Kintore Hydrogen Plant

Environmental Impact Assessment Report
Non-Technical Summary

Date: September 2024

Kintore Hydrogen
A STATERA COMPANY

Environmental Impact Assessment Report

Volume 1

Non-Technical Summary

Version: Final

Date: September 2024

This report is also downloadable from the Kintore Hydrogen website at:
https://www.kintorehydrogen.co.uk/

Qualifications

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Summary

This document summarises the environmental effects of constructing and operating Kintore Hydrogen Plant, and how they would be managed. It is written in non-technical language for a general audience. Full details of the assessments of effects can be found in the individual topic chapters of this Environmental Impact Assessment Report (Volume 2, Chapters 6 to 15).

1 Project Overview

1.1 Introduction to the proposed development

1.1.1 Kintore Hydrogen Ltd proposes to develop a hydrogen production plant on land next to Kintore Substation in Aberdeenshire. The plant would produce hydrogen from water by electrolysis using mainly renewable energy. This is sometimes called 'green hydrogen'. Hydrogen does not emit carbon dioxide when it is used as a fuel, making it a zero carbon fuel at the point of combustion.

1.1.2 The hydrogen would be transmitted via repurposed National Gas pipeline infrastructure to carry 100% hydrogen to aid in the decarbonisation of industrial uses and processes that cannot be easily electrified, as well as facilitating long duration energy storage. Initially, the plant would blend its product with natural gas in the existing National Gas network in order to reduce carbon emissions for uses that currently rely on gas fuel in the UK.

1.1.3 The electricity would be supplied from Scottish and Southern Electricity Networks' existing Kintore Substation, which provides transmission capacity for the increasing wind power generation in Scotland among other renewable sources. Producing hydrogen using excess renewable power generation provides a solution to balancing the electricity grid, storing and transmitting this energy in a form that can readily be used for industry and heating, making best use of existing gas infrastructure.

1.1.4 The raw water would be supplied from the River Don, which has enough capacity under a range of flow conditions to support the water demand of Kintore Hydrogen Plant. Kintore Hydrogen has been issued an abstraction licence by the Scottish Environment Protection Agency (SEPA) under the Controlled Activity Regulations for this water supply.

1.1.5 The location of the proposed development has been chosen due to being next to the newly expanded capacity of Kintore Substation (not requiring a new overhead transmission line), close to the National Gas National Transmission System pipelines (requiring a connection pipeline of less than 3 km) and close to a more than sufficient raw water supply from the River Don.

1.1.6 Kintore Hydrogen intends to develop the facility and introduce its hydrogen supply in phases, starting with production capacity from up to 500 megawatts of electricity (MWe) and then developing further phases to reach a planned 3,000 MWe capacity in total.

1.1.7 A more detailed description of the hydrogen plant is given in Section 3 starting on page 6. The location of the project site is shown in Figure 1.1, overleaf.

1.2 The applicant

1.2.1 Kintore Hydrogen is a subsidiary of Statera Energy Ltd, a private British company that develops, builds and operates flexible energy generation and storage technologies to help balance the grid.

1.2.2 Statera Energy was established with the aim of delivering increased flexibility for the UK electricity system to assist in the transition to a low carbon economy in the future.

1.3 Project timeline

1.3.1 The expected timeline for consultation, decision-making and (if planning permission is granted) development of Kintore Hydrogen Plant is as follows.

- Pre-application public consultation (completed) – summer 2024
- Submission of Planning Permission in Principle application to Aberdeenshire Council – autumn 2024
- Start of construction – 2026 (with possible enabling works in late 2025)
- Operation of first phase of the plant – around 2029
- Construction and operation of subsequent phases – in the 2030s

1.4 Further information

1.4.1 The purpose of this document is to provide a non-technical summary of the Environmental Impact Assessment Report (EIAR) for the proposed development.

1.4.2 At the end of this summary is a contents page for the full EIAR, which shows where to find more detailed information about particular environmental topics or impacts. A glossary and list of abbreviations is also provided at the end of this summary to explain technical terms used in the full report.

1.4.3 The EIAR and NTS (and all other application documents) can be viewed and downloaded free of charge from https://www.kintorehydrogen.co.uk/.

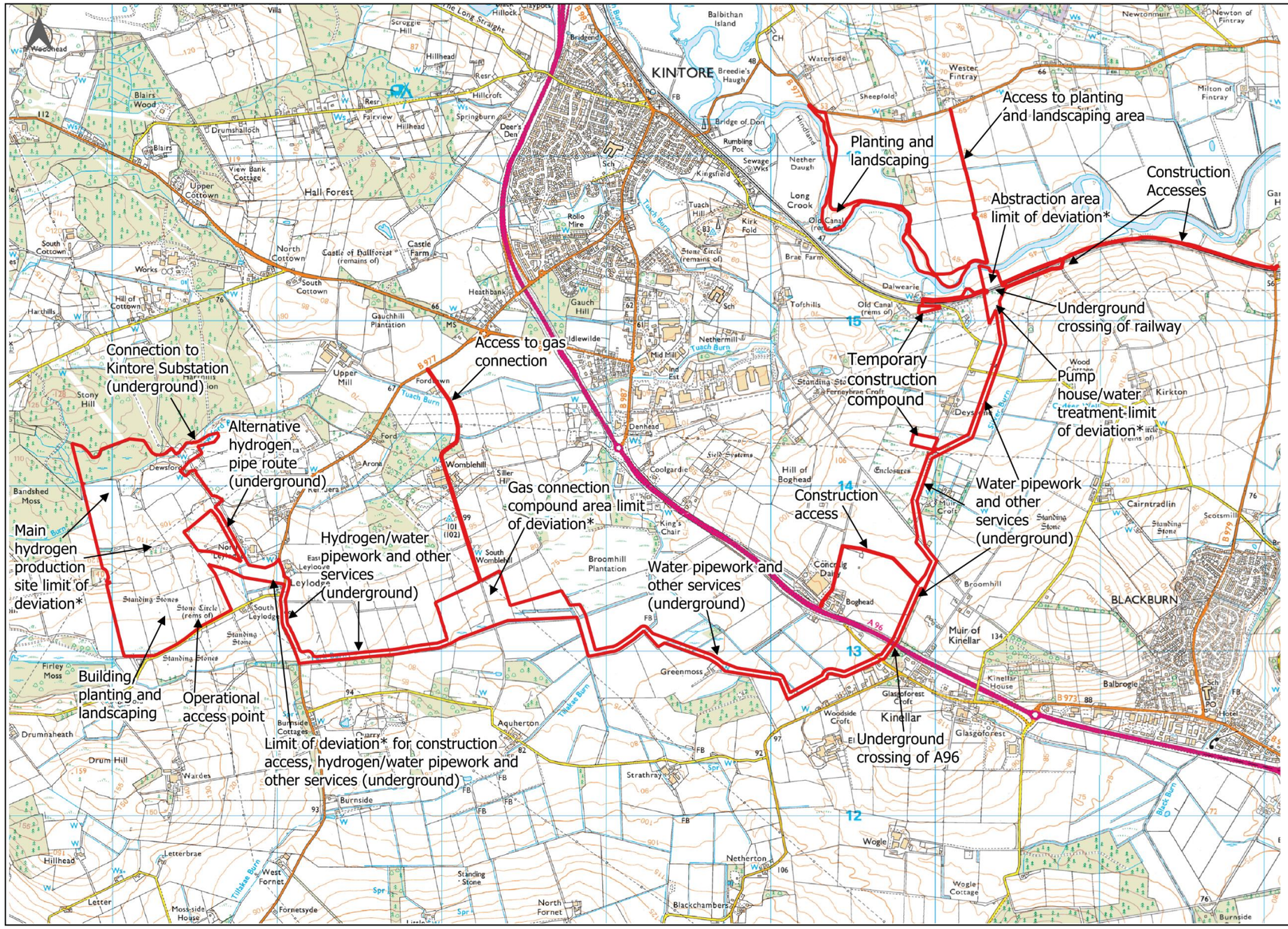
1.4.4 Following submission of the Planning Permission in Principle application to Aberdeenshire Council, accompanied by the EIAR and NTS, the Council will publicise and consult on the application.

1.4.5 Representations to Aberdeenshire Council concerning the planning application or content of the EIAR can be made by email to planningonline@aberdeenshire.gov.uk or in writing to:

ePlanning team
Aberdeenshire Council
Viewmount
Arduthie Road
Stonehaven
AB39 2DQ

1.4.6 Alternatively, representations can be made online by using the 'make a comment' function from the application on the planning register:

https://upa.aberdeenshire.gov.uk/online-applications/



KINTORE HYDROGEN PLANT

Date:	20-08-2024
Paper size:	A3
Scale:	1:26,000

0 100 200 300 400 m

Key:

Planning application boundary

* Where reference is made to a limit of deviation, this is an area in which the described plant is proposed to be sited. However, the actual footprint of the described plant in this area will likely be significantly smaller than the limit of deviation. The limit of deviation enables the flexibility for design that is necessary for phased development such as this for which planning permission in principle is being sought.

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Proposed development application boundary and overview – OS map

Status:	Final
Revision:	V2
Drawn by:	MP
Approved by:	TD

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Figure 1.1: Proposed development application boundary and overview

2 Purpose of this Environmental Impact Assessment Report

2.1 Purpose

2.1.1 The purpose of the Environmental Impact Assessment Report (EIAR) is to describe the predicted environmental impacts of the proposed development, identifying any significant effects that would result and how these can be further reduced, if possible.

2.1.2 To do this it explains the proposed development, the surrounding location and the baseline environmental information that has been gathered. It then documents the process of environmental impact assessment (EIA) and presents the findings.

2.1.3 The following sub-sections explain the EIA process and the information that can be found in the EIAR.

2.2 Need for EIA

2.2.1 Environmental Impact Assessment (EIA) is a process designed to identify and study the likely significant environmental impacts of a development. EIA is used to inform the public, decision-makers and their advisors about environmental impacts and to recommend measures that avoid, reduce or offset any significant harmful (adverse) effects. It can also recommend measures to maximise any potential beneficial effects or environmental enhancement opportunities. EIA studies the environmental baseline (the existing and future situation without the development) and how this may change if the development were to proceed.

2.2.2 ‘Environment’ in this context means both the natural and human world, including natural habitats and species, air, water and land quality, places where people live, roads, footpaths and workplaces. It also includes less tangible elements such as landscape character and cultural heritage.

2.2.3 EIA is employed when the nature or scale of a proposed development means that it is considered to have the potential to cause significant environmental effects. The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) govern what types of developments require EIA, the impacts that may need to be studied and the information to be reported.

2.2.4 In the case of Kintore Hydrogen Plant, formal consultation with Aberdeenshire Council in 2023 has confirmed that EIA is required and the council has given its view on the impacts the EIA should study through a Scoping Opinion published on 1 November 2023, with inputs from its technical advisors and statutory consultees.

2.3 Process of EIA

2.3.1 EIA is a systematic and evidence-based process with the following main stages:

- gathering information about the baseline (current and future situation without the development) from surveys, existing studies and consultation;
- predicting how this would be changed by the proposed development (the ‘impacts’);
- considering how these changes would affect ‘receptors’ such as people, protected species or landscapes;
- assessing the significance of effects, based on the size of impacts and the sensitivity of receptors to the changes;
- suggesting ways to avoid, reduce or compensate for impacts causing significant adverse effects (‘mitigating’ the impacts) and ways to further enhance any beneficial effects (‘enhancement’);
- reporting any remaining (‘residual’) significant effects after mitigation; and
- considering effects from the combination of impacts (e.g. changes in noise and air quality together) and from the proposed development together (‘cumulatively’) with other developments in the area.

2.3.2 The ES talks about ‘impacts’ and ‘effects’, making a distinction between these terms. Impacts are changes in the environment caused by some aspect of the proposed development’s construction or operation. Effects are the consequences of an impact.

2.3.3 For example, construction work would cause noise that isn’t currently present on the site, which is an impact. The effect of this noise might be to cause disturbance and annoyance to people in nearby residences, if it were loud enough to be noticeable and intrusive. If this effect were potentially significant, the impact could be mitigated (e.g. by limiting working hours or using an alternative construction technique) to reduce the effect. Impacts and effects can be adverse or beneficial.

2.3.4 The 'significance’ of an effect is based on the magnitude of the impact together with the importance and sensitivity of the element of the environment (the ‘receptor’) that is affected. The size of an impact is described in a range from negligible, low, medium to high, or there may be no change (a neutral impact). Taking into account the importance and sensitivity of the receptor, the resulting effect may be described on the following scale.

