section 16.5.

16.2.2 WFD Water Body Status / Potential

Table 16-3 details the water quality information for the South Queich, where a section of the Proposed Development is to be located, and Loch Leven, which is hydrologically linked, being located downstream of proposed works. The South Queich river water body has been designated as a heavily modified water body on account of modifications that cannot be fully addressed without a significant impact on the drainage of agricultural land.

The South Queich has had Poor status under the WFD since 2008 (pre-HMWB designation) and is classified as a heavily modified water body (HMWB) and therefore considered to have poor ecological

potential. The main driver for the poor ecological potential for the South Queich river is the fish status in the downstream River Leven (ID 6301) where there are a number of impassable barriers to fish migration. This has resulted in poor fish status in the South Queich River. All other contributing biological, physico-chemical, and hydrological elements have conditions which are consistent with at least good ecological status. The morphological conditions in the South Queich are also poor and cannot be addressed without impacting on the specified use for the waterbody, i.e., drainage which explains its designation as heavily modified. If the barriers to fish migration are addressed in the downstream River Leven then the South Queich river water body will achieve its objective of good ecological potential by 2027.

Loch Leven has had Poor overall status since 2011. The driving factor for its poor status classification is the nutrient conditions in the lake (Total Phosphorus) and the fish status, again the downstream barriers in the River Leven and an impassable barrier on the outlet of the Loch are prevent fish migration upstream affecting the ecological status.

It is important that the Proposed Development does not cause a deterioration in the current classification of these waterbodies. It is important to note that the Gelly Burn and Clash Burn are not considered under the WFD.

It should also be noted that there are no designated bathing waters nearby to the Proposed Development.

Table 16-3: WFD status of South Queich and Loch Leven

Perimeter	South Queich			Loch Leven		
	2008	2014	2020	2008	2014	2020
Overall Status	Poor	Poor	Poor Ecological Potential	Poor	Poor	Poor
Overall Ecology	Poor	Poor	Poor	Poor	Poor	Poor
Alien Species	-	-	-	Good	Good	Good
Hydromorphology	Good	Good	Poor	Good	Good	Good
Morphology	Good	Good	Poor	Good	Good	Good
Water Quality	-	Good	High	-	Moderate	Moderate

16.2.3 MImAS Assessment

A MImAS Assessment was carried out in 2021 using the guidance and methodology outlined in Sections 16.1.3 and 16.1.4, respectively. This section outlines the baseline conditions identified as part of this assessment. Volume III, Appendix O includes the full Assessment and should be referred to for further details.

For this assessment, a starting point is to establish the waterbodies that are impacted by the proposed development and their channel typology. The South Queich and the Gelly Burn were identified as being the impacted waterbodies due to the Proposed Development. Based on SEPA's database of channel types, it was established that both waterbodies were Type C channels. Type C channels are defined as plane-riffle (channels with poorly formed pools and riffles), braided and wandering channels. These channels have generally stable, well vegetated banks with a bed substrate mainly made up of cobbles and course gravels.

To establish supporting hydromorphological conditions, RPS consulted with SEPA's morphological team. The South Queich's morphological conditions are 0.55 (equating to 55%), which is consistent with 'Poor' ecological status (as shown in Table 16-2) as the baseline physical changes to the water body uses more than 50% of the water bodies' capacity to absorb engineering pressures. It should be noted that there was no information available on the supporting hydromorphological conditions of the Gelly Burn as it is not a monitored water body under the WFD monitoring programme.

Table 16-4: Morphological Condition Limits for 500m and Water Body Assessments

Zone	500m and Water Body Assessments			
	High/good	Good/moderate	Moderate/poor	Poor/bad
Channel	5%	25%	50%	75%
Banks and Riparian Zone	5%	25%	50%	75%

Establishing the existing morphological conditions of the South Queich and Gelly Burn involved 2 elements:

- Analysis of SEPA's Morphological Pressures Database (MPD); and
- Conducting of a MImAS Morphological Pressures Survey (MPS).

The MPD contains a series of GIS layers that show where morphological pressures are and what data SEPA holds about them. This information was used to establish the extent of physical changes to the channels that already exist. Figure 16-4 shows that the South Queich is heavily modified, with realignment along much of its course through South Kinross as well as bank reinforcement and embankments, especially downstream of High Street Bridge.

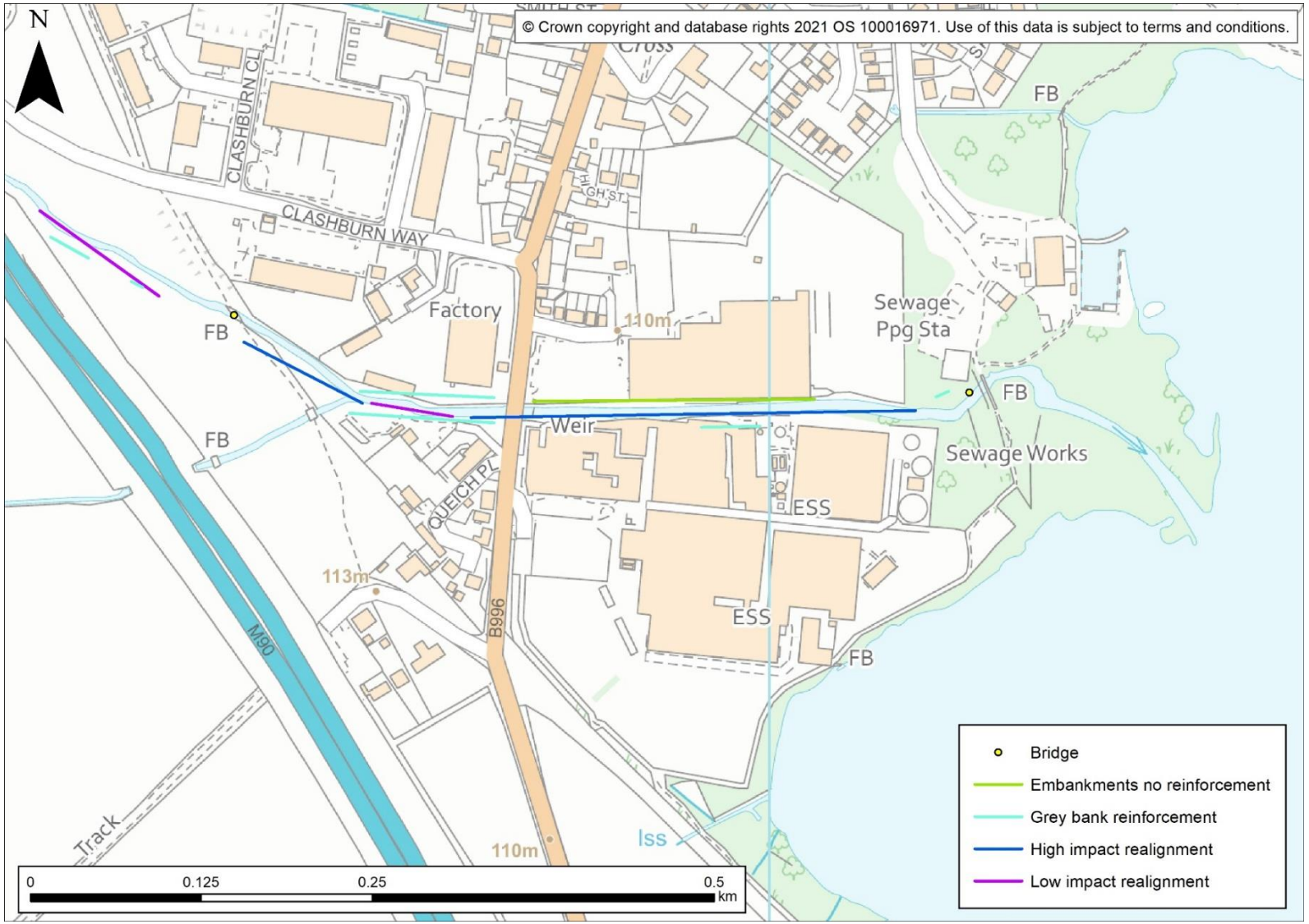


Figure 16-4: Morphological pressures included in the SEPA MPD for the South Kinross Area

The MPS was carried over two 500 m reaches of the South Queich channel. A smaller section of 200m was also surveyed on the Gelly Burn. The survey was undertaken as a desk-based study using information from previous walkover surveys (e.g., river hydromorphological assessment survey and other site walkovers), aerial imagery, photographs and information within the SEPA MPD database.

The findings of the MPS confirmed information available in the MPD, showing that the South Queich is heavily modified through South Kinross with floodplain land use primarily being suburban, with areas of broadleaf woodland in the lower reaches near Loch Leven and scrubland between the M90 motorway and High Street Bridge. Riparian vegetation structures for the South Queich range from complex in the lower reaches to simple upstream of High Street Bridge.

The Gelly Burn was found to be less heavily modified according to the MPS, with the only pressures identified being bridge abutments. Floodplain land use is mainly scrubland with some suburban areas and riparian vegetation is generally simple in structure.

The information gathered from the MPD and MPS was input into the MImAS tool for each affected waterbody. The outputs are summarised in Table 16-5 which also includes the Morphological Condition Limits (MCL). The existing supporting morphological conditions in the South Queich are already significantly impacted by existing pressures and the morphological status of the reaches assessed was found to be consistent with 'bad' status. The reach assessed for the Gelly Burn is less impacted and has morphological conditions consistent with 'moderate' status.

Table 16-5: Summary of MImAS assessment for existing pressures and existing morphological conditions for the local reach assessment

Water body affected (WFD Code)	Length of reach assessed (m)	Zone Classification based on	Highest Capacity Score %	Morphological status
South Queich (6302)	1,000	Channel	107	Bad
Gelly Burn	200	Channel	48	Moderate

The South Queich river is a HMWB. Waterbodies that are designated as heavily modified have a WFD environmental objective of Good Ecological Potential rather than Good Ecological Status. The designation means that a realistic objective is set that acknowledges that the water body has been physically altered for a specified use that society needs to be continued. The physical modifications caused by the use need to be mitigated against as far as possible, whilst acknowledging that the specified use needs to be retained.

Therefore, the designation of the South Queich as a HMWB means that mitigation measures have been identified under the programme of measures for the RBMP to address hydromorphological pressures as far is practical whilst still retaining the specified use of the water body, i.e. drainage of agricultural land. The Scotland RBMP has identified some barriers to fish migration in the downstream water bodies that are impacting on the fish status for the South Queich and these will be addressed through regulations by 2027. The physical modification to the bed, banks are the main reason for the HMWB designation and given that the other elements of ecological status in this water body are already achieving conditions indicative of good ecological

status the water body is already achieving its objective of good ecological potential and therefore there are no further mitigation measures planned beyond the measures to address the barriers to fish migration in the downstream River Leven (Loch Leven to Markinch).

16.3 Description of Likely Significant Effects

16.3.1 Construction Phase

Based on the nature of the works proposed, temporary impacts on water quality have the potential to occur during the construction phase of the works. The following have been considered in this assessment:

Suspended Sediments

Increased suspended sediment levels due to the accidental release of sediment to the water column during:

- Instream works associated with the construction of culverts, temporary and new bridge structures;
- Construction of flood defence structures; and
- Earthworks associated with embankment construction.

Suspended sediment, including all soils, sands and rubble is the single main pollutant to the aquatic environment generated at construction sites and largely arises from the erosion of exposed soils and sediments by surface water runoff. Both temporary and permanent impacts on surface waters may occur during construction. Pollution from mobilised suspended solids is the prime concern. Suspended sediment due to run off from stripped construction areas, stockpiled earth and the dewatering of excavations can have a severe negative impact on water quality. Once suspended sediment load enters a river it can result in long-term changes that cause chronic harm. Sediment can cause river hydromorphological changes, which in turn change the dynamics of the river in the future and can negatively impact on the supporting hydromorphological conditions and ecological status resulting in an increased risk to the environmental objectives of a water body.

Concrete and Cement Pollution

Accidental release of highly alkaline contaminants from concrete and cement during the construction of structures, etc. The construction works associated with the Preferred Scheme will involve the use of cement and concrete for construction of structures. During the construction phases, there is the potential for impact on the water quality and a toxic effect on the biological elements resulting in a possible further deterioration in the ecological status or compromise the improvement in ecological status through the implementation of the programme of measures included in the RBMP.

Fuel, Oil & Other Chemicals

General water quality impacts associated with works machinery, infrastructure and on-land operations including the temporary storage of construction materials, oils, fuels and chemicals.

16.3.2 Operational Phase

16.3.2.1 Improvements in Water Quality from Reductions in Flood Risk

The construction of defence structures within South Kinross has the potential to reduce the risk of flooding to 177 residential and non-residential properties. Reduced flooding in the town would also mean reduced potential for water contamination during flood events, particularly as the sewage treatment works currently flood in the present-day scenario.

It is also important to note that water quality may be impacted by runoff from flooding of Balado Poultry Farm, upstream of the Proposed Development. During operation of the Proposed Development, there is currently no measures in the design to protect this site from flooding and therefore it is likely that nitrates and phosphates will be washed into nearby fields, drains and watercourses. It is possible that chemicals from the poultry farm, may build up in fields behind the M90 storage embankment where water will be stored.