Table 2.1: Definition of significance levels

Significance	Description
Substantial	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category. Effects upon human receptors may also be attributed this level of significance.
Major	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	These beneficial or adverse effects have the potential to be important and may influence the decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor.
Minor	These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent 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.

2.3.5 EIA studies and the evaluation of the significance of effects are carried out using professional guidance or standards, and with regard to legislation protecting specific elements of the environment, but also rely upon the professional judgement of the topic expert who has undertaken the assessment.

2.3.6 The EIA studies are based upon the development design as specified in Chapter 2 of Volume 2 of the EIAR and use up-to-date baseline information gathered from published sources and surveys undertaken specifically for the project. Where there is uncertainty in the assessments, which is inherent to some degree when predicting future impacts and effects, the EIA takes a conservative approach and uses 'worst-case' assumptions, erring on the side of caution with regard to adverse impacts.

2.3.7 The EIA studies also consider potential cumulative effects that may result from the combination of impacts from the proposed development and other major developments that are proposed or have consent but have not yet been constructed. This may involve assessing the combined impact of the proposed development and other developments together (e.g. additional traffic from multiple developments on local roads) or may involve assessing impacts on new receptors introduced by other developments (e.g. new residential areas). It also considers inter-related effects, which are those where several different types of impact could combine to have a more significant effect on a particular receptor than when considered individually.

2.3.8 EIA is carried out at an early stage in the design of a proposed development alongside consultation with the public and other stakeholders. In this way it can influence the design and respond to concerns about environmental impacts that are raised during consultation. Mitigation and enhancement measures can be included in the proposed development design, with the goal of ensuring that (a) significant adverse environmental effects are avoided and (b) advantage is taken of opportunities for beneficial effects.

2.4 Maximum design scenario

2.4.1 Kintore Hydrogen is applying to Aberdeenshire Council for Planning Permission in Principle, which reserves details of design to subsequent stages of approval.

2.4.2 The EIA for Kintore Hydrogen Plant has therefore used a maximum design scenario (often called a 'Rochdale envelope' for EIA) to assess impacts. This approach allows for a proposed development to be assessed on the basis of maximum project design parameters in order to provide flexibility, while ensuring all potentially significant effects (adverse or beneficial) are assessed and reported.

2.4.3 For each of the impacts assessed within the topic chapters, the maximum design scenario is identified from the range of potential options for each parameter within Chapter 2. The maximum design scenario assessed is therefore the scenario which would give rise to the greatest potential impact for that topic. For example, the size of the buildings or external structures proposed would be of the maximum dimensions required although in detailed design later this may be reduced. By employing the maximum design scenario approach, the Applicant retains some flexibility in the final design of the plant and associated infrastructure, but within defined maximum parameters, which are assessed in this EIAR.

3 The Proposed Development

3.1 Purpose of Kintore Hydrogen Plant

3.1.1 The proposed development would produce hydrogen from water by electrolysis using mainly renewable electricity. This is sometimes called ‘green hydrogen’. Hydrogen does not emit carbon dioxide when it is used as a fuel, making it a zero carbon fuel at the point of combustion.

3.1.2 The hydrogen would initially be supplied for blending with natural gas in the existing National Gas high-pressure gas network in order to aid in decarbonising industrial uses that rely on gas fuel in Scotland and the wider UK. Scotland has a policy target for 5 gigawatts (GW) of hydrogen production by 2030 and 25 GW by 2045.

3.1.3 By the early 2030s, a new hydrogen transmission backbone (repurposing existing pipes) is expected to have been developed under National Gas’s ‘Project Union’, enabling a pure hydrogen supply to industrial clusters across the UK as well as for long duration energy storage. Kintore Hydrogen Plant could then become a major source of hydrogen for supply via the Project Union pipeline. Funding for the feasibility phase of Project Union was approved by Ofgem in 2023.

3.1.4 The electricity would be supplied from Scottish and Southern Electricity Networks’ Kintore Substation. At the moment, notwithstanding SSEN’s proposed future East Coast backbone electricity powerline and all other planned transmission infrastructure upgrades (both onshore and offshore) capacity to transmit Scottish renewable power to the areas of high UK demand south of the border is and will be a constraint on Scottish renewables. This is leading to renewable generation being limited and ultimately could mean that the benefits from Scotland’s wind, wave and tidal power resources are not fully realised.

3.1.5 Producing hydrogen using abundant renewable power generation provides a solution to transmitting and storing this energy, in a form that can readily be used for industry and heating, making best use of existing natural gas infrastructure. National Grid Energy System Operator’s ‘Beyond 2030’ strategy identifies hydrogen production in north east Scotland as important to make best use of Scottish wind power and reduce the scale and cost of electricity transmission network upgrades that would otherwise be needed.

3.1.6 The raw water would be supplied from the River Don, which has sufficient capacity under a range of flow conditions to support the water demand of Kintore Hydrogen. Kintore Hydrogen has been issued an abstraction licence by SEPA under the Controlled Activity Regulations for this water supply.

3.1.7 The rate at which hydrogen can be blended with natural gas in the existing transmission network is dictated by a number of factors including the compatibility of gas users’ equipment to accept the hydrogen blend. This rate is likely to change over time as the UK’s hydrogen transition progresses, and ultimately pure hydrogen transmission is anticipated under Project Union. Kintore Hydrogen therefore intends to develop the facility and introduce its hydrogen supply in phases, starting with production capacity from up to 500 megawatts of electricity and then developing further phases to reach a planned 3,000 MWe capacity in total.

3.2 Site location and setting

3.2.1 The land within the planning application boundary can be divided into five parts:

- the main electrolysis plant site including temporary construction access and permanent access road;
- the electrical connection from Kintore Substation to the electrolysis plant;
- the underground hydrogen pipeline to a connection and blending point for export into National Gas’s existing National Transmission System (NTS);
- the water abstraction and discharge point, pumping and treatment station, and underground water pipelines to and from the River Don; and
- the riparian and other habitat creation and enhancement area on the east bank of the River Don.

3.2.2 The proposed electrolysis plant site is on land to the west of the existing Kintore Substation, around 2.8 km to the southwest of Kintore, Aberdeenshire.

3.2.3 The hydrogen export pipeline route corridor would run south and eastwards from the electrolysis plant site to a connection and blending point with the existing National Gas NTS. The connection point would be in farm land around 1 km south-west of the A96 and Kinellar.

3.2.4 The water pipeline route corridor between the electrolysis plant and the River Don would be through farm land to the south of Kintore, crossing under the A96 at the north edge of Kinellar. The water intake and discharge point would be on the south bank of the Riven Don near The Rushlach road, around 1.5 km south-east of the edge of Kintore.

3.2.5 The main electrolysis plant site encompasses an area of approximately 86 ha within the application boundary for this part of the development. Buildings, equipment and access are expected to require up to around 50 ha of the available site, with the remainder being used for landscaping, retained and enhanced habitat, preservation of a Scheduled Monument, and drainage. The overall planning application boundary is

approximately 137 ha in total. The hydrogen pipeline route is around 2.2 km long and the water abstraction and discharge pipeline route is around 7.7 km long.

3.2.6 The British National Grid coordinates are NJ762137 for the electrolysis plant site and NJ812153 for the water abstraction and discharge site at the River Don.

Site description

3.2.7 The electrolysis plant site is currently agricultural land with a fringe of bog woodland and gorse scrub at the northern edge where it is crossed by Dewsford Burn. There are farm tracks, field boundaries and smaller stands of coniferous trees and scrub in the central part of the site. It is gently undulating, with a low east-west ridge crossing the centre of the site and peaking at The Knock, a low prominence on the western boundary with a small stand of trees and high voltage electricity pylon.

3.2.8 The site is crossed by several high-voltage overhead power lines from Kintore Substation. The substation is currently being expanded westwards to the edge of the site by Scottish and Southern Electricity Networks. SSEN has also consulted on proposals for a new high voltage overhead power line from Kintore Substation to Tealing via Fiddes, which is expected to cross or be adjacent to the application site in its southern half.

3.2.9 To the immediate north of the site are the Stony Hill, Harthills and Bandshed Moss coniferous plantations on gently rising ground from the burn. Beyond that is a light industrial park with animal rendering plant, exhaust stack and wind turbine. To the south, west and east are farm land with woodland pockets, the B977 road from Kintore, two wind turbines, and scattered residences, farm buildings and rural businesses. Further east, the A96 dual carriageway delimits the edge of Kintore.

3.2.10 The underground hydrogen pipeline connection from the electrolysis plant to the National Gas NTS connection would be through farm land. Two existing National Gas high-pressure natural gas pipelines run from north to south, 1.3 km to the west of the A96 and close to Broomhill Plantation.

3.2.11 The water pipeline route would be from the electrolysis plant site through farmland, taking a south-easterly loop around Kintore, crossing under the A96 and then turning north to the River Don. Besides farm land along this route, crossings of a number of burns, the A96 and the Aberdeen–Inverness railway line (single track at this location) would be required. The intake and discharge point, on the south bank of a meander of the Don known as Dalweary Pot, would be on farm land at the river bank.

Site setting

Residential areas

3.2.12 The locality of the main electrolysis plant site is a rural setting with sparse population. There are around 40 properties within 1 km of the electrolysis plant site. The nearest residences along the unclassified road to Bogfold are next to the south edge of the electrolysis plant site and further properties at Leylodge off the B977 are around 380 m east of the site. There is a single residence at north edge of the area in which the above-ground installation for the hydrogen export pipeline connection to the National Gas NTS would be located.

3.2.13 There are a further two existing residences at Dewsford, between the proposed electrolysis plant and the extended Kintore Substation; however, these are expected to be acquired prior to operation of the development. A ‘Grampian’ type planning condition is proposed to secure this, such that commissioning and operation of the development cannot occur unless these properties are vacant. Operational impacts and effects on these properties as sensitive receptors would therefore not occur.

3.2.14 The more densely populated residential area of Kintore, which has a population of around 4,700, is approximately 2.3 km from the electrolysis plant site and 1.4 km from the gas pipeline connection point. The edge of Kemnay is around 2.6 km to the west of the electrolysis plant site.

3.2.15 The water pipeline route corridor through farm land is generally away from residential areas but passes a number of individual rural residences. The water intake and discharge point has three residences within around 300 m and permission for holiday cabins, under construction at the time of writing.

Nature conservation setting

3.2.16 There are no internationally-, nationally- or locally-designated nature conservation sites within a 5 km radius of the electrolysis plant site. Looking further afield, the nearest designated sites are:

- ‘Paradise Wood – 1271’ Site of Special Scientific Interest (SSSI) approximately 9 km southwest of the electrolysis plant site;
- ‘Tilliefoure Wood – 1538’ SSSI approximately 10 km southwest of the electrolysis plant site;
- ‘The Loch of Skene – 1038’ SSSI and SPA approximately 4.8 km south the water pipeline corridor but more than 5 km from the electrolysis plant site;
- ‘Arnhall Moss – 8128’ Local Nature Reserve approximately 6.2 km south the water pipeline corridor; and

- The 'Ythan Estuary, Sands of Forvie and Meikle Loch' SPA is located more than 16 km from the application boundary but is mentioned as the River Don estuary discharges into the SPA area.

Landscape or townscape and cultural heritage setting

3.2.17 The landscape context is generally a mixture of relatively flat farm land with frequent drainage channels and burns, occasional deciduous and coniferous plantation woodland, farm buildings and rural residences. The A96 dual carriageway is a key transport corridor and defines the edge of the more built-up area of Kintore, which includes a business park and industrial estate.

3.2.18 Existing energy uses are clearly visible in the landscape, with eight high-voltage overhead powerlines and their towers radiating in all directions from Kintore Substation and two wind turbines also developed south of the substation.

3.2.19 The whole planning application boundary lies within the Scottish Natural Heritage (SNH) National Landscape Character Type 26: Wooded Estates – Aberdeenshire. Low hills and wide valleys with dense woodland are consistent features within this character type which covers a large area between the Don and Dee valleys. Within this overall characterisation, further subdivisions into undulating open or forested farmland and more settled or industrial areas can be made based on local landscape character types.

3.2.20 The Stony Hill and Harthill plantations to the north of the electrolysis plant site (outside its boundary) are designated as Ancient Woodland and there are other pockets of Ancient Woodland at locations adjacent to the water and hydrogen pipeline routes.

3.2.21 There are protected cultural heritage assets within and nearby to the application boundary. A stone circle Scheduled Monument (reference SM 12350) is in the south part of the electrolysis plant site. Two cattle rubbing stones (one of which was confirmed by survey as a natural feature, a glacial erratic) and a possible burial cairn have also been identified within the electrolysis plant site during baseline surveys. The remains of Aberdeenshire Canal, a Scheduled Monument on the south side of the Aberdeen to Inverness railway line (ref. SM7675) is next to a proposed temporary construction compound for work on the water intake and discharge.