16.3.2.2 Channel Morphology

Based on the existing pressures described in Section 16.2.3 and the new activities associated with the Proposed Development, the capacity scores and predicted morphological status during the operational phase is presented Table 16-6.

At the local reach level, the Proposed Development is likely to have an impact on the morphological supporting conditions which are predicted to deteriorate from ‘moderate’ to ‘poor’ in the Gelly Burn. However, morphological supporting conditions in the South Queich River will remain unchanged given the high impact and low impact realignment of the existing channel within South Kinross, grey bank reinforcement upstream of High Street Bridge, embankments and grey bank reinforcement downstream of High Street Bridge. The preferred scheme, including the flood walls embankments, culvert upgrades and scour protection for the river banks upstream and downstream of High Street Bridge will not alter the morphological supporting conditions which will remain ‘bad’ at a local reach level. Given the designation of the South Queich as a HMWB due to the supporting hydromorphological conditions and assuming that the Proposed Development does not prevent the achievement of the other elements of biological status and supporting general conditions then the proposed development is not likely to impact on the achievement of the environmental objectives for this water body, i.e., good ecological potential.

Table 16-6: Summary of MImAS assessment during operation of Proposed Development and supporting morphological conditions for the local reach assessment

Water body affected (WFD Code)	Zone Classification based on	Highest Capacity Score %	Morphological status
South Queich (6302)	Channel	119	Bad
Gelly Burn	Channel	57	Poor

At the waterbody level, the Proposed Development is likely to use an additional 4% of bed capacity and an additional 5% of bank capacity on the South Queich River water body as a whole. This will increase the overall capacity used within the waterbody, increasing the overall capacity score for the South Queich from 55 to 59%. This means that the South Queich is not expected to deteriorate in morphological supporting conditions at a waterbody scale and therefore the Proposed Development will pass the Environmental Standards Test. Table 16-7 provides a summary of the cumulative assessment for the South Queich.

Table 16-7: Waterbody cumulative assessment

Water body affected (WFD Code)	Overall Status	Hydro-morphology	Morphology	Morphological condition % capacity used		Additional Capacity used by Proposed Development (%)		Predicted Morphological conditions % capacity used	
				Bed	Bank	Bed	Bank	Bed	Bank
South Queich (6302)	Poor ecological potential	Good ecological potential	Good ecological potential	55	36	4	5	59	41

16.3.2.3 Sediment loading to Loch Leven

There is a concern that the removal of floodplain storage through the construction of the hard defences will result in an increase in the sediment load to Loch Leven given that areas of the floodplain within South Kinross will no longer be connected to the South Queich River. The significance of this impact needs to be considered in the context of the additional storage that will be made available upstream of the town to compensate for the loss of floodplain connectivity in the town. An assessment of the net change in storage volumes is therefore required to determine whether additional sediment loading to Loch Leven is likely during flood events.

16.4 Significance of Effects

The significance of effects on water quality likely to occur due to the Proposed Development are determined using the predominantly qualitative process described below. The criteria for determining the significance of effects follows a two-stage process. The first step in the process is to determine the sensitivity of the receiving environment and then to define the magnitude of the potential impact. This section describes the criteria applied in this chapter to assign values to the receptor to assist in defining sensitivity of receptors and the magnitude of potential impacts.

Table 16-8: Sensitivity values and descriptors

Value (Sensitivity	Typical Descriptors
Very High	**Very high** importance and rarity, international scale and very limited potential for substitution. Examples: Water body protected area, interests are of international importance and are included on the WFD Register of Protected areas, having been designated under the Habitats, Birds, Shellfish, Bathing Water, Drinking Water or Nitrate Directives. High Status Water bodies
High	**High** importance and rarity, national scale, and limited potential for substitution. Examples: Water body where the current status is good or better, and no deterioration is permitted. National designation e.g., Sites of Special Scientific Interest (SSSI)
Medium	**High** or **medium** importance and rarity, regional scale, limited potential for substitution. Examples: Moderate Status with an objective of good status by 2027, regionally important resource in terms of ecology or fisheries interest
Low	**Low** or **medium** importance and rarity, local scale. Examples: Local potable water source supplying <50 homes. WFD Status Poor. Amenity site used by small numbers of local people
Negligible	Very low importance and rarity, local scale. Examples: WFD Status Bad, limited amenity value or fisheries interest

The magnitude of the impact has also been adapted from the generic methodology for environmental assessment outlined in the Design Manual for Roads and Bridges (2011) (Table 16-9). Impacts may be considered to have no affect or be negligible to major adverse or beneficial and their magnitude has necessarily been assessed on a qualitative basis.

Table 16-9: Magnitude of impact (type and scale of effect)

Magnitude	Type and scale of effect
Major	Major alteration to water body status causing deterioration in either the ecological status including supporting elements, i.e., physico-chemical, specific pollutants and hydromorphology, chemical status or protected area status. Severe damage to key water body characteristics, features or elements (Adverse). Large scale or major improvement to water body status, extensive restoration, or enhancement of water body (Beneficial).
Moderate	Water quality impact but not adversely affecting the integrity or status of the water body, partial loss or damage of certain characteristics or water body attributes (Adverse). Benefit to or addition of key characteristics or features of the water body, improvement in water status (Beneficial)
Minor	Some measurable change in water quality attributes, minor loss or alteration to one (maybe more) key characteristics (Adverse). Minor benefit to one or more key characteristics, features or elements of the water body (Beneficial)
Negligible	Very minor loss to water body characteristics, features or elements (Adverse). Very minor benefit to or positive addition of one or more water body characteristics, features or elements (Beneficial)
No change	No loss or alteration to water quality or water body status.

Applying the formula, the greater the environmental sensitivity or value of the receptor or resource, and the greater the magnitude of impact, the more significant the effect. The consequences of a highly valued environmental resource suffering a major detrimental impact would be a very significant adverse effect. Table 16-10 illustrates how the sensitivity of attributes was considered against the magnitude of impacts to determine the significance of potential impacts.

Given the downstream sensitivities associated with Loch Leven i.e., the SPA, ASSI and Ramsar Designations and the hydrological connectivity of the water bodies directly impacted with Loch Leven the sensitivity of the receiving environment has been assessed as High.

Table 16-10: Assessment of significant effects matrix

Sensitivity	Magnitude of Impact				
	No Change	Negligible	Minor	Moderate	Major
Negligible	No change	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	No change	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	No change	Negligible or Minor	Minor	Moderate	Moderate or Major
High	No change	Minor	Minor or Moderate	Moderate or Major	Major or Substantial
Very high	No change	Minor	Moderate or Major	Major or Substantial	Substantial

16.4.1 Construction Phase

16.4.1.1 Suspended Sediment

Suspended sediment, including all soils, sands and rubble is the single main pollutant to the aquatic environment generated at construction sites and largely arises from the erosion of exposed soils and sediments by surface water runoff. Both temporary and permanent impacts on surface waters may occur during construction. Pollution from mobilised suspended solids is the prime concern. Suspended sediment due to run off from stripped construction areas, stockpiled earth and the dewatering of excavations can have a severe negative impact on water quality. This is particularly true in sloping areas with underlying clay following topsoil stripping. In areas of moderate to high rainfall, the potential problems are clearly exacerbated. If allowed to enter surface watercourses this run off can give rise to high suspended solids and detrimental impacts, in particular to fisheries and aquatic invertebrates which can impact the ecological status of a water body. Suspended solids may have an effect on:

- Sediment movement through rivers and its settlement onto the riverbed causing formerly clean gravels to become clogged with fine sediment;
- The survival of fish eggs in gravel beds or spawning grounds as a result of deoxygenation caused by silt deposition;
- The survival of plants and algae by smothering;

- The survival of young fish and aquatic invertebrates such as mayfly larvae through gill damage from sediment particles; and
- Amenity value through impaired visual appearance.

Once suspended sediment load enters a river it can result in long-term changes that cause chronic harm. Sediment can cause river hydromorphological changes, which in turn change the dynamics of the river in the future and can negatively impact on the supporting hydromorphological conditions of the water bodies ecological status resulting in an increased risk of deterioration in status.

Both bed and suspended materials, and subsequent changes in channel form associated with changes in sediment supply, may affect benthic invertebrates in many ways at various stages in their life cycle. The direct kill is only the first stage in the damage that silt causes to a benthic invertebrate population. Sediment that infiltrates the riverbed decreases oxygen supply in interstitial areas and destroys habitat for juvenile stages of the many benthic invertebrate life cycles. This can impact on the ecological status of a water body by changing the nature of the invertebrate community to more tolerant species that would not be indicative of the reference conditions expected for a water body of the typology within the Scheme area.

The sediment subsequently provides a medium for macrophyte growth. Macrophytes can smother the river substrate and habitat further. It can trap more sediment which exacerbates the problem in the long term. Silt infiltration of riverbed gravels can also have a negative effect on fish species which can further impact on the biological elements of the WFD ecological status classification and could prevent the achievement of the environmental objectives for the water body.

Given the scale and nature of the works, the magnitude of the impact associated with sediment loading is considered to be **Major** (adverse). The significance of the environmental effect is therefore **Major**, in the absence of mitigation, based on the high sensitivity of the receiving environment.

16.4.1.2 Concrete and Cement Pollution

The construction works associated with the Proposed Development will include concrete structures. During the construction phase, there is the potential for accidental spillage of cement materials or during the setting of concrete which could have a significant adverse impact on water quality and a toxic effect on the biological elements resulting in a possible further deterioration in the ecological status or compromise the improvement in ecological status through the implementation of the programme of measures included in the River Basin Management Plan.

Given the scale and nature of the works, the magnitude of the impact associated with concrete and cement pollution is considered to be **Major** (adverse). The significance of the environmental effect is therefore **Major** in the absence of mitigation based on the extremely high sensitivity of the receiving environment.

16.4.1.3 Fuel, Oil & Other Chemicals

The construction works will involve the use of plant and machinery, as well as the associated temporary storage of construction materials, oils, fuels and chemicals. During the construction phase, there is the potential for accidental spillage or release of construction materials (e.g. diesel, oil, chemicals) which could have a significant adverse impact on water quality and a toxic effect on the biological elements resulting in a possible

further deterioration in the ecological status or compromise the improvement in ecological status through the implementation of the programme of measures included in the River Basin Management Plan.

Given the scale and nature of the works, the magnitude of the impact associated with fuels, oils and other chemicals is considered to be **Major** (adverse). The significance of the environmental effect is therefore **Major** in the absence of mitigation based on the extremely high sensitivity of the receiving environment.

16.4.2 Operational Phase

16.4.2.1 Improvements in Water Quality from Reductions in Flood Risk

Reduced flooding in an area with significant polluting sources in 0.5% AEP extent has a beneficial impact, particularly given the scheme will reduce the flood risk to the Scottish Water sewage treatment works for South Kinross. In addition, manufacturing industries for fuel storage tanks, conservatories, cashmere and numerous warehouses will be protected from flood risk post scheme reducing pollution risk from the facilities and protecting water quality in the South Queich River in particular.

While there will be the potential for nitrates and phosphates to be introduced to nearby fields drains and watercourses through the flood storage areas, this impact is not considered to be significant as the source of nutrient loading already exists in the baseline scenario and the areas behind the storage embankment will only be used during flood events and the introduction of phosphates and nitrates to these fields may actually provide a beneficial effect in that it may allow for nutrients, particular sediment bound nutrients, to be deposited in these field during the storage period, reducing the loading to downstream Loch Leven and providing additional nutrients for crop growth with reduced fertiliser application.

Given the scale and nature of the works, the magnitude of the impact associated with protection of properties which present a pollution risk is considered to be **Major** (beneficial). Furthermore, the potential for a reduction in nutrient loading to Loch Leven, due to floodplain storage, and possible reductions in fertiliser application in the storage areas is considered to be **Minor** (beneficial). The overall significance of the environmental effect is therefore **Major** (beneficial) based on the extremely high sensitivity of the receiving environment.

16.4.2.2 Channel Morphology

The EST for the Proposed Development has demonstrated that at the local reach level there is a risk of deterioration in morphological conditions for the Gelly Burn but this is not a water body reported under the WFD. The South Queich is not significantly impacted as it's morphological condition at the local reach level is already considered to be 'bad'. When the assessment is undertaken at the water body level the activities proposed will not use significant additional system capacity that will result in an increase in the risk of deterioration in status at a water body level. However, the Single Activity Limit (SAL) for the grey bank reinforcement proposed as part of the Proposed Development within the South Queich will exceed the threshold for this activity, although the existing realignment in South Kinross is already significantly impacting the hydromorphology of the river resulting in the exceedance of the SAL for this activity. This existing pressure is contributing to the designation of this water body as heavily modified. Therefore, the Proposed Development will pass the Environmental Standards Test.

Waterbodies that are designated as heavily modified have a WFD environmental objective of Good Ecological Potential rather than Good Ecological Status. The designation means that a realistic objective is set that acknowledges that the water body has been physically altered for a specified use that society needs to be continued. The physical modifications caused by the use need to be mitigated against as far as possible, whilst acknowledging that the specified use needs to be retained.