3.2.22 In the wider landscape there are a number of other standing stone and enclosure Scheduled Monuments and various church, farmhouse and walled garden Listed Buildings.

Water, soil and geological environment

3.2.23 The proposed development is within the catchment of the River Don and the various parts of the application boundary are drained by several tributaries to the Don: Tuach Burn, Dewsford Burn, Park Burn, Black Burn, Tillakae Burn and Sheriff Burn. There are no Drinking Water Protected Areas (Surface Water) within 5 km of the application boundary.

3.2.24 Flood mapping published by the Scottish Environmental Protection Agency (SEPA) shows that flood extents are typically confined to the watercourse corridors, save near the confluence of the Park Burn and Tillakae Burn where a wider floodplain is noted.

3.2.25 The electrolysis plant site is underlain by bedrock comprising the Aberdeen Formation (psammite and semipelite) to the east and the Kemnay Pluton (granite and foliated-muscovite-biotite) to the west.

3.2.26 The bedrock is overlain by superficial deposits of Banchory Till (glacial till). An area of lacustrine deposits (clay, silt and sand) is located within the centre of the site, whilst alluvium and glaciofluvial deposits (clay, silt, sand and gravel) are recorded within the northern extent of the site and adjacent to the main watercourses. The hilltops locally are shown to be absent of any superficial deposits.

3.2.27 The majority of the superficial deposits (near surface geology) as well as the underlying bedrock beneath the site are unlikely to contain significant amounts of groundwater. The bedrock has been classified by the British Geological Survey as a low productivity aquifer, where small amounts of groundwater may be present within the near surface weathered zone and fractures.

3.3 Electrolysis process

3.3.1 The electrolysis process uses electricity to split water (2 H_2O) into hydrogen (2 H_2) and oxygen (O_2). A simple process diagram is illustrated in Figure 3.1.

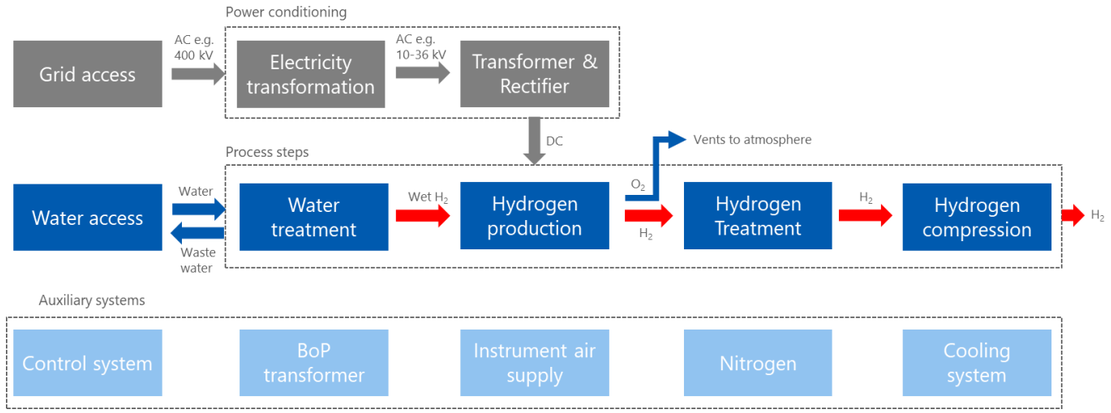

Figure 3.1: Electrolysis process diagram

3.3.2 The inputs to the electrolysis cells are fresh water and electricity. The outputs are separate streams of hydrogen and oxygen at the cathode and anode of the cell respectively.

3.3.3 The key steps of the hydrogen production would be as follows.

1. The incoming high-voltage alternating current (AC) power is converted to into lower voltage direct current (DC) power and distributed to the electrolyser modules.
2. An inlet water supply to a water treatment plant is used to produce demineralised water.
3. The electrolyser modules use the water and electricity to generate hydrogen and oxygen.
4. Hydrogen is treated to ensure its quality requirements for export are met. This can include cooling, drying and oxygen removal.
5. Hydrogen is compressed to reach the pressure level allowing it to be injected into the high-pressure gas transmission network.
6. Oxygen is safely vented to atmosphere.
7. Auxiliary systems, such as the control system, cooling system, instrument air system, and an inert gas (nitrogen) system are in place to enable the plant to operate.

3.3.4 The electrolysis process at full capacity would consume up to 1,836 cubic meters (m^3) of water per hour and 3 gigawatt-hours (GWh) of electricity to produce up to 54 tonnes per hour of hydrogen for export. Production at full capacity would not be continuous, and accounting for variability in the renewable electricity market, is expected to be around 40% of the maximum capacity as an average over a year. This would mean annual export of up to 190,646 tonnes of hydrogen (6,355 GWh) from 6.43 Mm^3 of water and 10,512 GWh of electricity.

3.4 The main electrolysis plant

3.4.1 In overview, the main buildings, structures and equipment of the electrolysis plant would be:

- electrolyser cells and associated infrastructure (including gas treatment equipment) inside or external to the buildings, and oxygen vent pipes;
- electrical switchyard and transformers;
- hydrogen scrubber, compressors and auxiliaries for export;
- an enclosed ground flare for hydrogen;
- nitrogen generation and storage;
- compressed air generation and storage;
- external cooling system with cooling towers and pumps;
- water treatment building and tanks;
- firewater tanks;
- control room, workshop and stores buildings;
- gatehouse, internal access and circulation roads and parking;
- site drainage, runoff attenuation ponds and underground services; and
- perimeter security fencing, lighting and CCTV.

3.4.2 These would be developed within the areas shown in the Planning Parameters Plan accompanying the planning application, reproduced as Figure 3.3, below.

3.4.3 Figure 3.2 gives an illustration of one potential site layout within the areas defined by the Planning Parameters Plan and an indication of the approximate footprints of buildings and equipment. This illustrates the intention to make best use of the more visually screened northern half of the site.

3.4.4 If buildings are used for the electrolyser units, these would be steel-framed and steel-clad structures of up to around 16 m height to the ridgeline, with heights varying across the site as recommended by the landscape and visual assessment. If electrolysis and gas treatment equipment is external to buildings it would be within this height. The high pressure hydrogen export compressors would be housed in a sound attenuating structure with ventilation system.

3.4.5 Oxygen from the electrolysis process would be exhausted via a series of vent pipes which may be on the roof or walls of the electrolyser buildings or among external equipment. In the north of the site, there would be a freestanding enclosed ground flare up to 30 m high to safely manage small quantities of hydrogen during start-up, shut-down and maintenance events for the electrolysis modules, and also to provide a safe way to de-pressurise the plant during an abnormal operational event. An enclosed ground flare is one that, as the name suggests, places the burners themselves close to ground level rather than at the top of an elevated flare stack; the enclosure is a circular heat- and wind-shield around the flame, largely or fully hiding it.

3.4.6 A water treatment plant would filter and demineralise raw water supplied from the River Don to produce very pure deionised water for use in the electrolysis. The water treatment plant would have a discharge water stream post-treatment that would be returned to the River Don.

3.4.7 A cooling water system is required to keep the electrolysis cells at a stable temperature for efficient operation and also to cool the hydrogen between various stages of

compression for export to the gas grid. A typical 'hybrid' cooling system would be a series of cooling towers with internal fans, which draw air in through louvres at the base, through a water mist system and then through a heat exchanger.

3.4.8 An electrical switchyard would have transformers and associated equipment to distribute power to the electrolysis plant, from the underground cable grid connection to Kintore Substation. This may be either an air-insulated system (AIS, with equipment not enclosed in buildings) or may include gas-insulated switchgear (GIS) inside buildings, or a combination of both for different phases of the development.

3.4.9 The proposed development would be capable of operating on up to a 24/7/365 basis (with periods of downtime for planned maintenance) to enable flexibility in hydrogen production. In practice actual operation of the site would likely be around 30-40% of that time over the course of a year, to respond to intermittency of renewable energy generation peaks.

3.4.10 The main electrolysis site would be staffed in a shift pattern with employees holding a variety of skillsets for operating the control room, undertaking maintenance and providing site security and administration. An operational workforce of typically 30-50 full-time equivalent (FTE) staff in total, across two or three shifts, is expected for the initial 500 MWe phase of development. For the full 3 GWe development this is expected to rise to 200 FTE staff.