Therefore, the designation of the South Queich (6203) river water body as a HMWB means that mitigation measures have been applied under the programme of measures for the River Basin Management Plan to address hydromorphological pressures as far is practical whilst still retaining the specified use of the water body, i.e., drainage.

Scotland adopts the “Mitigation (Prague) Approach” in the establishment of good ecological potential, i.e., a mitigation measures-based approach used by many member states. Under this system a heavily modified waterbody is considered to be at Good Ecological Potential (GEP) when it has:

1. The relevant mitigation measures in place. The recommendation here is to use the UK TAG mitigation measures library for surface waters;
2. Achieved Good (or better) condition for the monitored biological quality elements (BQE) that are not sensitive to the hydromorphological modification;
3. Achieved the physico-chemical conditions equivalent to Good Ecological Status, except where parameters are impacted by the hydromorphological alteration caused by the specified use; and
4. Achieved the best state previously achieved since the modification for the monitored biological quality elements that are sensitive to the hydromorphological modification, where those data are available.

Whilst hydromorphological supporting conditions will be mitigated to the greatest extent possible through the application of mitigation measures, HMWBs will still be expected to meet the required standards for other water quality elements.

The South Queich river water body is achieving its objectives for the biological elements that are not sensitive to hydromorphological pressures, e.g., macroinvertebrates. In addition, it is currently achieving the physico-chemical conditions consistent with good ecological status. The main reason it is not achieving good ecological potential is therefore the barriers to fish migration in the downstream water bodies which are resulting in a knock-on effect in the South Queich resulting in an overall current WFD classification of Poor Ecological Potential. According to the Programme of Measures of the River Basin Management Plans, these impassable barriers are to be addressed by 2027 and therefore the environmental objective for this water body will be good ecological potential by 2027. SEPA and voluntary organisations working with businesses and local communities are identified as the organisations to address this.

Given the scale and nature of the works, the magnitude of the impact associated with the morphological impacts is considered to be **Negligible** given the outcome of the Environmental Standards Test. The significance of the environmental effect is therefore **Minor** in the absence of mitigation based on the extremely high sensitivity of the receiving environment, which is not significant in EIA terms.

16.4.2.3 Sediment Loading to Loch Leven

An assessment of the volume of storage removed through the construction of hard defences and a loss of floodplain connectivity in South Kinross has been undertaken. Flood Storage was calculated by comparing modelled flood extents from pre and post scheme scenarios. An ascii depth grid was created for the pre and post flood depths from Infoworks ICM. The pre and post flood grids were then subtracted in ArcGIS using raster calculator to produce a new grid providing the difference in flood depths across the scheme area. The grid was then clipped to areas of increased flooding from the scheme to quantify any increase in flooding as a result of the scheme. The grid showing difference in depth was then then converted to flood volume by multiplying by the area using the maximum depth reported for storage lost and minimum depth reported for storage added to be conservative.

The additional storage provided through the upstream storage and the increased depth of flooding at locations downstream of the proposed defences has been assessed for the design flood event (0.5% AEP) and is summarised in Table 16-11.

There will be additional flood storage provided upstream and within South Kinross in green spaces. A total of 15,912m^3 will be provided by the flood storage being generated as part of the scheme. The removal of floodplain connectivity through the construction of the hard defences will result in the displacement of flood volumes downstream of the defences in the green spaces at the end of the Clash Burn and around the Scottish Water assets (sewage treatment works). This will result in a total of 12,327m^3 of additional flood volume which will be routed to these locations, however it is anticipated that these displaced flood waters will result in increased flood depth at these locations rather than a channelisation of flows into Loch Leven.

When the additional storage provided upstream is compared against the displaced flood water downstream there will be a net increase in flood storage and therefore increased area to facilitate the settling out of sediment load before it reaches Loch Leven during flood events.

Table 16-11: Changes in overall flood volumes during the design event (0.5% AEP) at South Kinross

Location of flood risk change	Flood Volume Change m^3
Flood storage added at South Queich from embankment	+7,665
Flood storage provided upstream of Kinross Services	+8,247
Increase in flood volume downstream end of Clash Burn green space	-5,810
Increase in flood volume downstream of defences (South Queich green space around Scottish Water assets)	-6,517
Net Increase	**3,585**

Given the scale and nature of the works, the magnitude of the impact associated with the additional storage volume on the ability to reduce sediment loading to Loch Leven is assessed to be **Moderate** (beneficial). The significance of the environmental effect is therefore **Moderate** beneficial based on the extremely high sensitivity of the receiving environment.

16.5 Mitigation Measures

Mitigation measures will be adopted through the construction and operation phases of the Proposed Development to minimise the impact of the works on water quality.

In the absence of mitigation, the construction of some elements of the project has the potential to have **Major** (adverse) impacts on the aquatic environment.

During the operational stage of the development there are major beneficial impacts in that major sources of pollution e.g. sewage treatment works will be protected from flooding and the risk of the contamination of surface waters. There are also moderate beneficial effects from the additional storage provided through the FPS which will result in greater opportunity for sediment loads to be removed prior to the floodwaters reaching Loch Leaven. The operational impact associated with the supporting morphological conditions are considered to be of minor negative significance given that the South Queich River is already designated as a HMWB, and the reach is already significantly altered with embankments, grey reinforcement and realignment as identified in the Morphological Pressures Survey conducted as part of the MImAS assessment and SEPA's MPD.

With these considerations in mind, the risk to water quality posed by this project during construction and operation will be dependent on the good practice construction measures to ensure contaminants do not enter the watercourse. Therefore, it is pertinent to ensure that procedures are put in place for the control and minimisation of surface water and suspended solids movement, it is also important that measures are taken to ensure existing drainage pathways are kept free from construction sediment and pollutants through the use of effective barriers to pollutant export and best practice techniques to control these pressures at source.

For the operational stage impacts the assessment undertaken as part of this EIAR has established that the Proposed Development will pass the EST, and therefore the impact significance of the Proposed Development is assessed as being minor to negligible.

Section 16.5.1 and Section 16.5.2 detail the mitigation measure that will be employed on site during the project construction and operational phases.

16.5.1 Construction Phase Mitigation

16.5.1.1 Construction Phase Best Practice Measures

Mitigation measures will be implemented by the contractors who will construct the Proposed Development in accordance with the requirements listed within the CEMP. Furthermore, once appointed, the contractors will submit a detailed Construction Management Plan based on the requirements of these submitted planning documents for approval by the Planning Authority. The mitigation measures implemented by the contractor will refer to the construction management procedures for best practice regarding the following recognised international guidelines:

- Good practice guidelines on the control of water pollution from construction sites developed by the Construction Industry Research and Information Association (CIRIA, 2001);
- Control of Water Pollution from construction sites, Guidance for consultants and contractors (C532);

- Environmental Good Practice on Site (3rd edition) (C692);
- WAT-SG-23 Good Practice Guide – Bank Protection;
- WAT-SG-25: Good Practice Guide - River Crossings;
- WAT-SG-26: Good Practice Guide - Sediment Management; and
- WAT-SG-29: Good Practice Guide – Construction Methods.

It is important to note that, while a CAR licence is not strictly a mitigation measure, it is important that it is in place before construction begins on the Proposed Development.

16.5.1.2 Suspended Sediment

Preventing run-off is an effective method of preventing sediment pollution in the water environment. Therefore, adoption of appropriate erosion and sediment controls to manage run-off during construction is essential to prevent sediment pollution.

Mitigation measures to address the potential impact from suspended solids will be carried out in accordance with a site-specific CEMP. The measures will be employed prior to the commencement and during construction and will include such measures as:

- Where engineering works are to be carried out in or on the banks of rivers, burns, ditches, it will be necessary to isolate and de-water the work area to create dry working conditions. Isolation of the works area reduces the risk of contaminants entering the river or loch and this will be undertaken in accordance with the guidance provided in WAT-SG-29: Good Practice Guide – Construction Methods.
- Drainage and measures to control run-off will be employed to manage sediments prior to any works to be undertaken at the site, i.e., arrangements for the treatment of dirty groundwater ingress from any excavations will be in place in advance of the dewatering to ensure it can be adequately managed on site.
- The site shall be surveyed to identify all existing drainage features and waterbodies.
- Silt fencing will be installed around the perimeter of the site. The location of the silt fencing will be determined in the construction stage CEMP and will be subject to a detailed assessment of the area or phase to be developed. The purpose of the silt fencing is to prevent silt laden water leaving the site and entering neighbouring land with the potential to impact nearby watercourses.
- Drainage ditches may be cut to intercept surface water where there is a risk of significant water flow into excavations or on to adjoining lands.
- There will also be a requirement to periodically pump water from excavations. All collected and pumped water will have to be treated prior to discharge. The run-off will be directed through appropriately sized settlement ponds to remove suspended solids.
- Site personnel will be trained in the importance of preventing pollution and the mitigation measures described here to ensure same.

- The site manager will be responsible for the implementation of these measures. They will be inspected on at least a daily basis for the duration of the works, and a record of these inspections will be maintained.
- Any temporary storage of soil, hardcore, crushed concrete or similar material will be stored as far as possible from any surface water drains. There can be no direct pumping of silty water from the works directly to any watercourse. All water from excavations must be treated by infiltration over lands or via settlement areas, silt busters etc.
- There is a possibility that more severe flooding could occur during the construction period, emergency measures are therefore required. The following control measures will be required:
    - Silt fencing shall be placed above the 10-year flood level, and where that is not possible at the highest level possible within the site. Trapped silt shall be removed from silt fencing at regular intervals;
    - Settlement ponds shall be placed above the 10-year flood level; and
    - Stockpiles of soil shall be kept out of the 10-year flood plain. This will not be possible at the northern extent of the site additional measures will be incorporated at this location.
- Earthworks shall be exposed for the minimum time possible. Earthworks formations shall be protected by a layer of imported granular left fill.
- Landscaping and seeding of the perimeter embankments and retaining structures shall be carried out as early as possible.
- An Emergency Response plan shall be developed for the site to mitigate against stockpiles or exposed earth that are at risk from flood waters.
- Spillage and blow-off of debris, aggregates and fine material onto public roads will be reduced to a minimum by employing the following measures:
    - Vehicles delivering material with potential for dust emissions to an off-site location shall be enclosed or covered at all times to restrict the escape of dust;
    - Any hard surface site roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only;
    - A power washing facility or wheel cleaning facility will be installed near to the site compound for use by vehicles exiting the site when appropriate; and
    - Road sweepers will be employed to clean the site access route as required.

The incorporation of these mitigation measures during the construction phase means the potential impact to receiving water environment will be reduced to negligible thus reducing the significance of the environmental effect to imperceptible, based on the extremely high sensitivity of the receiving environment.

16.5.1.3 Fuel, Oil & Other Chemicals

The use of oils and chemicals on-site requires significant care and attention. The following procedures will be followed to reduce the potential risk from oils and chemicals:

- New metal jerry cans with proper pouring nozzles will be used to move fuel around the site for the purposes of refuelling items of small plant on site. Metal jerry cans and any other items of fuel containers will be stored in certified metal bunded cabinets.
- Drip trays will be used under items of small plant at all times. Any waste oils etc. contained in the drip trays or the bunded area will be emptied into a waste oil drum, which will be stored within the bund.
- Any gas bottles will be stored in a caged area at a secure location on the site. All will be properly secured at point of work.
- No bulk chemicals will be stored within the active construction areas. Temporary oil and fuel storage tanks may be kept in the material storage area in suitable containers and will be stored on appropriately bunded spill pallets as required. Any fuel and oil stored onsite shall be stored on bunded spill pallets approved under BS EN 1992-3:2006). All bunds will be impermeable and capable of retaining a volume of equal to or greater than 1.1 times (>10%) capacity of the containers stored on them. In the event of a filling spillage excess oil or fuel will be collected in the bund.
- Refuelling of vehicles and the addition of hydraulic oils or lubricants to vehicles will be undertaken offsite where possible. Where this is not possible, filling and maintenance will take place in a designated material storage compound, which is located at least 10 m from any temporary or permanent drainage features. Spill protection equipment such as absorbent mats, socks and sand will be available to be used in the event of an accidental release. Training will be given to appropriate site workers in how to manage a spill event. A certified double skinned metal fuel tank will be situated in this secure bunded area on the construction site if applicable. This tank will be certified for lifting when full.
- Spill protection equipment such as absorbent mats, socks and sand will be available to be used in the event of an accidental release during refuelling. Training will be given to appropriate site workers in how to manage a spill event. A hazardous bin will also be available to contain any spent sand or soak pads.
- Contingency Planning: A project specific Pollution Incident Response Plan will be prepared by the contractor and will refer to GPP 21 Pollution Incident Response Planning. The contractor's Environmental Manager will be notified in a timely manner of all incidents where there has been a breach in agreed environmental management procedures. Suitable training will be provided by the contractor to relevant personnel detailed within the Pollution Incident Response Plan to ensure that appropriate and timely actions is taken.

The following mitigation measures will be taken at the construction site in order to prevent any spillages to ground of fuels during machinery activities and prevent any resulting soil and/or groundwater quality impacts:

- Refuelling will be undertaken off site where possible.
- Where mobile fuel bowsers are used the following measures will be taken:

- Any flexible pipe, tap or valve will be fitted with a lock and will be secured when not in use;
- The pump or valve will be fitted with a lock and will be secured when not in use;
- All bowsers to carry a spill kit and operatives must have spill response training; and
- Portable generators or similar fuel containing equipment will be placed on suitable drip trays.

16.5.1.4 Concrete and Cement Pollution

The impacts in relation to cement and concrete for the Proposed Development are, for the most part (but not limited to) the installation of the concrete structures (to be poured in-situ). The principal risks are:

The use of concrete in close proximity to water bodies requires a great deal of care. Fresh concrete and cement are very alkaline and corrosive and can cause serious pollution in water bodies. It is essential to ensure that the use of wet concrete and cement in or close to any water course is carefully controlled so as to minimise the risk of any material entering the water, particularly from shuttered structures or the washing of equipment.

The following measures will be undertaken to mitigate against possible pollution:

- Where engineering works are to be carried out in or on the banks of rivers, burns, ditches, it will be necessary to isolate and de-water the work area to create dry working conditions. Isolation of the works area reduces the risk of contaminants entering the river or loch and this will be undertaken in accordance with the guidance provided in *WAT-SG-29: Good Practice Guide – Construction Methods*.
- A concrete washdown area will be provided on site for trucks to use after delivery of concrete or on return to the batching plant. This area will be adequately bunded to mitigate the risk of contaminated runoff discharge to the water bodies. Concrete trucks are to be washed down within the concrete truck washdown area after delivery of concrete, prior to exiting the site. Washdown runoff will be appropriately treated prior to discharge.
- Wash-out areas on site will be properly designed with an impermeable line to contain all cement laden water. No wash-out of ready-mix concrete vehicles shall be located within 10 m of any temporary or permanent drainage features. Signage shall be erected to clearly identify the wash-out areas. Sufficient wash-out areas shall be provided to cater for all vehicles at peak delivery times.
- On-site batching of concrete is not envisaged, but ready to use mortar silos are often used. These systems involve the delivery and storage of dry cement and aggregates in silos, water is added at the point of delivery to make mortar or plaster. The following controls shall be put in place for the on-site batching of concrete, mortar and render:
    - The plant shall be maintained in good condition;
    - Delivery of cement shall be means of a sealed system to prevent escape of cement;
    - The plant shall be situated on a paved area at least 20m from any temporary or permanent drainage features; and
    - Emergency procedures shall be in place to deal with accidental spillages of cement or mortar.

In circumstances where the mitigation measures are employed during construction operations, the potential impact to receiving water environment will be reduced to negligible thus reducing the significance of environmental effect to imperceptible.

16.5.2 Operational Phase Mitigation

16.5.2.1 Sediment Loading to Loch Leven

The potential risk of additional sediment loading to Loch Leven from the construction of the hard defences in South Kinross resulting in a loss of floodplain connectivity and therefore the potential for suspended sediment in flood waters to settle out during floodplain storage has been mitigated through design.

The creation of a storage area upstream of the M90 and further storage embankments between the M90 and the South Queich will ensure that a net gain in floodplain storage is achieved. This will result in a beneficial impact in that additional storage will be available providing greater opportunity for sediment load to settle out of suspension during storage.

16.5.2.2 Channel Morphology

For the operational stage impacts the assessment undertaken as part of this EIAR has established that the Proposed Development will pass the EST, notwithstanding this the application of best practice will be followed, specifically an assessment in accordance with Regulatory Method WAT-RM-02: Regulation of licence-level engineering activities, (SEPA, 2020) will be undertaken to allow the full technical assessment required for the licence application under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended).

16.5.3 Future Monitoring

16.5.3.1 Construction Phase

The CEMP will also have procedures for monitoring the performance and effectiveness of mitigation measures employed during construction to ensure they are operating as intended and are providing the necessary protection to the receiving environment.

Regular checks will be carried out to ensure surface water drains are not blocked by silt, or other items, and that all storage is located at least 10m from surface water receptors. A regular log of inspections will be maintained, and any significant blockage or spill incidents will be recorded for root cause investigation purposes and updating procedures to ensure incidents do not reoccur.

16.5.3.2 Operational Phase

During the operational phase of the Proposed Development, it is not anticipated that monitoring will be required other than the routine maintenance monitoring that will be required to assess the integrity of the defences and to ensure the SoP is being achieved.

16.6 Residual Impacts

Where the appropriate mitigation measures are fully implemented during the construction and operational phases of the Proposed Development as outlined in the previous sections, the impact of the project on the water quality in the area will be negligible.

Accordingly, the Proposed Development will not have a significant effect on the water quality of the receiving waters. It can therefore be concluded that the Proposed Development are compliant with the requirements and environmental objectives of the Water Framework Directive and the other relevant water quality objectives for these water bodies.

16.7 Potential Cumulative Effects

16.7.1 Assessment of Cumulative Effects

The EIA Directive 2014/52/EU specifies at Annex III that "the likely significant effects of projects on the environment must be considered […] taking into account [inter alia] the cumulation of the impact with the impact of other existing and/or approved projects"; and at Annex IV that "a description of the likely significant effects of the project on the environment resulting from, inter alia […] the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources" is required.

A desk study involving general internet searches and PKC planning website have been undertaken to identify other projects which could act cumulatively with the Proposed Development.

The following guidelines and publications were considered when determining the other projects to be considered for their potential to generate cumulative effects with the Proposed Development:

- Scottish Natural Heritage Environmental Impact Assessment Handbook (v5) (2018);
- Scottish Government Planning Circular 1/2017: Environmental Impact Assessment Regulations (2017);
- The Planning Inspectorate Advice Note 17: Cumulative Effects Assessment (2015); and
- European Commission (EC) Guidelines for the Assessment of Indirect and Cumulative Impacts (1999).

There are no projects identified in Chapter 18 that are expected to have a significant cumulative impact on water quality when considered alongside the Proposed Development. This is due to their small scale, lack of temporal overlap with the Proposed Development and the fact that none of the projects involve working on or in close proximity to watercourses.

16.7.2 Inter-Relationships

The impact assessment also considers the inter-relationship of impacts on individual receptors. Inter-relationships are considered to be the impacts and associated effects of different aspects of the proposal on the same receptor.

The inter-relationship between Biodiversity – Aquatic (see Chapter 8), Soils, Geology, Hydrogeology & Contamination (see Chapter 13) or Flood Risk (see Chapter 15) and the potential for impact on water quality has been assessed. Given that the proposed mitigation there is unlikely to be any significant inter-related impact to water quality.

16.8 Conclusions

The impact of the Proposed Development has been assessed based on the existing baseline derived from the WFD Monitoring programme, Scotland River basin Management Plan 2021 – 2027, SEPA's MPD and MPS undertaken to inform the EST.

The baseline for the South Queich River is already significantly impacted and at a reach level is indicative of bad supporting morphological conditions. The Proposed Development will not significantly impact the morphological conditions given the existing realigned channel, grey bank reinforcement and embankments along the South Queich River. When assessed at the water body scale the Proposed Development will use some additional morphological capacity, but this is not significant as it will not result in a deterioration in the morphological condition, which is currently assessed to be moderate based on the MPS undertaken as part of the project.

Construction and operational impacts have been assessed, the significance of the impact during construction is considered to be potentially **Majo**r in the absence of mitigation whilst the operational impacts are considered to be minor negative to major beneficial particularly in the context of the avoidance of flooding of potentially significant pollution sources.

Mitigation has been recommended for both the construction and operational stages which will ensure that the residual impact is **Negligible** to **Minor** which is not significant in EIA terms.

17 SUMMARY OF MITIGATION MEASURES

This EIAR assesses the likely significant impacts arising from the Proposed Development. Where required, mitigation measures are identified and described within individual topic chapters. These are measures which could avoid, prevent, reduce and, where possible, offset likely significant adverse effects upon the environment.

Table 17-1 summarises the mitigation measures and monitoring recommended within the EIAR.

Table 17-1: Summary of proposed mitigation measures per individual topic chapter

Potential Effects	Summary of Proposed Mitigation
CHAPTER 6: Air Quality	
Dust deposition Visible dust plumes Elevated PM_{10} concentrations as a result of dust generating activities on site Increase in concentrations of airborne particles and nitrogen dioxide due to exhaust emissions from diesel powered vehicles and equipment used on site and vehicles accessing the site Release of heavy metals, asbestos fibres or other pollutants during the demolition of certain buildings, or the removal of contaminated soils Emissions of construction generated GHG will arise from embodied emissions in site materials, direct emissions from plant machinery/equipment as well as emissions vehicles delivering material and personnel to the construction site	• A dust and emissions management plan shall be developed for construction phase dust control and mitigation measures to be employed by the construction contractor. The series of mitigation and control measures will help prevent significant air quality and dust impacts during the construction phase. • The IAQM guidance outlines a number of mitigation measures for reducing impacts of fugitive dust from construction sites. Adoption of a number of these measures at the project site will reduce dust impacts to both personnel working at the site and off-site receptors. • With respect to communications, the following will be implemented: - Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary; and - Appropriate training will be provided to all staff to ensure that they are aware of and understand the dust control and other environmental control measures. • With respect to site management, the following will be implemented: - Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken; - Make the complaints record available to the relevant regulatory authorities when asked; - Record any exceptional incidents that cause dust and/ or air emissions, either on or offsite, and the action taken to resolve the situation in an environmental log book; - Avoid site runoff of water or mud; - Use covered skips; and - No bonfires and burning of waste materials on site. • With respect to earthworks, the following will be implemented: - Minimise drop heights from loading or handling equipment/ materials; and - Methods and equipment will be in place for immediate clean-up of spillages of dusty or potentially dusty materials. • With respect to construction, the following will be implemented: - Ensure bulk cement and other fine powder materials are delivered in enclosed; - For smaller supplies of fine power materials will be ensured that bags are sealed after use and stored appropriately to prevent dust; and

Potential Effects	Summary of Proposed Mitigation
	- Cleaning of hard stand areas by personnel only or if required mechanical road sweepers (with water suppressant fitted) to clean any site hard stand area. • As with any construction site, there are associated vehicle movement, emissions and plant use. With respect to vehicle movement and vehicle emissions, the following will be implemented: - Transportation of aggregates and fine materials will be conducted in enclosed or sheeted vehicles; - Ensure all vehicles switch off engines when stationary and not in immediate use - no idling vehicles (emissions to air controlled); - All plant utilised should be inspected weekly (emissions to air controlled); - Visual monitoring of plant will include ensuring no black smoke is emitted other than during ignition (emissions to air controlled); - Ensuring exhaust emissions are maintained to comply with the appropriate manufacturers' limits (emissions to air controlled); and - Vehicle exhausts will be directed away from the ground and other surfaces and preferably upwards to avoid road dust being re-suspended to the air.
CHAPTER 7: Biodiversity – Ornithology	
Likelihood that some waterfowl foraging habitat will be lost due to the Proposed Development during the construction phase Pathway for contamination to Loch Leven SPA during the construction phase due to accidental release of pollutants during the construction phase There will be a loss of a portion of low ecological value arable field to the north of the Proposed Development, which may reduce foraging grounds for over-wintering geese during the construction phase If the works take place over winter, there is potential for disturbance of birds from fields around the works, resulting in a loss of foraging habitat, within the foraging range of pink footed geese	• A Construction Environmental Management Plan CEMP will be produced to detail good practice measures relating to all elements of construction. The CEMP would also detail measures undertaken to conduct best working practices in relation to disturbance. • A Traffic Disturbance Plan (TDP) would also be produced. • Appointment of an Ecological Clerk of Works (ECoW) to oversee key elements of enabling works and construction. • Pre-construction checks for bird roosts should therefore be undertaken before construction begins. • Surveys will be undertaken within three months prior to commencement of the works in order to obtain as accurate a representation of the baseline conditions as possible. • A minimum 50m buffer will be maintained, where possible, between working areas, machinery and watercourses and ditches • Timing of works to avoid bird breeding periods when the risk of disturbance is significantly increased. • Timing of works to avoid periods when the risk of disturbance to overwintering wildfowl is significantly increased. Construction in the fields to the north should occur during summer months when pink-footed geese would have migrated. • Pollution incident response and drainage management measures will be prepared as a part of the CEMP.