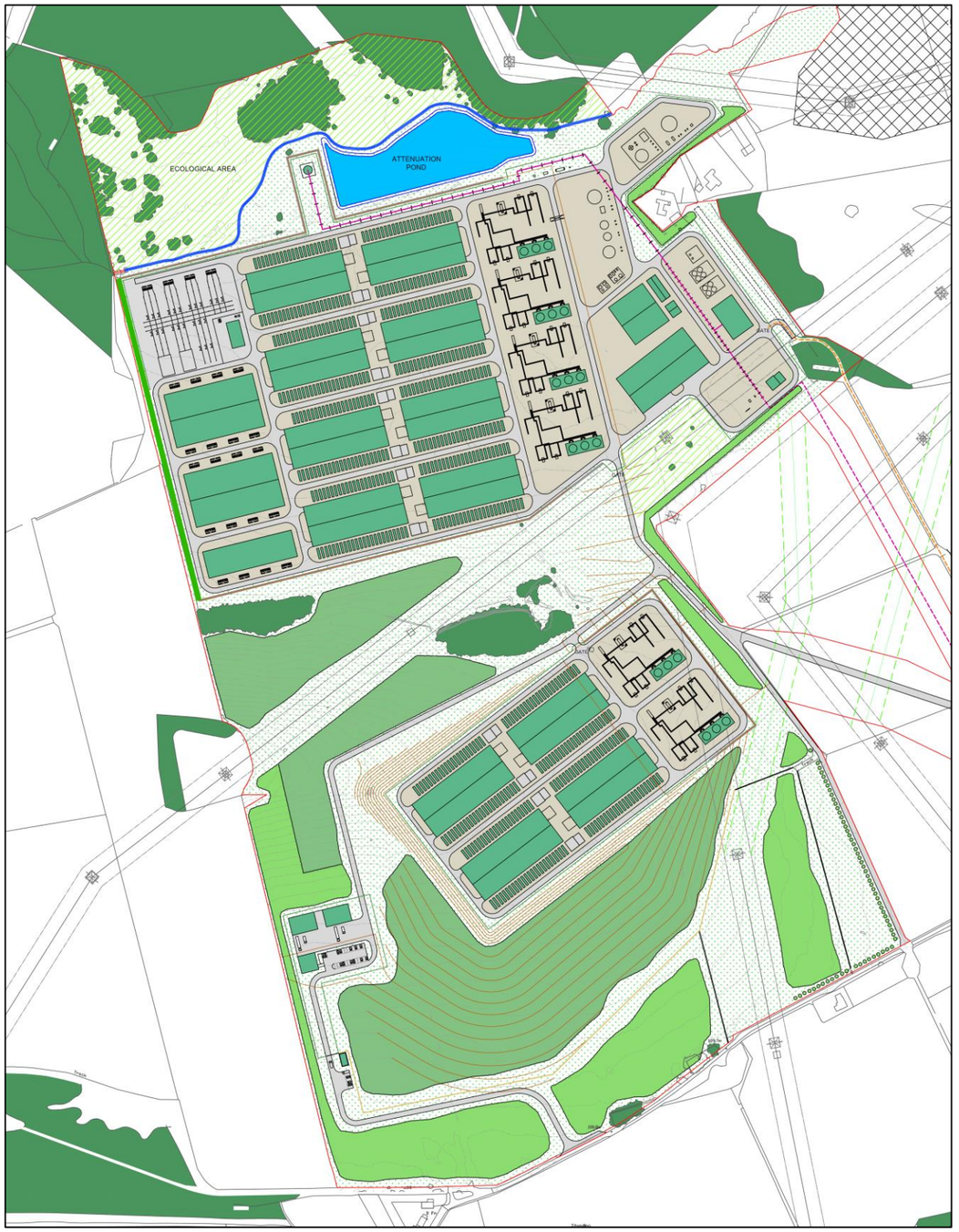

Figure 3.2: Illustrative electrolysis plant layout

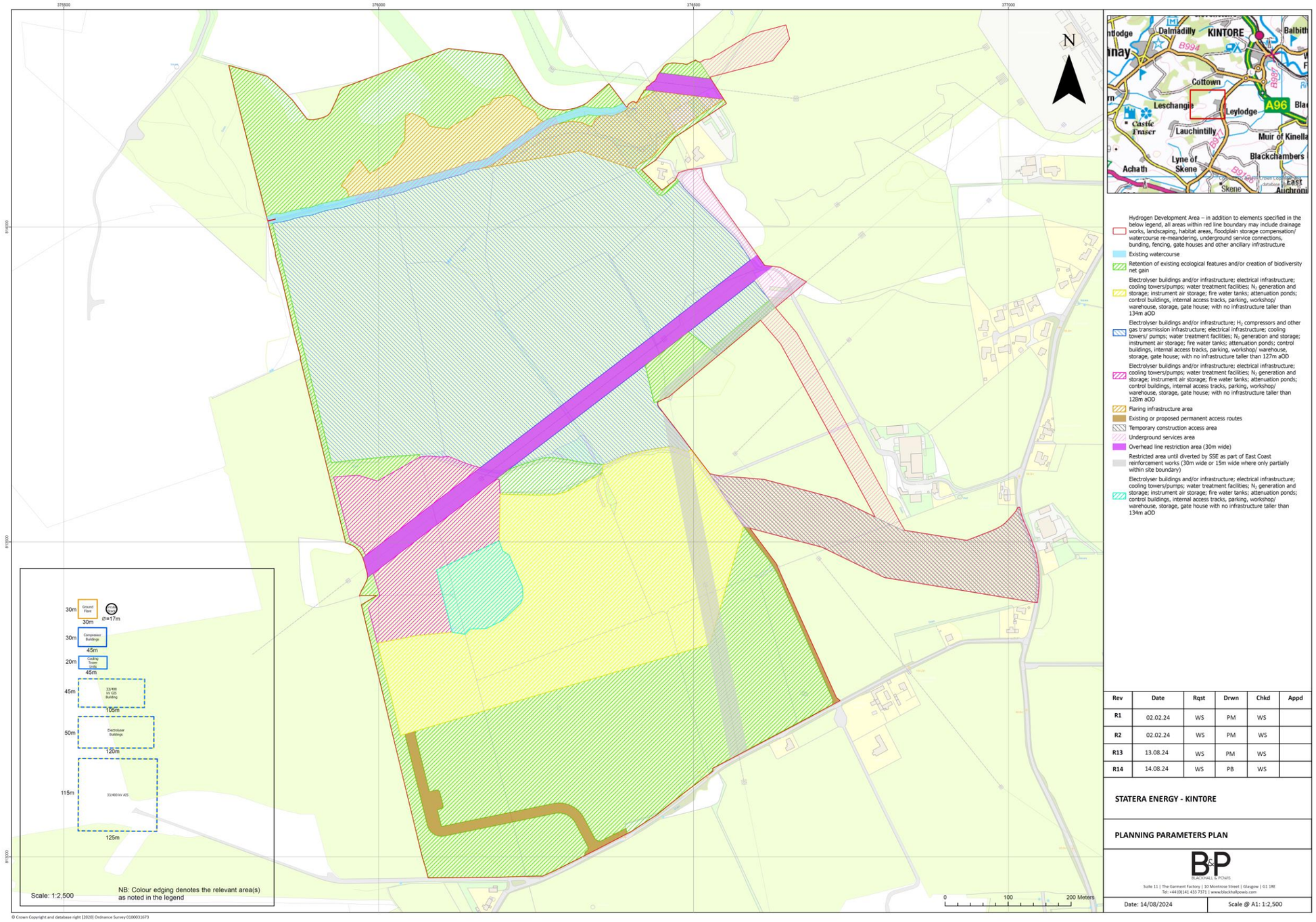

Figure 3.3: Planning Parameters Plan

3.5 Connections

3.5.1 Electricity supply would be via underground cable from Kintore Substation, into which Kintore Hydrogen has a contracted 3GW connection.

3.5.2 Hydrogen export would be via up to two stainless steel pipelines, each around a half meter in outer diameter (though only one will likely be needed), connecting the electrolysis plant site to an above-ground installation where a blending point with the National Gas NTS would be located. They will export hydrogen at a similar pressure to the existing high-pressure gas transmission network.

3.5.3 The water supply from the River Don would be via two parallel pipelines each slightly greater than a half meter in outer diameter, which can supply up to around 2,800 m^3 of water per hour in total. The return for water discharge would be via a similar single pipeline laid in parallel with the supply. The return pipeline capacity would be up to around 970 m^3 per hour.

3.5.4 The hydrogen and water pipelines would be mainly laid in trenches at around 1.5–2.0 m depth with soil cover of at least 1 m reinstated above the pipes. During construction, a typical working corridor width of around 30 m would be required for machinery access and temporary spoil piles when installing the pipelines.

3.5.5 Crossings of features such as watercourses and roads along the pipeline route would use 'trenchless' techniques where required to avoid disturbance from trenching, such as for the A96 and railway crossings. This can involve drilling a tunnel for the pipelines under the obstacle to be crossed, following which the pipe sections can be inserted, without disturbing features at the surface.

3.5.6 Temporary access points, hedgerow removal, working compounds, pipeline laydown areas and drilling machinery compounds where trenchless techniques are employed are likely to be required along the pipeline route during construction. These would be reinstated to the existing condition after construction.

3.5.7 Kintore Hydrogen will retain land rights to access the pipeline routes for potential inspection or maintenance in operation, but land above the pipelines can be farmed, including ploughing.

3.5.8 At the connection point where the hydrogen pipeline tees into the existing National Gas NTS, equipment above ground would be required for the exported hydrogen to be blended into the natural gas supply (or, in the future, a 100% repurposed hydrogen network). This would be located in a fenced and hedged compound of up to around 1.6 ha) in size. Within this would be sections of pipeline above ground where the hydrogen is blended into the natural gas, to enable access for maintenance and inspection, together with monitoring equipment.

3.5.9 The water intake and discharge point would be located on the south bank of the River Don. The buried pipelines would exit the river bank below the normal river water level through a self-cleaning fish and debris screen with a concrete structure to support it. No weir impinging on the river is required but works will be required to the river bed and bank to construct the pipes, screens and supporting structure.

3.5.10 From the intake point, the two intake pipelines would run to a buried pumphouse located outside the flood plain area. The pumphouse would be a vertical shaft belowground with a sump at the buried pipeline level, and pumps located in a single storey building at ground level.

3.5.11 Depending on further design work of the pump system and ongoing monitoring of sediment loads in the river, it is possible that an initial filtration and settling stage of water treatment at the pumping end of the water pipelines would be required, to reduce the risk of sedimentation in the pipelines. If required, this would be in single storey structures in an area of up to around 0.6 ha, including pumphouse).

3.6 Access

3.6.1 Operational access to the electrolysis plant site would be via a security gatehouse and private road in the south of the site, from a new junction to be constructed on the unclassified road off the B977 near Leylodge. The B977 is a two-lane road providing ready access to the A96 via the B994 and B987.

3.6.2 Access to the hydrogen pipeline connection point to the National Gas NTS would also be taken from the B977, around 400 m from the roundabout with the B994, using an existing private farm access road.

3.6.3 Limited car parking for 40 staff and visitors would be provided within the electrolysis plant site together with electric vehicle charging and cycle storage. To manage travel sustainably, It is not proposed to provide car parking within the electrolysis plant site for the full complement of operational staff per shift in single-occupancy vehicles. A Framework Operational Staff Travel Plan (in Volume 3, Appendix 9.1) sets out the proposed measures to limit traffic and encourage sustainable transport options, which includes providing a shuttle minibus service from Kintore Train Station and/or park and ride facilities.

3.7 Landscaping and habitat creation

3.7.1 Landscape planting and habitat creation would be included as part of the proposed development. The proposed landscaping includes perimeter tree and hedge planting to aid in screening views of the development. This would be implemented as part of Phase 1 of the development, providing the maximum time for planting to become established and achieve its visual impact mitigation as further phases are brought forwards.

3.7.2 The existing stands of trees and tree/hedge areas at the electrolysis plant site perimeter would be retained. Throughout the application boundary, where any temporary loss is required, for example in construction of the construction access road, hydrogen export pipeline or electrical export route, this would be reinstated.

3.7.3 The Design Principles Statement includes an Illustrative Landscape Masterplan (reproduced here as Figure 3.1) and proposals for a Landscape Management Plan incorporating aftercare and maintenance during the short term (2-5 year establishment period) and long term (ongoing maintenance).

3.7.4 In addition to landscape planting and habitat management for enhancement within the main areas of the proposed development, Kintore Hydrogen has also proposed a further area of land along the River Don, south of Kintore, for new habitat creation.

3.7.5 The goal of this is to provide high quality riparian habitat with wildflower grassland and lowland woodland, contributing to biodiversity net gain achieved by the proposed development. An Outline Biodiversity Enhancement and Management Plan at Volume 3, Appendix 8.18 of this EIAR describes the proposals for habitat management and creation.

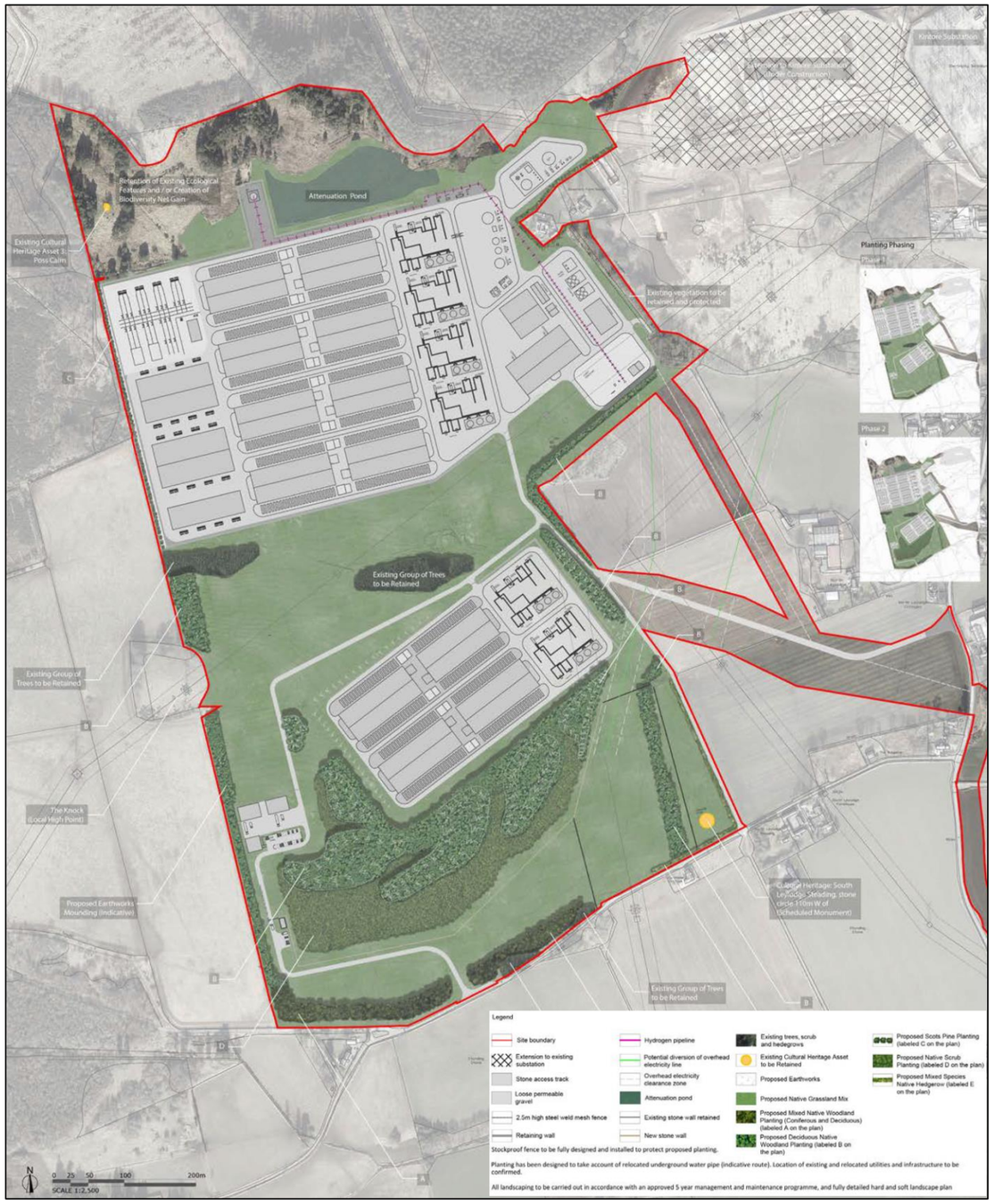

Figure 3.1: Illustrative landscape masterplan (electrolysis plant site)

3.8 Construction

3.8.1 Kintore Hydrogen expects to develop the facility in at least two phases. The first phase would provide up to 500 MWe of electrolysis capacity. Subsequently, the remaining planned 2,500 MWe capacity could be built in a single second phase or a series of further 500 MWe phases, subject to market conditions, electricity supply agreement with SSEN, progression of hydrogen blending in the UK gas network and progression of Project Union.