Potential Effects	Summary of Proposed Mitigation
There is the potential for pollution incidents to occur during maintenance activities within the operational period of the Proposed Development	• Best practice measures for minimising the potential for disturbance and injury to protected species will be employed and detailed in the CEMP. These will include: (1) Directional lighting when required; (2) Vehicle speed limit restrictions to minimise risk of collision with birds; and (3) Checks for nesting birds by an experienced ecologist no more than 24 hours prior to any vegetation clearance being carried out (only applicable between March and August). • Vehicles coming on site for maintenance works would be regularly checked for oil leaks to avoid risk of pollution. • Spillage kits will be provided.
During the operational phase of the Proposed Development there is the potential for disturbance to protected species (birds) through human presence on the site during maintenance activities and the operation of the plant	
CHAPTER 8: Biodiversity – Terrestrial & Aquatic	
Likelihood that some waterfowl foraging habitat will be lost due to the Proposed Development during the construction phase	• A Construction Environmental Management Plan (CEMP) will be produced to detail good practice measures relating to all elements of construction. The CEMP will also detail measures undertaken to conduct best working practices in relation to working within watercourses • Pre-construction checks for otter, badger, red squirrel and bat roosts should be undertaken before construction begins. • Surveys will be undertaken within three months prior to commencement of the works in order to obtain as accurate a representation of the baseline conditions as possible • Application of SEPA Pollution Prevention Guidance (PPGs) and the delimitation of working areas to minimise damage to habitats; • A minimum 50m buffer will be maintained, where possible, between working areas, machinery and watercourses and ditches; • Pollution prevention measures will be installed and maintained as appropriate, including sediment and dust mitigation measures; • Chemicals, oils and hazardous materials will be stored in designated areas securely at a minimum distance of 50 m from the watercourses; • Spillage contingency kits will be provided in all site vehicles and there will be daily checks for oil and fuel leaks; • Application of best practice techniques of construction to ensure that drainage patterns and water quality within the study area are maintained; and • Timing of works to avoid periods of heavy rain when the risk of fine sediment being transported from earth works is significantly increased.
Pathway for contamination to Loch Leven SPA during the construction phase due to accidental release of pollutants during the construction phase	
There may be a loss of a portion of low ecological value arable field to the north of the development, which may reduce foraging grounds for over-wintering geese during the construction phase	
Total direct habitat loss as a Result of the Proposed Development is approximately 1ha	
Temporary habitat loss during construction (e.g. construction compounds, temporary access tracks and buffers) totals approximately 3.95ha	
Construction activities could lead to an increase in ground disturbance, sediment scour and surface water runoff from the works area. This has the potential to increase sediment in the	

Potential Effects	Summary of Proposed Mitigation
Clash Burn, South Queich river and ultimately Loch Leven. There is the potential for pollution incidents to occur during maintenance activities within the operational period of the Proposed Development During the operational phase of the Proposed Development there is the potential for disturbance to protected species through human presence on the site during maintenance activities and the operation of plant.	• Pollution incident response and drainage management measures will be prepared as a part of the CEMP. • Prior to creating a dry working area in any watercourse, a fish rescue will be undertaken to remove any fish present in the area to be de-watered. These fish will be released in suitable habitat elsewhere in the watercourse. • Fish passage should be maintained in any watercourses where a dry working area is required. • Appointment of an Ecological Clerk of Works (ECoW) to oversee key elements of enabling works and construction. • Best practice measures for minimising the potential for disturbance and injury to protected species will be employed and detailed in the CEMP. These will include: (1) Directional lighting when required; (2) Covering all trenches, trial pits, excavation and pipeline; (3) Provision of a method of escape where such excavations cannot be closed or filled on a nightly basis; (4) Vehicle speed restrictions to minimise risk of collision with animals; and (5) piles will be installed using EITHER a Giken Silent Press (vibration free thus reducing disturbance) OR, traditional piling. If traditional piling is used, noise and vibration may lead to disturbance to protected species. Pre-construction surveys will inform any required disturbance buffers. Where traditional piling is unavoidable within these buffers, a derogation licence will be required from NatureScot. • Vehicles coming on site for maintenance works would be regularly checked for oil leaks to avoid risk of pollution. • Spillage kits will be provided. • Traffic calming measures will be incorporated onto any access roads within the new development. • Post-construction management of trees and shrubs will be undertaken outside of the bird nesting season (i.e., works to be undertaken between November and February inclusive)
CHAPTER 9: Cultural Heritage & Archaeology	
Removal or disturbance of unrecorded archaeological artifacts would result in the loss of archaeological interest and cultural significance	• No mitigation is recommended for the construction or operational phase of the Proposed Development
CHAPTER 10: Landscape & Visual	
Landscape Character Area impacts on Lowland Basins (LCT 390) during the construction phase Landscape Character Area impacts on Lowland Basins (LCT 390) during the operational phase	• Clearance and demolition work at each of the identified sections of the Proposed Development and subsequent construction works will be restricted to land within the site boundary. • It is proposed to provide a soft landscape scheme within the site boundary associated with the South Queich river hard defences that includes landscape treatments to the riverbanks which will include new tree, shrub and other

Potential Effects	Summary of Proposed Mitigation
Townscape impacts on Kinross Townscape	planting, primarily of locally appropriate, native species with the aim of using nature-based solutions in the design and the use of low maintenance native tree species. • A landscape management plan will be prepared to ensure the healthy establishment of all trees within the proposed development and the replacement of any dead or dying plants in subsequent years.
CHAPTER 11: Material Assets & Land Use	
There are likely to be construction phase impacts on access to commercial, industrial and residential premises	• By design, the Proposed Development aims to avoid clashes with utilities where possible and reduce the number of roads, properties, businesses, services and community facilities. • Culverts under roads and accompanying manholes will aim to avoid infrastructure wherever it is possible. • Where required, utilities will be re-routed to avoid any interruptions in gas, water, electricity and telecommunications supplies. • Works will also be timed in order to have as small an impact on traffic and transport across Kinross and beyond. Where disruption is unavoidable, traffic, including any affected bus routes, will be temporarily re-routed to avoid construction areas. • All those working to expose services will be competent to do so and be fully trained on the use of detection tools, safe excavation techniques and have an understanding of the risk to safety from damaging services. • All excavation work will follow safe digging practices. • Any mechanical excavation will be carefully planned to avoid any damage to services and reduce health and safety risks to drivers and operators. • There will be careful selection of tools and plant at different sections to excavate safely and avoid damage to services. • Identification of each of the exposed services will also take place and a marking system will be developed and agreed to help all working on site to understand which service is which. Markings on the ground will be done with paint, stakes, pins or posts. • Any required excavations will be properly supported, stepped or battered back to prevent them collapsing during construction. • Edge protection, fencing and coverings will also be provided where necessary to prevent anyone falling into the excavation. Furthermore, steps to prevent excavated material falling into the excavation will be taken. • Backfilling of any excavation will be done carefully to ensure that services are not damaged. Warning tiles, tape etc. will be returned to their original positions above the services.
Construction phase impacts are expected on access to public footpaths	
There are likely to be impacts due to temporary road closures for culvert upgrades	
Construction phase impacts are expected on bus (stops and routes) transport across Kinross and the wider area	
There may also be temporary road closures for construction of flood walls and embankments	
There may also be some disruption to traffic across wider areas of Kinross as construction traffic will require access to a number of roads	
Construction phase impacts to some low and medium pressure gas mains	
Construction phase impacts to some low voltage electricity lines	
Construction phase impacts to some telecommunications infrastructure	

Potential Effects	Summary of Proposed Mitigation
Construction phase impacts to water mains and sewers. Pipes may have to be re-routed permanently in some areas to avoid culvert upgrades	• If the plans or other information provided are inaccurate, or if the Proposed Development changes the path or depth of a service, the service owners /operators should be informed so they can update their records accordingly. • A permit-to-work system is recommended. This is a formal recorded process used to control work that is identified as potentially hazardous and provides a means of communication between managers, supervisors and operatives.
Indirect construction phase impacts on services (e.g. police, fire and healthcare) due to road closures and traffic management measures.	
CHAPTER 12: Noise & Vibration	
During the construction phase, there is limited possibility of the 65dB BS5228 noise guideline limit being exceeded for works at the South Queich/ Gelly Burn	• The contractor will implement a programme of noise management measures that will include engagement with the community on the activities that need to be carried out, the timing and duration of such activities, commitment to specific hours of work and the use of quiet work methods such as the selection of low-noise plant and operating methods. PKC and potentially affected residents will be kept informed of the works to be carried out and of any proposals for work outside normal hours. • A Construction Environmental Management Plan (CEMP) will be put in place to ensure that the appropriate environmental measures and monitoring are in place during the construction phase. This will be an iterative document and will be revised and updated throughout the construction phase as construction works evolve. • The use of noise mitigation measures will be determined based on the precise nature of the activities and use of plant/equipment in each area as detailed in the Method Statement. Method Statements will include measures taken to limit noisy activities in the vicinity of adjacent residential properties. • Noise monitoring will be completed at the nearest properties to the works in each of these sensitive areas to ensure that the 65dB BS5228 limit is not exceeded. • Where there is potential for the 65dB BS5228 limit to be exceeded, temporary noise barriers will be deployed to attenuate noise levels at the nearest noise sensitive properties. • Ensuring that mechanical plant and equipment used for the purpose of the works are fitted with effective exhaust silencers and are maintained in good working order. • Careful selection of quiet plant and machinery to undertake the required work where available. • Machines in intermittent use will be shut down in the intervening periods between work. • Ancillary plant such as generators, compressors and pumps will be placed behind existing physical barriers, and the direction of noise emissions from plant including exhausts or engines will be placed away from sensitive locations, in order to cause minimum noise disturbance. Where possible, in potentially sensitive areas, temporary construction barriers or enclosures will be utilised around noisy plant and equipment.
Construction activities will take place in relative close proximity to properties at Queich Place and Old Cleish Road and there is potential for the 65dB BS5228 guideline limit to be exceeded at some of these properties due to construction works at the South Queich	
During the construction phase, there is potential for the 65dB BS5228 guideline limit to be exceeded at some of the properties at Hopefield Place/ Levenbridge Place/ Montgomery Way due to works for culvert upgrades at Hopefield Place	
During the construction phase, there is potential for the 65dB BS5228 guideline limit to be exceeded at some of the properties at Levenbridge Place/ Montgomery Way due to works for diversion culvert at Clash Burn	
During the construction phase, there is potential for the 65dB BS5228 guideline limit to be exceeded at some of the properties at Myre	

Potential Effects	Summary of Proposed Mitigation
Terrace/ Smith Street/ Montgomery Street due to works on the bund in The Myre playing fields	• Handling of all materials will take place in a manner which minimises noise emissions. • Audible warning systems will be switched to the minimum setting required by the Health & Safety Executive. • It is proposed that standard construction working hours will apply as follows: - Monday to Friday: 08:00 to 19:00; - No activities will take place on site on Weekends and Bank Holidays; and - Deviation from these times will only be allowed in exceptional circumstances where prior written approval has been received from PKC. • Where piling activities take place in relative close proximity to buildings, details will be included within the respective Method Statement to limit and measure vibration levels affecting these buildings. For residential properties, monitoring will be completed to ensure that the relevant vibration guideline limits are not exceeded. For commercial buildings, monitoring will be completed to ensure that the limits for structural damage are adhered to.
During the construction phase, there is potential for the 65dB BS5228 guideline limit to be exceeded at some of the properties at Smith Street/ High Street/ Sandport/ Nan Walker Wynd/ Sandport Close due to works for the diversion culvert for Clash Burn in the Vicinity of Smith Street	
During the construction phase, there is potential for the 65dB BS5228 guideline limit to be exceeded at these properties at properties that are being recommended Property Level Resilience. This will depend on the exact nature of the measures being implemented	
The exact location of piling activities is not known in detail at this stage. Therefore, during the construction phase there may be vibration impacts to properties nearby piling activities in the vicinity of the South Queich/ Gelly Burn	
CHAPTER 13: Soils, Geology, Hydrogeology & Contamination	
Construction impacts may include noise, dust, odour and site traffic generation problems as well as potential contamination issues arising with the use of fuel storage tanks, vehicles and the use of paints and oils.	• At least 300mm of screened topsoil will be imported to the site and a geotextile membrane is proposed which will provide mitigation against human health exposure.
CHAPTER 14: Waste	
Waste materials will be generated as a result of the proposed demolition of unused buildings at BCA and parts of the Todd and Duncan site to facilitate access for construction.	• Design principles - Minimise waste material during the construction phase by ‘designing out waste’ by reusing topsoil and excavated material where possible during the construction phase. - Materials that cannot be reused onsite will be recycled or recovered offsite where possible.
The proposed buildings to be demolished were constructed before 2000 and therefore may	

Potential Effects	Summary of Proposed Mitigation
contain hazardous substances such as Asbestos Containing Materials (ACMs).	- The main FPS structural elements have been designed for a minimum working life of 100 years with maintenance activities included. • Duty of Care - Contractors working on site during the works will have a duty of care and be responsible for the collection, control and disposal of all wastes generated by their works. - Perth and Kinross Council and their appointed contractor will ensure that all waste materials leaving the site will be transported via a registered and licensed carrier and disposed or recovered at a licensed/permitted site in accordance with national waste legislation. • Site Waste Management Plan (SWMP) - The SWMP will contain procedures for the management of waste and assist with providing a complete audit trail. - The SWMP will be a live document and will be subject to revision throughout the course of the construction phase. - The SWMP will: 1) Include specific details on the projected waste types and subsequent management; 2) Identify and capture the decisions made in the design process to reduce waste generation; 3) Identify the methodologies for waste management at each stage of the project; 4) Identify how the waste will be dealt with; and 5) Identify potential markets e.g., reuse, recycling facilities, waste treatment facilities and disposal sites. - The SWMP will specify procedures for: 1) On-site segregation of waste at source where practical; 2) On-site segregation of waste materials into appropriate categories; 3) On-site segregation of non-hazardous waste materials into appropriate categories (e.g., metals, timber etc.); and 4) On-site segregation of any hazardous waste materials into appropriate categories (e.g., contaminated soils, waste oil and fuels and paints, glues, adhesives etc.) - The SWMP will additionally specify: 1) Measures to ensure monitoring and updating of records under Duty of Care requirement; 2) Measures to avoid over-ordering and generation of surplus waste materials; 3) Measures to ensure appropriate staff training and levels of awareness in relation to waste management;
Waste will arise from site clearance including the removal of tarmac surfaces, boundary fences and vegetation clearance to establish a working strip to facilitate the construction of flood defences and site traffic movement	
Invasive non-native plant species are present on some of the lands to be cleared and clearance of this land without the proper measures in place has the potential to cause the spread of invasive non-native plant species	
Construction waste can also include waste materials generated as a result of excavations, typically consisting of materials, for example, soil and made ground removed as a function of design to create trenches for culverts, flood wall construction and flood embankment construction	
Two vegetated stockpiles in the southwestern corner of a former car park located between Gelly Burn tributary and Old Cleish Road which appear to comprise construction and demolition material will need to be removed in order to facilitate the construction of the flood wall	

Potential Effects	Summary of Proposed Mitigation
	4) Measures and procedures to monitor waste flows on site; 5) Steps to be taken with materials suppliers to reduce the amount of packaging or to participate in a packaging take-back scheme; 6) Implement a 'just in time' materials delivery system to avoid stockpiling of materials, which increases the risk of the damage and disposal as waste; and 7) All waste materials will be stored in skips or other suitable receptacles in designated areas of the site. The waste storage area(s) will be assigned, and all construction staff provided with training regarding the waste management procedures on commencement of the project. • Construction Environmental Management Plan - A CEMP will be prepared by the appointed contractor after Contract Award which should contain measures and procedures for the management of construction waste. - Contractors will be contractually obligated to comply with the requirements of the CEMP and should be adhered to by all parties with any involvement in construction, including main contractors, sub-contractors and visitors to the site. - The CEMP will address specific waste management requirements: 1) Identifying how waste will be dealt with 2) All waste leaving site will be recycled, removed or reused where possible, with the exception of those waste streams for which appropriate facilities are not currently available. On-site segregation of non-hazardous waste materials into appropriate categories; 3) Control measures and attention to materials quantity requirements to avoid over-ordering and generation of waste materials; 4) Implement a 'just in time' materials delivery system to avoid materials being stockpiled, which increases the risk of damage and the disposal as waste; 5) All waste materials will be stored in skips or other suitable receptacles in designated storage areas within compounds. The waste storage area(s) will be assigned, and all construction staff provided with training regarding the waste management procedures on commencement of the project; 6) Ensure appropriate staff training and levels of awareness in relation to waste management; 7) Waste streams will be collected by an appropriately licenced and permitted private waste contractor, appointed by the contractor for recycling, recovery or disposal at suitably licenced facilities; 8) Monitoring and updating of records under Duty of Care requirements; 9) Sewage effluent from the temporary site compound will be removed using a vacuum tanker by a suitable licenced waste contractor.

Potential Effects	Summary of Proposed Mitigation
	• Construction Phase Monitoring - Records will be kept for each waste material which leaves the site, whether for reuse on another site, recovery, recycling or disposal. - A system will be put in place to record the waste arising on site during the construction phases. - The following should be recorded: 1) Waste taken off-site for reuse; 2) Waste taken off-site for recovery; 3) Waste taken off-site for recycling; and 4) Waste taken off-site for disposal. - For each movement of waste off-site a signed waste collection docket will be obtained from the contractor. This will be carried out for each material type. This system will also be linked with the delivery records. A signed waste acceptance docket will be issued for each movement of waste on-site. - If waste movements are not accounted for, the reasons for this shall be established in order to see if and why the record keeping system has not been maintained. Each material type will be examined in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved. - The contractor will be responsible for conducting an audit of the waste practices at the site during the construction phase of the development. - Upon completion of the construction phase, a final report will be prepared summarising the outcomes of waste management processes adopted and the total recycling/reuse/recovery figures for the Proposed Development.
CHAPTER 15: Flood Risk, Hydrology & Drainage	
As the construction works will be in the vicinity of watercourses, there is a risk of flooding to the works from extreme events. Impacts would include flooding of the site compound, flooding of plant and machinery, and a risk to construction workers	• Use of SEPA's Floodline service which provides live flooding information and advice on how to prepare for or cope with the impacts of flooding 24 hours a day, 7 days a week. The contractor can sign up to the service and get notified when the area is at risk of flooding. • Use of the Scottish Flood Forecast which produced by the Scottish Flood Forecasting Service (SFFS) daily. The SFFS is a partnership between SEPA and the Met Office. It is available on SEPA's website. The Scottish Flood Forecast complements the existing regional flood alerting and local flood warning services. • It is proposed that the footbridge is replaced, and the culvert extended to act as the footbridge to maintain consistent flow capacity. • It is recommended that signage is adopted in the area around flood walls and embankments along the South Queich to inform of the potential risk during extreme rainfall events.

Potential Effects	Summary of Proposed Mitigation
	• To manage surface water flood risk behind the new flood walls, back drainage will be constructed behind defences to capture flow paths and ensure the land behind the defences does not become waterlogged.
CHAPTER 16: Water Quality	
Increases in suspended sediment in waterbodies during the construction phase due to instream works associated with construction of culverts, flood walls and embankments	• Mitigation measures will be implemented by the contractors who will construct the Proposed Development in accordance with the requirements listed within the Construction Environmental Management Plan (CEMP). • Contractors will submit a detailed Construction Management Plan based on the requirements of these submitted planning documents for approval by the Planning Authority. The mitigation measures implemented by the contractor will refer to the construction management procedures for best practice regarding the following recognised international guidelines: - Good practice guidelines on the control of water pollution from construction sites developed by the Construction Industry Research and Information Association (CIRIA, 2001); - Control of Water Pollution from construction sites, Guidance for consultants and contractors (C532); - Environmental Good Practice on Site (3rd edition) (C692); - WAT-SG-23 Good Practice Guide – Bank Protection; - WAT-SG-25: Good Practice Guide - River Crossings; - WAT-SG-26: Good Practice Guide - Sediment Management; and - WAT-SG-29: Good Practice Guide – Construction Methods; • Adoption of appropriate erosion and sediment controls to manage run-off during construction is essential to prevent sediment pollution. • Mitigation measures to address the potential impact from suspended solids will be carried out in accordance with a site-specific CEMP. The measures will be employed prior to the commencement and during construction. • The use of oils and chemicals on-site requires significant care and attention. The following procedures will be followed to reduce the potential risk from oils and chemicals: - New metal jerry cans with proper pouring nozzles will be used to move fuel around the site for the purposes of refuelling items of small plant on site. Metal jerry cans and any other items of fuel containers will be stored in certified metal bunded cabinets. - Drip trays will be used under items of small plant at all times. Any waste oils etc. contained in the drip trays or the bunded area will be emptied into a waste oil drum, which will be stored within the bund.
Concrete and cement pollution during the construction phase associated with construction of culverts, flood walls and embankments	
Fuel, oil and other chemical pollution during the construction phase associated with words machinery, infrastructure and on-land operations including the temporary storage of construction materials, oils, fuels & chemicals	
Improvements in water quality from reductions in flood risk during the operational phase	
Deterioration in channel morphological supporting conditions in the Gelly Burn during the operational phase (however this impact will only be at local reach level and the overall waterbody will not be impacted significantly)	

Potential Effects	Summary of Proposed Mitigation
	- Any gas bottles will be stored in a caged area at a secure location on the site. All will be properly secured at point of work. - No bulk chemicals will be stored within the active construction areas. Temporary oil and fuel storage tanks may be kept in the material storage area in suitable containers and will be stored on appropriately bunded spill pallets as required. Any fuel and oil stored onsite shall be stored on bunded spill pallets approved under BS EN 1992-3:2006). All bunds will be impermeable and capable of retaining a volume of equal to or greater than 1.1 times (>10%) capacity of the containers stored on them. In the event of a filling spillage excess oil or fuel will be collected in the bund. - Refuelling of vehicles and the addition of hydraulic oils or lubricants to vehicles will be undertaken offsite where possible. Where this is not possible, filling and maintenance will take place in a designated material storage compound, which is located at least 10 metres from any temporary or permanent drainage features. Spill protection equipment such as absorbent mats, socks and sand will be available to be used in the event of an accidental release. Training will be given to appropriate site workers in how to manage a spill event. A certified double skinned metal fuel tank will be situated in this secure bunded area on the construction site if applicable. This tank will be certified for lifting when full. - Spill protection equipment such as absorbent mats, socks and sand will be available to be used in the event of an accidental release during refuelling. Training will be given to appropriate site workers in how to manage a spill event. A hazardous bin will also be available to contain any spent sand or soak pads. - Contingency Planning: A project specific Pollution Incident Response Plan will be prepared by the contractor and will refer to GPP 21 Pollution Incident Response Planning. The contractor's Environmental Manager will be notified in a timely manner of all incidents where there has been a breach in agreed environmental management procedures. Suitable training will be provided by the contractor to relevant personnel detailed within the Pollution Incident Response Plan to ensure that appropriate and timely actions is taken. • The following mitigation measures will be taken at the construction site in order to prevent any spillages to ground of fuels during machinery activities and prevent any resulting soil and/or groundwater quality impacts: - Refuelling will be undertaken off site where possible. - Where mobile fuel bowsers are used the following measures will be taken: - Any flexible pipe, tap or valve will be fitted with a lock and will be secured when not in use; - The pump or valve will be fitted with a lock and will be secured when not in use; - All bowsers to carry a spill kit and operatives must have spill response training; and - Portable generators or similar fuel containing equipment will be placed on suitable drip trays. • The use of concrete in close proximity to water bodies requires a great deal of care. Fresh concrete and cement are very alkaline and corrosive and can cause serious pollution in water bodies. It is essential to ensure that the use of wet concrete and cement in or close to any water course is carefully controlled so as to minimise the risk of any material entering the water, particularly from shuttered structures or the washing of equipment.

Potential Effects	Summary of Proposed Mitigation
	• The following measures will be undertaken to mitigate against possible pollution: - Where engineering works are to be carried out in or on the banks of rivers, burns, ditches, it will be necessary to isolate and de-water the work area to create dry working conditions. Isolation of the works area reduces the risk of contaminants entering the river or loch and this will be undertaken in accordance with the guidance provided in WAT-SG-29: Good Practice Guide – Construction Methods. - A concrete washdown area will be provided on site for trucks to use after delivery of concrete or on return to the batching plant. This area will be adequately bunded to mitigate the risk of contaminated runoff discharge to the water bodies. Concrete trucks are to be washed down within the concrete truck washdown area after delivery of concrete, prior to exiting the site. Washdown runoff will be appropriately treated prior to discharge. - Wash-out areas on site will be properly designed with an impermeable line to contain all cement laden water. No wash-out of ready-mix concrete vehicles shall be located within 10 metres of any temporary or permanent drainage features. Signage shall be erected to clearly identify the wash-out areas. Sufficient wash-out areas shall be provided to cater for all vehicles at peak delivery times. - On-site batching of concrete is not envisaged, but ready to use mortar silos are often used. These systems involve the delivery and storage of dry cement and aggregates in silos, water is added at the point of delivery to make mortar or plaster. The following controls shall be put in place for the on-site batching of concrete, mortar and render: - The plant shall be maintained in good condition; - Delivery of cement shall be means of a sealed system to prevent escape of cement; - The plant shall be situated on a paved area at least 20m from any temporary or permanent drainage features; and - Emergency procedures shall be in place to deal with accidental spillages of cement or mortar. • Regular checks will be carried out to ensure surface water drains are not blocked by silt, or other items, and that all storage is located at least 10m from surface water receptors. A regular log of inspections will be maintained, and any significant blockage or spill incidents will be recorded for root cause investigation purposes and updating procedures to ensure incidents do not reoccur.

18 CUMULATIVE EFFECTS & ENVIRONMENTAL INTERACTIONS

18.1 Introduction

This chapter presents a summary of the assessment of cumulative effects which may arise from adjacent or nearby developments together with those predicted for the Proposed Development as well as the environmental interactions which have been examined within the individual technical assessment chapters (Chapters 6– 16).

18.1.1 Cumulative Effects

Cumulative effects address long-term changes that may result from the construction and operation of the Proposed Development in combination with other developments in the area.

Cumulative assessment is undertaken to ensure that the combined effects of the Proposed Development and other influences are assessed together, and not as individual aspects of the environmental assessment.

Cumulative effects are defined as changes to the environment that are caused by an action in combination with other actions, arising from:

- The interaction between existing and/ or approved Projects in the same area; as required by Schedule 4, Section 5 of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- The interaction between the various impacts within a single Project.

The EU Guidance on the preparation of the EIAR states that it is important to consider effects, not in isolation, but cumulatively, as this may show that individually analysed impacts can become significant when they are added together, or with, other effects.

The coexistence of impacts may increase or decrease their combined impact. Impacts that are considered to be insignificant, when assessed individually, may become significant when combined with other impacts.

Cumulative effects can occur at different temporal and spatial scales. The spatial scale can be local, regional or global, while the frequency or temporal scale includes past, present and future impacts on a specific environment or region.