3.8.2 Subject to planning permission and a final investment decision, construction start is intended in 2026 (with the possibility of enabling works in 2025). The construction programme for the first phase is anticipated to be around 36–48 months, enabling commissioning by 2029. In this phase the first electrolysis buildings and associated equipment would be constructed together with the site access, pipeline routes and water and hydrogen connection points. Landscaping and habitat creation would also be done in this phase.

3.8.3 In subsequent phases, the balance of plant capacity and equipment on the electrolysis plant would be built. Overall, completion of all construction is anticipated in the early 2030s. As set out above, construction would be intermittent in phases during the 2026 to early 2030s period.

3.8.4 During each phase of the development, an average construction workforce of around 860 full-time equivalent (FTE) is anticipated, with a peak during certain stages of work at 1,430 FTE. The main construction compound and laydown area would be within the main electrolysis plant site.

3.8.5 Construction working hours would be 08:00–18:00 Monday to Saturday, with no working on Sundays or Bank Holidays. Works inside buildings and non-noisy works may be undertaken outside these hours where required, such as during the commissioning work.

3.8.6 A dedicated construction access road from a new junction off the B977 would be provided. This would be a temporary access, retained for the duration of the phased construction. Following construction, the temporary access road would be removed, but the junction with the B977 would be retained (closed to traffic) in case it is needed in future to bring a large load in as part of site maintenance.

3.8.7 It is not proposed to accommodate car parking within the electrolysis plant construction site for the full complement of construction workers in single-occupancy vehicles. The draft Construction Traffic Management Plan (see Volume 3, Appendix 9.1) sets out the proposed measures to provide modal shift to sustainable transport options, which includes provision of a shuttle minibus service from Kintore Train Station and/or park and ride facilities.

3.8.8 Access to the above-ground installation for construction of the hydrogen pipeline connection to the NTS would be taken from the B977, around 400 m from the roundabout with the B994, using an existing private farm access road with resurfacing where needed.

3.8.9 Access to construct the water intake and discharge point with pumping station would be taken from The Rushlach road via an existing level crossing and, if necessary, from further east off the B979 with a temporary haul road in farm land adjacent to the railway alignment. This could help with access by construction machinery to the north side of the railway. Access to construct the water pipeline route corridor would be taken at a number of locations from roads along the route.

3.9 Decommissioning

3.9.1 Kintore Hydrogen is not applying for planning permission with a time limit on operating the proposed development. It would have an initial design lifetime of around 35 years. Further operation beyond that timescale would be dependent on prevailing market conditions. The assets, if in continuing use, would be refurbished and upgraded as required, and would follow any necessary approvals process in place at that time. Alternatively, it would be decommissioned with structures removed from the site, following an approval process and method statement agreed at the time.

3.9.2 Decommissioning activities are therefore expected to have similar impacts construction and have not been separately assessed.

3.10 Alternatives considered

3.10.1 As part of EIA, reasonable alternatives to the proposed development that have been studied by the applicant must be reported together with the reasons for the option chosen. Kintore Hydrogen has done this in two stages to select the proposed development location and design, taking into account findings of EIA work and feedback from pre-application consultation.

3.10.2 In the first stage, the broad area to locate the proposed development was chosen based on its fundamental requirements for hydrogen production: an electricity grid connection, gas grid connection and water supply.

3.10.3 In the second stage, Kintore Hydrogen has then considered specific aspects of design, scale, technology and opportunities for environmental enhancement for the development on the identified site.

3.10.4 It should also be noted that Kintore Hydrogen Plant will require a Pollution Prevention and Control (PPC) Permit from the Scottish Environment Protection Agency (SEPA) before it can operate. Obtaining a PPC Permit is subject to a detailed justification of 'Best Available Techniques' (BAT) approved by SEPA. Specific technology choices and detailed engineering design of the hydrogen production process is governed by the PPC permitting regime.

3.10.5 The fundamental requirements of the hydrogen production process are sufficient supplies of water and electricity and a route to transmit the hydrogen for use. All three elements are essential, but to utilise up to 3 GW of electricity for hydrogen production as proposed, there must be available capacity at a suitable substation on the backbone high voltage transmission network.

3.10.6 The North East of Scotland comprised the initial site search area as this is identified by National Grid Energy System Operator and the Department of Energy Security and Net Zero as the optimum for hydrogen production. Within this region, Kintore Hydrogen considered areas around seven high voltage transmission network substations plus two just outside the region, screening them for significant environmental constraints (such as nationally- or internationally-designated sites of ecological, heritage or landscape protection), landscape character and level of existing development. From this, Kintore Substation emerged as the clear preference due to best satisfying the project requirements and the balance of environmental constraints.

3.10.7 Once Kintore Substation was chosen as the preferred area, sites for the electrolysis plant and routes for the water, electricity and hydrogen export connections were considered. These included alternative electrolysis plant sites (for example on land further east, across the B977), an alternative hydrogen pipeline route south to Garlogie, and alternative water pipeline routes.

3.10.8 The proposed main electrolysis plant site is immediately adjacent to Kintore Substation, providing the shortest grid connection, minimising the trenching for underground cables and avoiding any need for new overhead power lines. The land form of the site is favourable, providing the opportunity to locate the majority of the electrolysis plant buildings and equipment tucked behind the site's central ridge, between it and the woodland to the north, which has been strongly advantageous for minimising landscape and visual impacts. Being on land as close as possible to the substation keeps the area of energy infrastructure development localised.

3.10.9 Other sites did not have sufficient available land or had greater environmental constraints; and other hydrogen pipeline and water pipeline routes were longer and considered likely to have greater environmental impacts and road network disruption during construction.

3.10.10 Masterplanning of the electrolysis plant layout and the detailed siting of aspects such as access routes, the water intake and discharge location and the hydrogen export connection point to the existing gas transmission network has encompassed a number of design alternatives informed by the EIA and consultation.

3.10.11 The electrolysis plant site layout has been iterated to locate buildings insofar as possible to the north, minimising visibility behind the ridge; to retain existing trees and higher value habitat which stands out from the farmland on the site; and to vary building heights following the site's landform to minimise their visibility.

3.10.12 Two options for Dewsford Burn in the north of the electrolysis plant site have also been considered and are proposed to be subject to selection of the preferred option for approval prior to construction. Surveys suggest that Dewsford Burn has been canalised (artificially straightened) in the past at this location, probably as part of improvement works to drain farmland. The burn could be retained in its current configuration, delimiting the northern edge of the built development (aside from the hydrogen flare and attenuation pond, which could be north with a bridge over the burn). This would have the advantage of minimising hydrological disturbance. Alternatively, the burn could be re-meandered with a more naturalistic course to the north of its current channel. This would offer the opportunity to provide further habitat enhancement in this area, where there are surface water dependent ecosystems, and would avoid any development north of the burn.

3.10.13 The proposed construction and operational access points have been iterated to ensure safe visibility for turning from the junctions and to avoid a section of privately owned road.

3.10.14 The proposed water intake and discharge location has considered based on the flow capacity of the river, feedback from the fishing community about avoiding the location of the most productive fishing lies, and access across the railway for construction while avoiding unsuitable development in the flood plain.

3.10.15 Following stakeholder engagement, including with the River Don Trust, an additional area of wetland habitat creation on farmland along the east bank of the Don, south of Kintore, has also been included in the proposed development.

3.10.16 Overall, a wide range of alternatives both as to the location and specific matters of design and environmental protection for the proposed development have been considered, including a number of additional points of detail that are described fully in Volume 2, Chapter 3: Alternatives of this EIAR. It is considered that the proposed development is the environmentally preferred option among those alternatives studied.

4 Environmental Impacts

4.1 Environmental impacts studied

4.1.1 Environmental impact assessment studies have been carried out for the following topic areas, agreed with Aberdeenshire Council and consultees through the EIA scoping process.

- Landscape and visual resources
- Archaeology and cultural heritage
- Ecology and biodiversity
- Transport and access
- Noise and vibration
- Air quality
- Climate change
- Soils, geology and the water environment
- Population and health
- Socio-economics

4.1.2 Volume 2 of this Environmental Impact Assessment Report (EIAR) has a chapter about each of these topics and Volume 3 has appendices providing further technical information about each. The structure of the whole EIAR is set out in Section 5 of this Non-Technical Summary.

4.1.3 The following sections describe the baseline environmental information gathered, the impacts that have been assessed, the mitigation measures and the conclusions about the significance of predicted effects for each topic.

4.2 Landscape and visual resources

4.2.1 The character of the existing landscape is described in publications from NatureScot as 'Wooded Estates – Aberdeenshire', which is "*a landscape of low hills and wide valleys, with dense woodland as a consistent feature*". A finer-grained landscape characterisation for this EIA has found a mixture of more undulating open farmland, with areas of commercial forestry and a relatively well-settled rural landscape crossed by a number of roads (including the A96 dual carriageway) and the railway to Kintore.

4.2.2 There are areas with a more industrial character along the A96 transport corridor, around the edges of Kintore and near Kinellar, and an area where substantial electricity infrastructure is apparent around Kintore Substation (including completed and under-construction extensions), the high-voltage overhead power lines radiating from it, and battery storage development.

4.2.3 The application site is not within or near any nationally designated (protected) landscape. The nearest designated landscape is the locally-designated Bennachie Special Landscape Area to the east, which has its boundary at the B993 road through Kemnay.

4.2.4 The area within which Kintore Hydrogen Plant could theoretically be visible was initially worked out based on the tallest part (the enclosed hydrogen ground flare stacks at up to 30 m) and information on ground heights on the site and surrounding landscape. In consultation with Aberdeenshire Council, representative locations were selected for photography of the existing landscape and views. These locations included paths, roads and residential areas.

4.2.5 The height and shape of the completed hydrogen plant have then been considered in the assessment of visual and landscape character impact during operation, using the baseline photography from the viewpoints and 'wireline' or 'photowire' outlines of the maximum dimensions for the proposed development main buildings.

4.2.6 As committed mitigation, the Planning Parameters Plan has set limits on building heights (relative to the existing ground levels) in different areas of the main electrolysis plant site to best use the existing landform to reduce the visibility of the development. It also reserves areas for landscape planting around each part of the development to further screen it from views.

4.2.7 Before further mitigation, localised significant adverse effects on the 'undulating open farmland' local landscape character area are predicted, focused around the proposed electrolysis plant site. These effects would be most prominent during the construction phase and would reduce during the operational phase. This would be an intensification of the energy generation and transmission industrial infrastructure around Kintore Substation.

4.2.8 Effects on other parts of the landscape character areas and on the Bennachie Special Landscape Area would be non-significant.

4.2.9 Further mitigation and enhancement including landscape planting and earthworks, combined with sensitive architectural design and masterplanning of the proposed development, is proposed as described in the Design Principles Statement accompanying the planning application. It is anticipated that with the effective implementation of these measures (secured by a planning condition and approval of details of design and landscaping), long-term operational effects on landscape character would be reduced to a non-significant level.

4.2.10 Before further mitigation, during construction and operation there would be a small number of localised significant adverse effects on views from properties at Dewsford, Leylodge and Bogfold/Drumnaheath/Wardes, and from a short section of the B977, where these properties and locations are in close proximity to the electrolysis plant site and have direct or partially filtered views of the works.

4.2.11 Visual effects at all other receptors in the wider study area would be non-significant due to factors such as intervening landform, buildings and vegetation, the distance of views and the existing context of electricity infrastructure.

4.2.12 With the further mitigation and enhancement in place, described above, the visual effects can be further reduced during the operational phase of the proposed development. This is likely to reduce visual effects to a non-significant level for all but, perhaps, properties at Drumnaheath, where some significant effects may remain to three or fewer properties due to more elevated views to parts of the electrolysis plant site. It is considered that maturing of screening planting of the type proposed in the Illustrative Landscape Masterplan in the Design Principles Statement, and other design measures described in this document, could potentially reduce effects to not significant for these receptors too in the longer term.

4.2.13 Overall, the landscape and visual impact assessment has predicted that prior to further mitigation, there would be localised significant landscape and visual effects occurring during the construction of the proposed development, within an area in the immediate context of the proposed electrolysis plant site. During operation, the majority of these effects would reduce following completion of construction activities, although a small number of significant landscape and visual effects would still be experienced from areas closest to the proposed electrolysis plant site. Within other parts of the wider study area, the majority of landscape and visual effects would be non-significant.

4.2.14 It is anticipated that with the proposed further mitigation and enhancement measures, to be approved in detail in line with the Illustrative Landscape Masterplan and the Design Principles Statement, adverse landscape and visual effects can be further reduced in significance.