The methodology for selecting the relevant projects (listed in Chapter 3, Section 3.6) is presented in Section 18.2.

The experts leading each of the technical assessments (as presented in Chapters 6 to 16), have defined significance thresholds and criteria for the cumulative effects assessment, using professional judgement and consideration of the relevant standards and guidelines via a collaborative approach, involving all the interested parties in the process of data collection and analysis, to determine whether in-combination effects give rise to additional levels of significance.

The overall summary of the assessment of the likely cumulative effects, and interactions, between the Proposed Development and other projects in the vicinity is presented in Section 18.3, along with appropriate mitigation measures to address any identified cumulative effects.

18.2 Assessment Methodology

The following guidelines and publications were considered when determining the other projects to be considered for their potential to generate cumulative effects with the Proposed Development.

- European Commission (EC) Guidelines for the Assessment of Indirect and Cumulative Impacts (1999);
- European Commission (EC) Guidance on the preparation of the Environmental Impact Assessment Report (2017);
- Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment Process in Scotland (SNH (now NatureScot) & HES, 2018);
- Scottish Planning Series Planning Circular: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- UK Planning Inspectorate (PINS) Advice Note 17: Cumulative effects assessment relevant to national significant infrastructure projects. Version 2, 2019.

The first step in determining cumulative effects comprised the identification of a list of 'other projects' which may have the potential to overlap with the proposed redevelopment based on available information.

Other projects and plans that have been considered as part of this cumulative assessment have been identified through a desk study involving general internet searches and in particular, scrutiny of consenting authority websites.

The different developments considered as part of this cumulative assessment are those in close proximity to the Proposed Development and with the potential to interact with it. The resulting selected developments comprise of:

- Projects in the area that are listed on the local planning authority website;
- Projects at construction stage in the area;
- Projects that are at an advanced stage of planning; and
- Other Projects which have the potential to result in a cumulative impact.

Those other projects whose impacts could foreseeably overlap with the construction or operation of the proposed redevelopment or where construction impacts may be consecutive but cumulative, were considered. The cut-off date for sourcing information on the other projects considered was 16th August 2023.

There are 13 proposed Projects in the vicinity of the Proposed Development. These are listed below:

- Erection of office/ workshop building, formation of parking area, hardstanding associated – Land north of Macduff Place, Kinross;
- Erection of a garden studio – 3 Hopefield Place, Kinross;
- Alterations and extension to dwellinghouse – Green Gates 12, Station Road, Kinross;
- Alterations to dwellinghouse – 11 Talla Park, Kinross;
- Extension to dwellinghouse – 10, Levenbridge Place, Kinross;
- Extension to dwellinghouse – 16 Levenbridge Place, Kinross;
- Installation of flue – Cobwebs 6, Montgomery Street, Kinross;
- Erection of 3 light industrial units (classes 4, 5 and 6), and a members only retail club unit – Anchorpoint House, Clashburn Close, Bridgend Industrial Estate, Kinross;
- Screening Opinion for EIA (Demolition of former Auction House) – British Car Auctions (BCA), Kinross;
- Siting of combined heat and power unit (CHP) and erection of steam boiler enclosure, transformer and compound radiator, low temperature hot water boiler enclosure and fencing – Todd & Duncan Ltd, Lochleven Mills, High Street, Kinross;
- Installation of solar panels – 8-10 Piper Row, Kinross;
- Installation of replacement windows – 1st Floor, 111 High Street, Kinross;
- Change of use of and alterations to workshop/restaurant/offices to form restaurant with function room/ancillary hot food takeaway/offices, erection of workshop/store, installation of replacement decking, fence and canopies over outdoor seating area – Loch Leven Fisheries, Pier Road, Kinross.

18.3 Cumulative Effect between the Proposed Development and Projects in the same area

When determining the significance of the cumulative effects of the Proposed Development and other existing and/or approved projects, consideration was given to the following factors:

- The Spatial and Temporal interactions between the Project and other projects;
- Identification of potential of cumulative effects by environmental topics and establish if a potential linkage exists using the source-pathway-receptor model;
- The type and duration of the impact - will it be temporary or permanent;
- The value and resilience if the receptor affected; and
- Mitigation measures that will be employed and the likelihood of their success.

Table 18-1 provides a description of potential interactions between the Proposed Development and the other listed projects in the area which are deemed likely to have cumulative effects.

Table 18-1: Potential Interactions between the Proposed Development and other projects

Project	Stage	Distance from Project	Temporal overlap	Spatial overlap	Potential Interaction(s) (Construction phase)	Potential interaction (Operational phase)
Erection of office/ workshop building, formation of parking area, hardstanding associated	Awaiting Decision	50m west of Clash Burn Diversion Culvert	Unknown	No	Construction traffic may be impeded by works if carried out simultaneously as Proposed Development construction traffic will need to use Macduff Place for access for culvert upgrades.	None
Erection of a garden studio	Approved	20m west of Hopefield Culvert Upgrades	Unknown	Yes	Construction traffic may be impeded by works if carried out simultaneously. However, this is unlikely due to the small scale of this development.	None
Alterations and extension to dwellinghouse	Approved	390m north of Clash Burn Bund	Unknown	No	None	None
Alterations to dwellinghouse	Approved	400m north of Clash Burn Diversion/ Culvert Upgrade	Unknown	No	None	None
Extension to dwellinghouse	Awaiting decision	45m north-west of Clash Burn Diversion Culvert	TBC	No	None	None
Extension to dwellinghouse	Approved	75m west of Clash Burn Diversion Culvert	Unknown	No	None	None
Installation of flue	Awaiting Decision	140m north of Clash Burn Diversion/Culvert Upgrade	TBC	No	None	None
Erection of 3 light industrial units (classes 4, 5 and 6), and a members only retail club unit	Approved	100m north of South Queich flood walls and 90m south of Clash Burn Bund	Unknown	No	None	None
Screening Opinion for EIA (Demolition of former Auction House)	Unknown	Immediately north of South Queich flood walls	Unknown	Yes	Construction traffic may be impeded by works if carried out simultaneously. BCA building is located adjacent to construction areas for flood walls on South	None

Project	Stage	Distance from Project	Temporal overlap	Spatial overlap	Potential Interaction(s) (Construction phase)	Potential interaction (Operational phase)
					Queich so demolition may impact this.	
Siting of combined heat and power unit (CHP) and erection of steam boiler enclosure, transformer and compound radiator, low temperature hot water boiler enclosure and fencing	Approved	40m south of South Queich flood walls	Unknown	No	None	None
Installation of solar panels	Awaiting decision	330m north of Clash Burn Diversion/ Culvert Upgrade	TBC	No	None	None
Installation of replacement windows	Approved	225m north of Clash Burn Diversion/ Culvert Upgrade	Unknown	No	None	None
Change of use of and alterations to workshop/ restaurant/ offices to form restaurant with function room/ ancillary hot food takeaway/ offices, erection of workshop/ store, installation of replacement decking, fence and canopies over outdoor seating area	Approved	50m east of Clash Burn Diversion/ Culvert Upgrade	Unknown	No	None	None

The majority of the above listed developments are relatively small scale and are unlikely to directly impact upon the Proposed Development. However, depending on timing of works, there could be indirect impacts during the construction phase.

Larger-scale developments such as the demolition of the BCA building, the erection of an office / workshop building at Macduff Place may have some construction phase impacts if works are carried out at the same time as the Proposed Development.

Chapters 6-16 have concluded that there are not likely to be any significant cumulative impacts between the projects in Table 18-1 and the Proposed Development.

18.4 Environmental Interactions within the Proposed Development

This section of the EIAR determines the potential for environmental interactions within the Proposed Development, between specialist topic chapters.

Environmental factors are inter-related to some degree, and these interactions can exist on many levels. This section summarises the primary interactions between the environmental topics and provides a matrix to coherently display them.

Table 18-2 identifies the interacting topics which are then discussed further in the following sections.

Table 18-2: Proposed Development Environmental Interactions

	Air Quality & Climate	Biodiversity – Ornithology	Biodiversity – Terrestrial & Aquatic	Cultural Heritage & Archaeology	Landscape & Visual	Material Assets & Land Use	Noise & Vibration	Soils, Geology, Hydrogeology & Contamination	Waste	Flood Risk, Hydrology & Drainage	Water Quality
Air Quality & Climate											
Biodiversity – Ornithology											
Biodiversity – Terrestrial & Aquatic											
Cultural Heritage & Archaeology											
Landscape & Visual											
Material Assets & Land Use											
Noise & Vibration											
Soils, Geology, Hydrogeology & Contamination											
Waste											
Flood Risk, Hydrology & Drainage											
Water Quality											

18.4.1 Air Quality & Climate

During the construction phase of the Proposed Development, there is potential for the interaction between Air Quality with Material Assets and Land Use (specifically traffic & transport) and Soils, Geology, Hydrogeology & Contamination. Climate is mostly likely to have an inter relationship with Flood Risk, Hydrology & Drainage. These interactions are fully assessed within Chapter 6, Chapter 13, and Chapter 15.

18.4.2 Biodiversity – Ornithology

During the construction phase of the Proposed Development, there is potential for the interaction between Biodiversity – Ornithology with Biodiversity – Terrestrial & Aquatic. These interactions are fully assessed within Chapter 7.

18.4.3 Biodiversity – Terrestrial & Aquatic

During the construction phase of the Proposed Development, there is potential for the interaction between Biodiversity – Terrestrial & Aquatic with Biodiversity – Ornithology, Waste and Water Quality. These interactions are fully assessed within Chapter 7, Chapter 14, and Chapter 16.

18.4.4 Cultural Heritage & Archaeology

The Proposed Development has the potential for interaction between Cultural Heritage and Landscape & Visual effects. These interactions and effects are fully assessed within Chapter 9 and Chapter 10.

18.4.5 Landscape & Visual

The Proposed Development has the potential for interaction between Cultural Heritage and Landscape & Visual effects. These interactions and effects are fully assessed within Chapter 9, and Chapter 10.

18.4.6 Material Assets & Land Use

During the construction phase of the Proposed Development, there is potential for the interaction between Material Assets & Land Use with Air Quality & Climate (specifically air quality) and Waste. These interactions and effects are fully assessed within Chapter 6, Chapter 11, and Chapter 14.

18.4.7 Soils, Geology, Hydrogeology & Contamination

During the construction phase of the Proposed Development, there is potential for the interaction between Soils, Geology, Hydrogeology & Contamination with Air Quality & Climate and Water Quality. These interactions and effects are fully assessed within Chapter 6, Chapter 13, and Chapter 16.

18.4.8 Waste

During the construction phase of the Proposed Development, there is potential for the interaction between Waste with Biodiversity – Terrestrial & Aquatic and Material Assets & Land Use These interactions and effects are fully assessed within Chapter 8 and Chapter 11.

18.4.9 Flood Risk, Hydrology and Drainage

During the construction phase of the Proposed Development, there is potential for the interaction between Flood Risk, Hydrology & Drainage with Air Quality & Climate and Water Quality. These interactions and effects are fully assessed within Chapter 6, Chapter 15, and Chapter 16.

18.4.10 Water Quality

During the construction phase of the Proposed Development, there is potential for the interaction between Water Quality with Biodiversity – Terrestrial & Aquatic, Soils, Geology, Hydrogeology & Contamination and Flood Risk, Hydrology & Drainage. These interactions and effects are fully assessed within Chapter 8, Chapter 13, Chapter 15, and Chapter 16.

19 SUMARY & CONCLUSIONS

The assessment presented within the EIAR has identified and documented impacts arising from the Proposed Development. These impacts have been assessed as to whether or not they are likely to result in significant effects on the wider environment. Where significant effects have been predicted, measures to avoid or mitigate these effects have been included so that, where possible, they are no longer significant.

The overall objectives of the Proposed Development are to reduce the economic damages to residential and non-residential properties in the South Kinross area from the South Queich, the Gelly Burn and the Clash Burn, as well as improving the WFD status of the bodies of water in the area where possible. Historically, South Kinross has suffered from a number of flood events, and there are two distinct areas affected by flooding. The northern area suffers from flooding from the Clash Burn, while the southern area is affected around the confluence of the South Queich and the Gelly Burn. A third flood risk area is affected by the South Queich, located north of Kinross, affecting Kinross Services and the M90.

Of the 11 topic areas assessed in this EIAR, only one (Soils, Geology, Hydrogeology & Contamination) was identified to have Neutral effects. During the construction phase, there will be no measurable impact on geological features, no measurable impact on soils and no discernible change with regards to contaminated land. During the operation phase, there will be no measurable impact upon surface waters or groundwater, no measurable impact on geological features and no measurable impact on soils/ sediments. Therefore, no mitigation measures have been recommended.

Potentially significant effects have been identified for Biodiversity (Ornithology and Terrestrial & Aquatic). With the successful implementation of mitigation measures outlined it is expected that Biodiversity effects will be of Negligible to Minor significance.

For Material Assets, Minor to Moderate effects have been identified to utilities infrastructure which mitigation will aim to reduce impacts where possible.

For Noise & Vibration, potentially significant effects were only identified at the construction phase where a range of mitigation measures are recommended in order to reduce impacts on sensitive receptors near to construction areas.

For Air Quality & Climate, potentially significant effects were identified for air quality at the construction phase however, no significant effects were identified for the operational phase. Again, a range of mitigation measures are outlined to reduce construction air quality impacts to Negligible. There are no potentially significant effects identified for Climate for either the construction or operation phase.

Potentially significant effects were also identified for Waste, but only for the construction phase. With mitigation, these effects will likely be Neutral or Slight.

Potentially significant effects from Cultural Heritage have the potential to be of Moderate significance with regard to the potential for disturbance or removal of previously undiscovered archaeological artifacts during the construction phase. However, it was deemed that this likelihood of this effect occurring is extremely remote and, as such, no mitigation for the construction phase is recommended. Furthermore, no potentially significant effects were identified at the operation phase.

Flood Risk has been determined to have Minor adverse effects for which mitigation is recommended. Operation of a successful Flood Protection Scheme will likely lead to Major beneficial effects through protection of properties from flooding.

In the case of Water Quality Major (significant) adverse effects are expected, however it has been determined that this could be reduced to Negligible to Minor (not significant) effects with successful implementation of mitigation measures. During the operational phase, there is potential for beneficial effects in the context of the avoidance of flooding of potentially significant pollution sources. Furthermore, while potential Major (significant) impacts have been identified, it is expected that the Proposed Development will not significantly impact the morphological conditions given the existing realigned channel, grey bank reinforcement and embankments along the South Queich. When assessed at the water body scale the Proposed Development will use some additional morphological capacity, but this is not significant as it will not result in a deterioration in the morphological condition.

Landscape & Visual presented a range of effects. Landscape and Townscape impacts were not deemed to be significant at either the construction or operational phases. However, from a visual perspective, the impact to Viewpoint 2 (Old Cleish Road) was deemed to be Moderate (significant) and the impact to Viewpoint 5 (Loch Leven Heritage Trail) was deemed to be Moderate to Major (significant) during the construction phase. Only Minor effects are expected to visual receptors during the operational phase.

Overall, the EIAR has determined that the development of the Proposed Development has the potential to have significant effects on environmental receptors in the absence of any mitigation measures. Where significant effects have been identified, mitigation measures have been recommended in order to reduce any impacts on sensitive receptors from significant to not significant. Adherence to a CEMP is also important in reducing any potentially significant effects. It is expected that the Proposed Development will lead to beneficial effects to the town and people of Kinross through the protection of people and property from flooding and the potential avoidance of flooding of pollution sources.

20 REFERENCES

20.1 Air Quality & Climate

Adaption Scotland (2022) Available at: https://www.adaptationscotland.org.uk/ (Accessed 05/01/2022)

Clean Air for Europe (CAFE) Directive (2008/50/EC) (European Parliament, 2008)

Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance

Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation

Met Office (2022) *Data* Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/data/index (Accessed: 10/01/2022)

Perth & Kinross County Council (2019) Available at: https://consult.pkc.gov.uk/communities/climate-emergency_phase1/ (Accessed: 05/01/2022)

Perth and Kinross Council (2021) Available at: https://www.pkc.gov.uk/media/48919/2021-Air-Quality-Annual-Progress-Report/pdf/2021_Air_Quality_Annual_Progress_Report.pdf?m=637716354401670000 (Accessed: 06/01/2022)

Scottish Climate Change Adaption Programme: Progress Report 2021 Available at: file:///C:/Users/Cara.Mcmurray/Downloads/scottish-climate-change-adaptation-programme-progress-report-2021.pdf (Accessed: 05/01/2022)

The Scottish Parliament (2021) Available at: https://digitalpublications.parliament.scot/ResearchBriefings/Report/2021/1/12/afbd2373-a14f-4a78-af9c-4fc5c775b23d#e9894842-9d31-470f-b8ff-5a8612f200bc.dita (Accessed 05/01/2022)

World Health Organisation Air Quality Guidelines 2005 (WHO, 2005).

20.2 Biodiversity – Ornithology

Band, W., Madders, M. & Whitfield, D.P. (2007) Developing field and analytical methods to assess avian collision risk at wind farms. In: de Lucas, M., Janss, G.F.E. & Ferrer, M. (Eds.) Birds and Wind Farms: Risk Assessment and Mitigation, pp 259-275. Quercus, Madrid.

Bibby C., Burgess N., Hill D. and Mustoe S. (2000) Bird Census Techniques, 2nd Edition, Academic Press, London.

Brown, A. F. and Shepherd, K. B. (1993) A method for censusing upland breeding waders. Bird Study, 40, pp. 189-195.

CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland.

Forrester, R.W., Andrews, I.J., McInerny, C.J., Murray, R.D, McGowan, R.Y, Zonfrillo, B., Betts, M.W., Jardine, D.C., and Grundy, D.S. (eds) (2007) The Birds of Scotland. The Scottish Ornithologists Club, Aberlady.

REFERENCES

Frost, T., Austin, G., Hearn, R., McAvoy, S., Robinson, A., Stroud, D., Woodward, I and Wotton, S. (2019) Population estimates of wintering waterbirds in Great Britain British Birds. Vol 112. pp 130–145.

Gill, J.G. (1996) Habitat Choice in Pink-Footed Geese: Quantifying the Constraints Determining Winter Site Use. Journal of Applied Ecology. Vol. 33, No. 4, pp. 884-892.

Jensen, G.H.,Tombre, I.M., and Madsen, J. (2016) Environmental factors affecting numbers of pink-footed geese *Anser brachyrhynchus* utilising an autumn stopover site Wildlife Biology, 22(5) : 183-193.

Met Office (2018) UK Climate Projections 2018.

Mitchell, C and Hearn, R (2004) Pink-footed goose *Anser brachyrhynchus* (Greenland/Iceland population) in Britain (1960/61-1999/2000). Waterbird Review Series, The Wildfowl and Wetlands Trust/Joint Nature Conservation Committee). Slimbridge.

Musgrove, A., Aebischer, N., Eaton, M., Hearn, R., Newson, S., Noble, D., Parsons, M., Risely, K. and Stroud, D., (2013) Population estimates of birds in Great Britain and the United Kingdom. British Birds, *106*(2), pp.64-100.NatureScot (2016) The Story of Loch Leven NNR Second edition. Edited by Neil Mitchell and Susan Luurtsema and approved by Ewan Lawrie.

NatureScot (2017) Recommended bird survey methods to inform impact assessment of onshore wind farms March (2017) Version 2.

NatureScot (2020) Scottish Biodiversity List. Scottish Natural Heritage, Battleby, Perth.

NatureScot (2021) https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/planning-and-development-protected-species

NatureScot Sitelink database website (https://sitelink.nature.scot/home) (Accessed 20/04/2023).

RPS (2021) South Kinross Flood Protection Scheme Preliminary Ecological Appraisal Report.

RPS (2022) Chapter 3.3 Biodiversity-Terrestrial and Birds. South Kinross Flood Protection Scheme EIA Scoping Report.

RPS (2023) South Kinross Flood Protection Scheme Environmental Impact Assessment Report

Scotland's Environment Web (https://map.environment.gov.scot).

Scottish Government (2023) National Planning Framework 4 Available online at https://www.gov.scot/publications/national-planning-framework-4/

South Lanarkshire Local Development Plan 2 (2021) Available online at https://www.southlanarkshire.gov.uk/info/200145/planning_and_building_standards/39/development_plans/2

Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D., and Win I. (2021) The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. British Birds 114: 723-747. Available online at https://britishbirds. co.uk/content/status-our-bird-populations

Summers, R.W. (1990) The Effect on Winter Wheat of Grazing by Brent Geese *Branta bernicla*. Journal of Applied Ecology. Vol. 27, No. 3, pp. 821-833

20.3 Biodiversity – Terrestrial & Aquatic

British Standards Institution (2012). Trees in relation to design, demolition and construction – Recommendations. BS5837:2012.

CIEEM (2018). Guidelines for ecological impact assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (2nd Edition).

Environment Agency (2003). River Habitat Survey in Britain and Ireland. Field Survey Guidance Manual: 2003 Version. Environment Agency, Bristol.

JNCC (2006). National Vegetation Classification: Users' handbook. Available online at: http://data.jncc.gov.uk/data/a407ebfc-2859-49cf-9710-1bde9c8e28c7/JNCC-NVC-UsersHandbook-2006.pdf. Accessed 13th April 2023.

JNCC (2010). Handbook for Phase 1 habitat survey: A technique for Environmental audit.

Maitland P.S., (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5.

NatureScot (2021). Species Planning Advice. https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/planning-and-development-standing-advice-and-guidance-documents. Accessed 15th May 2023.

Perth and Kinross Council (2016). Tayside Local Biodiversity Action Plan. Available at: https://www.pkc.gov.uk/media/37386/TaysideLocalBiodiversityActionPlan/pdf/Tayside_LBAP_report_GP_10_Web#:~:text=The%20Tayside%20Biodiversity%20Action%20Plan%20is%20a%20means%20to%20fulfilling,environment%20and%20interaction%20with%20biodiversity. Accessed 15th May 2023.

Perth and Kinross Council (2019). Perth and Kinross Local Development Plan. Available at https://www.pkc.gov.uk/ldp2. Accessed 15th May 2023.

Perth and Kinross Council (2020). Supplementary Guidance – Green & Blue Infrastructure. Available at https://www.pkc.gov.uk/media/45773/Adopted-SG-2020/pdf/GI_Supplementary_Guidance_-_Adopted.pdf?m=637195204335030000. Accessed 15th May 2023.

Scottish Government (2003). Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003.

Scottish Government (2008) Planning Advice Note (PAN) 60: Planning for Natural Heritage. 2008

Scottish Government (2011). Wildlife and Natural Environment (Scotland) Act 2011.

Scottish Government (2015). Scotland's Biodiversity, a Route Map to 2020. PDF. Available online at https://www.gov.scot/publications/scotlands-biodiversity-route-map-2020/. Accessed 3rd April 2023.

Scottish Government (2020). Scottish Biodiversity List. Online. Available at https://www.webarchive.org.uk/wayback/archive/20160402063428/http://www.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL. Accessed 25th March 2023.

Scottish Government (2023). National Planning Framework Four. Online. Available at National Planning Framework 4 - gov.scot (www.gov.scot). Accessed 2nd April 2023.

SEPA (2017). Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Land Use Planning System SEPA Guidance Note 31. Available at https://www.sepa.org.uk/media/144266/lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions-and-groundwater-dependent-terrestrial-ecosystems.pdf. Accessed 13th March 2023.

Stace. C. (2010). New Flora of the British Isles, Cambridge University Press; 3rd edition.

UK Government (1981). Wildlife and Countryside Act 1981, Chapter 69. Part 1.

UK Government (1992). Protection Of Badger Act 1992.

20.4 Material Assets & Land Use

Health and Safety Executive (HSE). 2014. Avoiding Danger from Underground Services: HSG47 (Third Edition). Available at https://www.hse.gov.uk/pubns/books/hsg47.htm [Accessed 11 May 2023]

National Records of Scotland (NRS). 2020. Mid-2020 Population Estimates for Settlements and Localities of Scotland. Available at https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-estimates/settlements-and-localities/mid-2020) [Accessed 2 May 2023]

Perth & Kinross Council. Opendata. 2022. Available at https://data.pkc.gov.uk/dataset/household-estimates-by-data-zone [Accessed 2 May 2023]

Scottish Government. 2021. Average Household Size: a data cube spreadsheet. Available at https://statistics.gov.scot/slice?dataset=http%3A%2F%2Fstatistics.gov.scot%2Fdata%2Faverage-household-size&http%3A%2F%2Fpurl.org%2Flinked-data%2Fsdmx%2F2009%2Fdimension%23refPeriod=http%3A%2F%2Freference.data.gov.uk%2Fid%2Fyear%2F2021 [Accessed 2 May 2023]

WaterSafe. 2023. I am installing a new water service. How deep should the trench be for water pipes? Available at https://www.watersafe.org.uk/advice/installation_faqs/i_am_installing_a_new_water_service_how_deep_should_the_trench_be_for_water_pipes/ [Accessed 12 May 2023]

20.5 Waste

CECA (2018), Waste Classification & Permitting in Construction: Guidance for the construction industry on the Waste Permitting Regime.

IEMA (2020), IEMA guide to: Materials and Waste in Environmental Impact Assessment Guidance for a proportionate approach.

SEPA (2023) Waste Sites and Capacity Tool - Landfill Sites and Capacity Map. Available at: https://www.sepa.org.uk/data-visualisation/waste-sites-and-capacity-tool/ (Accessed: 2nd June 2023).

Zero Waste Scotland (2020) Construction Resources: For a Circular Economy V10.

20.6 Flood Risk, Hydrology & Drainage

Climate change allowances for flood risk assessment in land use planning, SEPA (April 2023)

Flood Risk and Land Use Vulnerability Guidance, SEPA (July 2018)

Perth and Kinross Local Development Plan 2, Perth & Kinross Council (November 2019)

SEPA Flood Maps

Supplementary Guidance: Flood Risk and Flood Risk Assessments, Perth & Kinross Council (March 2016)

Technical Flood Risk Guidance for Stakeholders- SEPA requirements for undertaking a Flood Risk Assessment, SEPA (June 2022)