4.3 Archaeology and cultural heritage

4.3.1 Records of the historic environment in the area of the proposed development have been gathered from publications and through consultation with Historic Environment Scotland and Aberdeenshire Council Archaeology Service (ACAS). This includes consulting records of archaeological finds and the locations and features of any specific protected heritage assets such as Scheduled Monuments, Listed Buildings, battlefields and Gardens and Designed Landscapes in the study area around the proposed development.

4.3.2 A field survey of the proposed development site has also been carried out to identify any unrecorded heritage assets visible above ground level and to view the condition of known assets. Further archaeological investigation is proposed prior to construction, discussed below.

4.3.3 Twenty-eight cultural heritage assets were identified within the application site boundary. The majority of these are related to the post-medieval agricultural landscape (such as cattle rubbing stones, field boundary walls and farm outbuildings) and are of low sensitivity to impact. There is one Scheduled Monument, a prehistoric standing stone and stone circle, in the south-east corner of the electrolysis plant site near Leylodge Steading, which is of high sensitivity. There is a milestone for the former 19th century Aberdeenshire Canal near to a proposed temporary construction access track to the water intake/outfall point, and a possible prehistoric burial cairn was found during field survey of the northern part of the electrolysis plant site near Dewsford Burn; these are each of medium sensitivity.

4.3.4 Within the wider study area outside the application boundary, there are a number of Listed Buildings in the vicinity of the water pipeline route, four Scheduled Monuments related to prehistoric settlement, and a section of the former a section of the Aberdeenshire Canal (now infilled) adjacent to a proposed temporary construction compound for the water pipeline works, which is of high sensitivity.

4.3.5 There is considered to be a moderate potential for hitherto unrecorded archaeological remains from the prehistoric period, with less potential for unrecorded medieval and post-medieval sites, to be present within the application site boundary.

4.3.6 As designed-in mitigation, the proposed development avoids construction works that would physically disturb the standing stone Scheduled Monument and the burial cairn found within the electrolysis plant site. These are within areas proposed for retaining and enhancing existing habitat and for landscape planting, which are designed to retain the heritage assets and be sensitive to their setting. The construction compound location, access and area of water pipeline and pumping station construction works have been designed to avoid physical impact on the Aberdeenshire Canal Scheduled Monument.

4.3.7 An assessment has also been made of potential for visibility of the development or changes in landscape character to affect the setting of designated heritage assets, including a series of visualisations of the proposed development using baseline viewpoint photography taken at seven assets selected through EIA scoping and

consultation. Designed-in mitigation of the development's visibility has been discussed in section 4.2, above.

4.3.8 No significant adverse effects on the integrity or setting of known heritage assets are predicted.

4.3.9 It is possible that construction activities could also disturb or destroy any hitherto unrecorded buried archaeological remains, resulting in impacts potentially of up to a high magnitude which could be significant.

4.3.10 As further mitigation prior to construction, a programme of archaeological recording and mitigation has been recommended in order to preserve by record any archaeological remains which may be found. The archaeological investigation would be agreed through consultation with ACAS and set out in an approved Written Scheme of Investigation prior to construction work. The Outline Construction Environmental Management Plan includes arrangements for an Archaeological Clerk of Works to manage the investigation and also manage investigation of any further unforeseen archaeological discoveries made by construction contractors.

4.4 Ecology and biodiversity

4.4.1 Information about the existing habitats and species has been gathered from the North East Scotland Biological Records Centre, the North East Scotland Biodiversity Partnership, the Scottish Ornithologists' Club, Aberdeen, the River Don Trust and a range of NatureScot and SEPA publications and resources.

4.4.2 Site-specific ecological surveys have been made in 2022–2024. These involved initial habitat and botanical (vegetation) surveys, recording the type and condition of habitats across the application site and its immediate surrounds. Further species surveys were made where existing records, consultation with stakeholders and/or the habitat surveys suggested that protected species may be present. These included surveys for presence of otter, water vole, pine marten, squirrel, hedgehog, brown hare and badger and their setts; reptiles, amphibians and invertebrates; bird and bat roost surveys and recording of species foraging; wintering bird surveys of goose species; and fish and freshwater pearl mussel surveys. A National Vegetation Classification survey was made of wetland areas that had potential to either be groundwater dependent terrestrial ecosystems or to be Priority Habitat types in the Scottish Biodiversity List.

4.4.3 In the assessment of ecological impacts, the significance of effects is described on a scale of 'site level', 'local', 'county', 'regional', 'national (Scotland)', 'national (UK)' to 'international' depending on the importance and rarity of ecological features affected. The lowest levels of significance are at the 'site' and 'local' level, where habitats and species are common or widespread or are important in the local area.

4.4.4 Land within the application boundary is mainly in agricultural use for grazing and cereal crops, with limited habitat value. Within the electrolysis plant site there are stands of trees on the central ridge and an area of lowland fen habitat with purple moor-grass and rush pasture, gorse and mixed scrub in the northern part of the site, largely north of Dewsford Burn. There is ancient plantation woodland immediately to the north. Within pipeline corridors, the gas connection point and water intake/outfall location, besides agricultural land, there is riverine habitat, several burns, and various neutral grassland and native and non-native trees and hedgerow species.

4.4.5 The potential areas of groundwater dependent terrestrial ecosystems, once surveyed, were found not to have groundwater dependence.

4.4.6 Six invasive and non-native species were recorded within or adjacent to the application boundary: giant hogweed, Japanese knotweed, monkeyflower, white butterbur, Himalayan balsam and water crowfoot.

4.4.7 A number of bat species were recorded foraging within the application boundary, including Leisler's bats, which are rarely recorded in the north east of Scotland and considered Near Threatened on the Red List for Scotland's Mammals. Twenty-four trees were surveyed as having moderate or high suitability for bat roosts; farm buildings were also surveyed but no bat roosts found.

4.4.8 Several badger setts were recorded in and around the development site with signs of use. Badger are common and widespread in Scotland, with moderately high densities being estimated for main setts in the Grampian region. Widespread suitable habitat for hedgehog, pine marten, red squirrel, brown hare and amphibians was found in the application site and surrounding area, with some sightings. One otter holt and various rest sites and other signs of otter were found along the banks of the River Don and Silver Burn, but no evidence of otter was identified throughout the remainder of the application site. A significant proportion of the UK's otter population are found in the north of Scotland, where numbers are considered to be flourishing.

4.4.9 Common lizards were found within the scrub habitat at the north of the electrolysis plant site. No other reptile species were recorded in the survey, but habitat survey and records from around the site suggest that slow worm and adder are also likely to be present at times. Common lizard, adder and slow worm are listed as species of least concern for their conservation status. A wide range of invertebrates were seen throughout the site, and due the extensive habitat for them on- and off-site, populations would not be significantly affected.

4.4.10 A wide range of bird species were recorded within the application site, with suitable habitat being present for nesting, loafing and foraging birds within the woodland, scrub, agricultural fields and grassland habitats. There is a Barn Owl breeding roost in one tree on the electrolysis plant site. Meadow Pipit and Skylark were other notable species recorded on the site. An additional survey of wintering birds (to record goose species which overwinter at protected sites, discussed further below, and which might forage at the proposed development site) found low numbers of Greylag Goose and Pink-footed Goose.

4.4.11 Due to suitable residing, sheltering and foraging habitats present within the River Don and records of species, Atlantic salmon, sea trout, brown trout, brook, river and sea lamprey and eel are all considered to be present within the River Don system. No suitable habitat was found for freshwater pearl mussel. The River Don has good habitat for salmonids (Atlantic salmon and trout). However, limited spawning habitat is present in the section of river surveyed. More suitable spawning habitat may be present upstream. Atlantic salmon and sea trout rod catches have been declining in the River Don and nationally.

4.4.12 The nearest Local Nature Conservation Sites are Kinaldie Den, Cottown Woods, Rollo Mire and along the Aberdeen to Inverness and Kittybrewster Railway Line, all within 2 km of the application site boundary. Due to their distance from areas of works and lack of impact pathways, no impact and hence no significant effect on these sites is predicted.

4.4.13 Two nature conservation sites with protective designations of national and international importance have been considered in the assessment: the Loch of Skene Site of Special Scientific Interest (SSSI), Special Protection Area (SPA) and Ramsar convention site at a little over 5 km distance from the application boundary; and the Ythan Estuary, Sands of Forvie and Meikle Loch SPA, which is at more than 20 km distance. No direct impact and no adverse effect on the integrity of the sites is predicted. Greylag and Pink-footed geese populations, which overwinter at these sites, can forage as far as the proposed development site and so indirect effects via disturbance to the geese or loss of foraging habitat have been assessed. The wintering bird surveys found that only a small proportion of the goose population forages in and around the application site, there is extensive other foraging habitat in the area (with the proportion lost to the proposed development being negligible) and Greylag goose in particular are also more tolerant to disturbance from temporary works. No adverse effect is predicted.

4.4.14 With regard to other sensitive habitats and species, prior to mitigation, potential adverse effects during construction due to disturbance, loss of habitat or pollution events on terrestrial habitats, bats, badger, otter, reptiles, birds and fish were initially predicted, which would be significant only at a site level.

4.4.15 The Outline Construction Environmental Management Plan includes specific mitigation for each potential impact, with implementation to be overseen by an Ecological Clerk of Works. This includes further pre-construction surveys to re-check for presence of protected species, restricted working times and areas (for example to protect nesting birds), good practice pollution control measures, and Species Protection Plans to be implemented with re-location of species under license from NatureScot where necessary. It also provides for removal, control and ongoing monitoring of invasive and non-native species. Suitable habitat and available capacity for relocation of badger setts and reptiles has been confirmed through pre-application surveys.

4.4.16 With implementation of this mitigation, to be approved in the detail by Aberdeenshire Council or NatureScot (if applicable for licences) prior to construction, no significant adverse effects at any geographical level are predicted.

4.4.17 During the operational phase, the potential for adverse effects on otter and fish to be significant at a site level, prior to mitigation, was identified due to elevated temperature or any changes in sedimentation or water quality in the River Don from water discharged to it by the proposed development. This will be regulated by SEPA under the Controlled Activities Regulations and Pollution Prevention and Control regimes and subject to further hydrological modelling prior to approval. With this mitigation, i.e. control and monitoring of discharges under regulation by SEPA to ensure water quality is maintained, no significant adverse effects are predicted.

4.4.18 Overall, effects during construction and operation are not considered likely to adversely affect the favourable conservation status of populations in a local, national or international context.

4.4.19 The proposed development incorporates retention and enhancement of existing habitat on the electrolysis plant site (particularly north of Dewsford Burn), landscape planting with a mixture of grass, shrubs and woodland to provide a variety of habitats and visual screening, plus acquiring further farm land by the River Don, south of Kintore, to provide a new area of wildlife habitat creation. This is detailed in an outline Biodiversity Enhancement and Management Plan submitted with the planning application, with the detail of this to be approved prior to construction. The goal of this is to achieve a net gain in biodiversity, which has been calculated using Natural England's methodology to represent an achievable net biodiversity gain of 16% for terrestrial habitats such as wildflower grassland and woodland, 14% for hedgerows and treelines and 3% for watercourses. This would improve connections between habitat areas throughout the site and landscape, which will benefit a range of species as well as restoring landscape quality.

4.4.20 Although not assessed as an effect in the EIA, because the details of the biodiversity net gain goal and habitat creation are subject to approval by Aberdeenshire Council post-consent, with full implementation and success of the proposed habitat areas, this is could constitute a significant beneficial effect in the long term.

4.5 Transport and access

4.5.1 Traffic count surveys and a review of Department for Transport traffic flow data, road condition, paths and cycle routes, and personal injury accident data have been used to establish the baseline conditions. This included carrying out an additional traffic survey on the B977 near the junction to Uppermill Farm to measure both traffic numbers and speed, after residents raised concerns during public consultation that speeding occurs. A traffic growth factor has been used to predict future baseline flows.

4.5.2 The baseline assessment has shown that there are no specific road safety issues, speed limits are broadly being kept to within the study area, including on the B977 where surveyed, and that the condition of roads to be used for access to the proposed development site is generally good. There is little opportunity for pedestrian or cycle access to the proposed development using designated routes due to its rural location. The available headroom in road capacity to accommodate proposed development traffic flows has been considered in the assessment of impacts.

4.5.3 Designed-in mitigation measures for the construction are creating a dedicated temporary construction access road and junction from the B977 at Leylodge, providing a construction staff shuttle coach service to minimise private car access to the site (picking construction workers up from park and ride sites and Kintore rail station), and use of on-site concrete batching to reduce heavy goods vehicle (HGV) numbers.

4.5.4 The peak of construction activity is expected to cause 278 daily two-way vehicle trips (139 inbound and 139 outbound per day). Of these, it is estimated that typically 212 would be HGVs, which would be bringing equipment, construction materials, components etc. to the application site. Fifty-six would be for construction staff arriving at and departing the application site, mainly by coach with a smaller number by car or van, and the remaining ten movements would be other car and light goods vehicles for general site deliveries and visitors.

4.5.5 The majority of this traffic would be travelling to the main electrolysis plant construction site, with smaller numbers of vehicles accessing the pipeline routes for construction of these and their connection points during that phase of work.

4.5.6 The effects of construction traffic would be temporary in nature and would be transitory. Traffic volume would fall considerably outside the peak period of construction.

4.5.7 The assessment concludes that prior to further mitigation, moderate adverse significant effects on amenity for 'non-motorised road users' (such as riders, walkers and cyclists), and for residents and road users particularly during movements of large indivisible abnormal loads, are likely on the most-affected sections of road leading to the construction site access points. All other effects on all receptors and road sections would be minor or negligible, and not significant.

4.5.8 A comprehensive Construction Traffic Management Plan incorporating an Abnormal Load Transport Management Plan is proposed to be developed prior to construction, for agreement with Aberdeenshire Council and Police Scotland. An initial, outline draft of this has been prepared (within EIAR Volume 3, Appendix 9.1). With the implementation of this further mitigation, residual effects are predicted to reduce to a minor adverse, non-significant level.

4.5.9 For the operational phase, designed-in mitigation measures are a dedicated new access road and junction from an unclassified road which runs from the B977 to Bogfold, separate to the construction access, and a decision to provide only limited car parking on the electrolysis plant site with 40 spaces for workers and visitors, with electric vehicle charging and cycle parking. A Staff Travel Plan will be implemented to manage traffic sustainably (see the framework for this presented in Appendix 9.1), which will include a shuttle bus service that is likely to run between Kintore rail station, Aberdeen and the wider network of park & ride sites, and the electrolysis plant site, and could also include home pick up and drop offs for employees who live closer to the proposed development.

4.5.10 During the operational phase, up to 124 daily two-way vehicle trips (62 inbound and 62 outbound) per day on average are expected for the maximum anticipated operational workforce. This includes staff journeys made across two operating shifts in both cars and staff shuttle buses. In addition, an allowance has been included for visitors and general deliveries made to the proposed development.

4.5.11 The effects on all bar one receptor in the study area would be negligible to minor adverse and not significant.

4.5.12 The existing unclassified road from the B977 to Bogfold, on which the new operational access junction is proposed, is lightly used by traffic at the moment. The change in traffic due to the proposed development would therefore be relatively high in percentage terms, although the total number of vehicles would not be substantial. Prior to further mitigation, there could be a moderate but significant adverse effect for residents and users of this road due to the change from the baseline.

4.5.13 The operational access junction has been designed to be located further east on this road than initially considered (i.e. with a shorter distance to travel from the B977) and

an extension of the existing 40 mph speed section is also proposed (suggested during public consultation). Commitments are proposed for the Staff Travel Plan, to be approved prior to operation, to carefully monitor use of this road and the timing of staff shuttle bus trips, adjusting as needed to minimise impacts. With implementation of this further mitigation, it is considered that effects can be reduced to a non-significant level.

4.5.14 Overall, there are no significant road capacity issues with the addition of construction traffic associated with the proposed development and significant spare capacity exists within the trunk and local road network to accommodate all operational phase traffic.

4.6 Noise and vibration

4.6.1 Baseline sound levels were monitored in October 2023 and February 2024 at six locations that are representative of the nearest noise-sensitive receptors around the proposed development. Noise levels were typically measured for a week (including weekend days) and in addition, attended surveys were carried out during shorter periods in the day, evening and night-time to describe the types of sound that could be heard.

4.6.2 Existing background noise levels were mostly influenced by the sound of local and distant road traffic, aircraft, farm machinery and livestock, and, in the area are Kintore Substation, occasional noise from the substation. The baseline ambient noise level was generally low during the day and night, representative of a relatively quiet rural location.

4.6.3 Best practicable means to minimise noise during construction will be followed, as specified in the Outline Construction Environmental Management Plan. This also sets committed limits on construction working hours for noisy and non-noisy activities and for vehicles making deliveries to the construction site.

4.6.4 Noise experienced at sensitive human and ecological receptors from construction works, including general construction plant use, horizontal drilling (for hydrogen and water pipelines at certain crossing locations) and traffic on the public highway network and access roads, would be temporary and are not predicted to cause significant effects.

4.6.5 The main sources of noise during operation of Kintore Hydrogen Plant would be the high-pressure hydrogen compressors, cooling tower pumps and fans, enclosed ground flare, transformers and the equipment in the electrolysis process buildings. These, together with other equipment (including that at the above-ground installation for the hydrogen export connection and at the water intake pumping station and potential treatment works) have been modelled to predict day and night-time noise levels at sensitive receptors. To be conservative, continuous 24/7 operation of the hydrogen plant equipment at full capacity has been modelled.

4.6.6 As designed-in mitigation, electrolysis plant site layouts (for the location of noisy equipment) and levels of sound attenuation have been studied to establish that it will be feasible to achieve a noise level limit at the site that has been proposed to Aberdeenshire Council, which would avoid unacceptable noise levels at sensitive receptors during the day and night time.

4.6.7 No significant adverse noise effects during the day or night time at any occupied residential or other sensitive receptors are predicted. At the most-affected residential receptor, ‘Leylodge House’ (representing three residences in this location), the greatest potential change in noise compared to the baseline would be at night time, due to the very quiet baseline nighttime sound levels. However, this is predicted to remain below the World Health Organisation threshold for sleep disturbance and also not to exceed the ‘NR20’ criterion recommended for assessment by Aberdeenshire Council.

4.6.8 The increase in road traffic caused during operation is below the threshold where assessment of noise is required and no significant effects are likely.

4.6.9 Levels of vibration attenuate very rapidly through the ground within a few metres of the source. Due to the distance between construction works and operational plant with the potential to cause groundborne vibration and residential receptors, it is considered that the construction and operation of plant items will be very unlikely to cause significant adverse effect at any receptor due to vibration.

4.6.10 Overall, best practice measures to manage noise during construction and a limit on the day and night-time site noise level in operation will mitigate noise impacts and no significant adverse effects are predicted.

4.7 Air quality

4.7.1 Construction of the proposed development could cause nuisance dust emissions from earthworks and machinery movements. In operation, intermittent use of the enclosed ground flare for hydrogen would cause nitrogen dioxide emissions.

4.7.2 Information about current air quality in the Kintore area has been gathered from routine monitoring published by Aberdeenshire Council and from maps of background air pollution published by the Department for Environment, Food and Rural Affairs (Defra).

4.7.3 This shows that existing background air quality in the area of the proposed development is good, with levels of nitrogen dioxide to the proposed development’s potential impacts) being well within the applicable air quality standards. The Defra

pollutant mapping and the one urban background monitoring station operated by Aberdeenshire Council suggest very low pollutant levels of less than 5 micrograms per meter cubed (µg/m^3) as an annual average, well below the air quality standard of 40 µg/m^3. The other Aberdeenshire Council monitoring sites at roadside locations show a higher baseline level of 13.8 µg/m^3 as an annual average. This higher figure has been used as the background for the assessment in order to be conservative.

4.7.4 Under guidance from the Institute of Air Quality Management (IAQM), the scale of the proposed development construction works falls into the potential 'high dust risk' category. The applicable best practice measures to manage dust recommended by the IAQM have been included in the Outline Construction Environmental Management Plan. With these measures in place, no significant effects due to construction dust are predicted.

4.7.5 The increase in road traffic caused during construction and operation is below the threshold where assessment of air pollutant emissions is required under IAQM guidance, and no significant effects are likely.

4.7.6 Atmospheric pollutant dispersion modelling has been used to assess the impact of nitrogen dioxide emissions from burning hydrogen in the enclosed ground flare when that is necessary. This would be an occasional use: with small amounts of hydrogen burned during routine start-up and shut-down of the electrolysis modules, and possible occasional use at full capacity during an abnormal operational event that requires the plant to be depressurised. However, to be very conservative, the flare has been modelled as though it operates continuously at full capacity. Five years of meteorological data, such as wind speeds and directions, monitored at Dyce (Aberdeen Airport) has been used in the assessment.

4.7.7 The change in long-term (annual average) air pollutant concentrations at all occupied residential receptors would be negligible and would remain well within the applicable air quality standard. No significant effect at any location is predicted.

4.7.8 The applicable air quality standard for short-term (hourly average) nitrogen dioxide concentration is 200 µg/m^3 not to be exceeded more than 18 times per year. By definition, therefore, it is extremely unlikely that this could be exceeded because the hydrogen flare is only very rarely expected to be used at its full capacity. Nevertheless, it has been modelled as though operating at maximum capacity during every hour of the year to be highly conservative. Even in this scenario, the change in short-term air pollutant concentrations at all occupied residential receptors would be negligible and would remain well within the applicable air quality standard.

4.7.9 The final design, location and pollutant emission rate of the flare will be subject to regulation under the Pollution Prevention and Control (PPC) Permit by the Scottish Environment Protection Agency (SEPA), for compliance with air quality standards. A PPC Permit is required prior to operation. Operation of the flare will be subject to monitoring requirements under SEPA's regulation.

4.7.10 The potential for nutrient nitrogen deposition, acid gas deposition and concentration of nitrogen oxides to affect sensitive ecological habitats has also been assessed. No significant air quality effects on designated habitats are predicted to arise due to the proposed development due to the dispersion of nitrogen dioxide and distance to sensitive sites leading to a negligible pollutant concentration.

4.7.11 Overall, no significant adverse air quality effects are predicted.

4.8 Climate change

4.8.1 Climate change impacts can mean any risks that climate change may pose to Kintore Hydrogen Plant, the way in which climate change may influence other environmental effects (such as by increasing the stress on ecosystems impacted by the development), and the impact that the development has on climate change through directly and indirectly changing greenhouse gas emissions.

4.8.2 Climate change risks were evaluated at the EIA scoping stage and the main risk was considered to be flooding, which is described in Section 4.9, below. Other risks are not considered to be significant to the proposed development. Nevertheless, good practice measures to further reduce risk have been included in the Outline Construction Environmental Management Plan (CEMP) with the planning application.

4.8.3 Potential changes in the future baseline environment due to climate change have been considered within the relevant EIA topic assessments, based on the Met Office's UK Climate Projections 2018. In overview, this predicts likely wetter winter conditions, greater risk of extreme weather, and hotter, drier summer conditions.

4.8.4 The existing mainly agricultural land use is not a significant carbon store as the land does not include peat deposits, carbon-rich soils or extensive woodland, but rather has sparse vegetation in the areas to be developed.

4.8.5 Producing hydrogen from primarily renewable electricity in Scotland is part of UK and Scottish national policy and part of strategy for reaching net zero greenhouse gas emissions. When hydrogen is used as a fuel, it has zero greenhouse gas emissions. By substituting for burning natural gas as a fuel, it would therefore reduce emissions compared to the baseline. The greenhouse gas emissions from generating electricity that would be used by Kintore Hydrogen plant to produce hydrogen have been considered under a range of scenarios for offshore wind power and future mixes of other generation sources.

4.8.6 The balance of greenhouse gas emissions, from electricity used and natural gas substituted, is predicted to be a net reduction of 1.3 million tonnes of carbon dioxide equivalent per year. This would be a significant beneficial effect.

4.8.7 At 3 GW capacity, the proposed development would make a very substantial contribution to the Scottish Government's target of 5 GW hydrogen production by 2030 and 25 GW by 2045. The greenhouse gas emission reduction it provides would be equivalent to around 19% of a future carbon budget suggested for Scotland in academic research, although five-yearly carbon budgets have not been set by the Scottish Government by regulation at the time of writing. It would be equivalent to around 0.4–0.7% of future carbon budgets set by regulation for the whole of the UK.

4.8.8 Greenhouse gas emissions due to construction activity and producing the materials used for the development are estimated to be very minor compared to the operational impacts, at less than 1% of the total, and are not considered to be significant. The potential effect of fugitive hydrogen or insulating gas release in operation is considered to be negligible and not significant.

4.8.9 Overall, evaluating the scale of the net greenhouse gas emission reduction compared to a future baseline without the proposed development, in the context of carbon budgets, the carbon intensity of its energy supply and its role in supporting energy and climate policy goals, its effect on climate change is considered to be significantly beneficial.

4.9 Soils, geology and the water environment

4.9.1 Information about the baseline environment has been gathered from published information such as British Geological Survey and NatureScot geology and soil maps, flood risk maps from the Scottish Environment Protection Agency (SEPA), and precipitation records and river flow records for the River Don published by SEPA.

4.9.2 A field survey of the application site and surrounding area has been carried out, which has included inspection of watercourse crossings, catchments and potential flood plain areas, and hydrological conditions that provide evidence of whether any groundwater-dependent ecosystems are present. A trial pit investigation and infiltration capacity testing of ground within the electrolysis plant site have also been carried out to study the ground conditions and inform the drainage design.

4.9.3 The proposed development is within the catchment of the River Don and the various parts of the application boundary are drained by several tributaries to the Don: Tuach Burn, Dewsford Burn, Park Burn, Black Burn, Tillakae Burn and Sheriff Burn. The range in river flows for the Don has been modelled under a variety of conditions and calibrated against recorded flow rates in 2024.

4.9.4 The water quality of the River Don has also been monitored through monthly sampling during November 2022 to July 2024 and compared against SEPA's Environmental Quality Standards. The overall water quality measured at the monitoring location is good. SEPA's reporting of water quality in the River Don and Tuach Burn indicates an overall 'good' status for the Don but 'moderate' status for Tuach Burn due to barriers to fish migration, modification of the natural river channel, and diffuse pollution from rural sources.

4.9.5 There are no Drinking Water Protected Areas (Surface Water) within 5 km of the application boundary and no known private water supply abstractions in the study area.

4.9.6 Flood mapping published by the SEPA shows that flood extents are typically confined to the watercourse corridors, save near the confluence of the Park Burn and Tillakae Burn where a wider floodplain is noted.

4.9.7 Records of historic landfills and contaminated land have been obtained from Aberdeenshire Council. The risk of there being existing contaminated land within the application boundary is considered to be low.

4.9.8 Peatland mapping and the field survey of the application site have confirmed that it has primarily mineral soils and that no peatland is present. The groundwater-dependent ecosystems survey has found that these are not present.

4.9.9 The flood risk assessment and initial conceptual drainage design for the proposed development have shown that the proposed areas to be developed within the application site are not at risk of existing surface water or river flooding. Clean surface water drainage would be managed through attenuation ponds that are sized to provide water storage and control the runoff rate so that it does not exceed the baseline greenfield runoff rate under a 1 in 200 year probability storm event, including an uplift for higher future rainfall due to climate change in line with SEPA's guidance. Foul drainage from staff facilities will be managed via a packaged treatment plant on site. Discharge of water from the application site would be to existing watercourses and potentially also to a soakaway in the southern part of the electrolysis plant site.

4.9.10 No significant effects from or due to flood risk are therefore predicted.

4.9.11 The section of Dewsford Burn crossing the northern part of the electrolysis plant site has been found to show signs of having been canalised (straightened) in the past, likely as part of drainage work for farming. An option of re-meandering the burn to provide a more naturalised course is being considered, which could form part of habitat

enhancement in this part of the site. Whether or not to alter the burn channel is proposed to be confirmed through further design work and detail of the habitat enhancement proposals, to be approved prior to construction.

4.9.12 Abstraction of water from the River Don to produce hydrogen is regulated by SEPA through the Controlled Activities Regulations (CAR) process. A CAR authorisation has been granted to Kintore Hydrogen by SEPA, which specifies a maximum water intake rate and a required return rate for discharged water under a range of river flow conditions. The quality of discharged water (parameters such as mineral content and temperature) will be regulated by SEPA under the Pollution Prevention and Control (PPC) permitting regime. The River Don has been shown through the CAR process to have more than sufficient capacity to provide the water supply and no significant effects on it are predicted.

4.9.13 As embedded mitigation, the Outline Construction Environmental Management Plan (Outline CEMP) includes good practice management measures to avoid ground or water contamination from any spillages and includes a draft Soil Management Plan to stockpile topsoil and subsoil for use in landscaping and restoring the ground over pipeline routes and in areas of temporary works once completed.

4.9.14 During operation, the proposed development will be regulated by SEPA through PPC permitting, which will include controls over discharges to land, water and air for protection of the environment.

4.9.15 As a consequence of the embedded mitigation included in the site design and the adoption of mitigation measures including good practice set out in the Outline CEMP, no significant residual effects on soil (including peat), geological, surface water or groundwater receptors are predicted during the construction and operational phases of the proposed development.

4.10 Population and health

4.10.1 Environmental or socio-economic impacts of a development can have the potential to affect people's health, which has been studied using information about those impacts as described in the rest of this non-technical summary. 'Health' here means people's physical, mental and social wellbeing, rather than a narrow definition of just disease or infirmity.

4.10.2 Baseline information on existing health and about the socio-economic factors influencing it for communities in the area of the proposed development has been gathered from NHS statistics and Scottish Public Health Observatory health profiles published by Public Health Scotland.

4.10.3 The majority of public health indicators analysed show better health and wellbeing circumstance in Kintore (or Aberdeenshire where data for Kintore is unavailable) than the regional and Scottish average. The exceptions to this are hospital admissions for respiratory and heart diseases, where the rate in Kintore is more similar to the Aberdeenshire average.

4.10.4 The population living in the Kintore area is overall not considered to have a higher sensitivity than the general Scottish population to changes in environmental and/or socio-economic conditions that may be associated with a development project. As with any population, individuals will range in level of sensitivity due to factors such as age, socio-economic status and the prevalence of any pre-existing health conditions. Individuals could be particularly vulnerable to changes in environmental and socio-economic factors (both adversely and beneficially) whereby they could experience disproportionate effects when compared to the general population. No high sensitivity receptors such as schools or care homes have been identified in proximity to the proposed development works.

4.10.5 The population and health assessment has considered environmental and social pathways through which the proposed development has the potential to influence health. These include air pollution, which can affect respiratory and heart disease, noise, which can affect people's physical health or their wellbeing if significant annoyance or sleep disturbance were caused, and traffic levels which can affect road safety or the routes that people walk or cycle. Any impacts on Core Paths and other recreational routes and the amenity of the landscape that could affect recreation and exercise have been considered, as has the impact of employment generated, which is important to the social and economic factors that influence people's health and wellbeing.

4.10.6 The changes in transport nature and flow rate during the construction and operational phases from staff cars, shuttle buses and heavy goods vehicles would be managed through the Travel Plan documents explained in section 4.5, and no significant adverse effects on health and wellbeing are predicted.

4.10.7 The predicted noise from construction and operation of the proposed development (discussed in section 4.6) would not be at a level likely to cause annoyance or sleep disturbance, and no significant effects on health and wellbeing are predicted.

4.10.8 A quantitative exposure-response assessment was undertaken to establish how the changes in local air quality (discussed in section 4.7) might impact the health of the local population. The results showed that there would be no measurable change in population health outcomes associated with long-term nitrogen dioxide emissions from the enclosed ground flare.

4.10.9 The water pipeline route would cross a Core Path section, which could temporarily disrupt use of that route during construction works. Measures to ensure Core Path access is maintained and a safe public crossing of the pipeline trenching route are included in the Outline CEMP.

4.10.10 The land permanently required for the development is primarily agricultural. Considering Scotland's 'freedom to roam' and from observations on various site visits, the application site and surrounding land are lightly used by people for recreational activities such as dog walking. While this is the case, equally, the freedom to roam means that there are extensive accessible alternatives for recreation and physical activity that exist in the surrounding area.

4.10.11 The underground high voltage electricity cable connection to Kintore Substation avoids residential properties that would be occupied during operation. There would be no potential for long-term exposure to magnetic fields from this transmission infrastructure, and transient exposure from public access at this location is also very unlikely. The cable design would comply with magnetic field strength limits set to be protective of public health and no effect is predicted.

4.10.12 While hydrogen is flammable and if allowed to reach certain concentrations in an enclosed space it can be explosive, these hazards and risks are well known and understood, such that hydrogen production facilities can be designed and operated in a way that is safe and protective of population and health of workers and the public. This will be regulated by the Health and Safety Executive and the Scottish Environment Protection Agency under the Control of Major Accident Hazards (COMAH) and Pollution Prevention and Control (PPC) permitting regimes.

4.10.13 There would be beneficial effects from construction-related employment, the long-term operational employment created and the associated income, which are two of the most important wider determinants of health and wellbeing. Job creation is discussed in section 4.11. The short-term construction employment is likely to provide health and wellbeing benefits that are important at the individual level, but collectively not sufficient to quantify a significant change in health at a population level. The health and wellbeing benefits from operational employment generation would be greater due to the long-term nature, and again likely to be significant both for individuals but across the size of population in the Aberdeenshire study area would be a beneficial effect but not amounting to a significant change in health measurable at a population level.

4.11 Socio-economics

4.11.1 Construction and operation of Kintore Hydrogen Plant would generate job opportunities for a variety of skillsets in the short and long term. These would be both from the direct employment and from the indirect and multiplier effects of the development's supply chain and employee spending. These would occur both within Aberdeenshire and in a wider region through the indirect and multiplier effects. The focus of the socio-economic assessment has been on effects within Aberdeenshire.

4.11.2 Baseline demographic and employment data for Aberdeenshire shows that it currently benefits from a pool of highly qualified and skilled residents relative to Great Britain, with 82.3% of residents aged 16-64 being economically active and a higher employment rate among all people in this age bracket than the Scottish and Great Britain average.

4.11.3 However, it also has a higher proportion of economically active people who are seeking a job, and employment in the manufacturing and construction sectors (which support the energy and utilities sectors) is forecast to decline over the next five years while the working age population increases. This means there are opportunities for creating new employment in Aberdeenshire to bring people back into the labour force and provide long-term jobs to existing workers in sectors undergoing change.

4.11.4 Aberdeenshire and Aberdeen City Council's Regional Economic Strategy (2024) identifies the high proportion of jobs currently driven directly and indirectly by the energy sector. The strategy plans for an expected period of change in the regional economy, with the energy industry transforming to meet the UK's net zero carbon ambitions and the need for a just transition. The strategy sets out opportunities in renewable energy, carbon capture and hydrogen – including Aberdeen's status as *"the UK's leading hydrogen city"* – and the desire to be *"a pioneer of the energy transition"*, reducing carbon and maintaining GVA, and supporting the skills needed to deliver a just transition. These are objectives that would be supported by the proposed development.

4.11.5 Construction of the proposed development is expected to generate 1,520 net additional on-site and off-site construction jobs per year over the construction period for Aberdeenshire residents.

4.11.6 Once complete and having entered commissioning, the proposed development is expected to generate around 315 net additional on-site and off-site operational jobs in the energy sector.

4.11.7 The socio-economic impacts of this employment in each phase are considered to have a moderate beneficial effect, which is significant.

4.11.8 The beneficial effects could be further enhanced through an Employment and Skills plan, to help target employment opportunities at local residents (including those who

have been in longer-term unemployment) and provide training and apprenticeship opportunities.

4.12 Cumulative effects with other developments

4.12.1 'Cumulative effects' are those that could result from the combination of the effects of the proposed Kintore Hydrogen Plant development together with other development projects in the same area affected.

4.12.2 Any current effects of other existing developments form part of the baseline environment, established through surveys and from published data as discussed above. However, newly proposed developments could introduce new impacts or could bring sensitive receptors, such as residential areas, closer to the proposed Kintore Hydrogen Plant development.

4.12.3 Planning applications to Aberdeenshire Council and the national Energy Consents Unit, together with Aberdeenshire Council's Local Development Plan, have been searched to identify other proposed developments that due to their scale and location have the potential for significant cumulative impacts together with Kintore Hydrogen Plant.

4.12.4 Using the resulting shortlist of potentially relevant developments, each environmental topic assessment in the EIA has then studied potential cumulative effects together with developments within their study area. The extent to which this can be done depends on the level of information available about the other proposed developments. Sixteen cumulative developments were identified for assessment, of which one was subsequently removed because a site visit confirmed it was completed and already formed part of the baseline.

4.12.5 Overall, from the information available about other developments, the topic assessments of cumulative effects have concluded that no additional significant adverse cumulative effects would be created, compared to the effects of Kintore Hydrogen Plant alone; and where a significant adverse effect (prior to further mitigation) from Kintore Hydrogen Plant alone had been predicted, the effects of cumulative developments were not likely to significantly increase the magnitude or level of significance of the effect.

4.12.6 Other major developments will equally have duty to assess and mitigate any significant cumulative effects through the EIA process, and can be expected to implement good practice measures (such as for control of impacts on flooding) under the planning permission or other consent of the relevant planning authority and regulatory bodies.

4.13 Conclusion

4.13.1 The proposed development is designed to meet a clear national need for hydrogen production infrastructure, with the location of the site chosen after considering environmental sensitivities and land availability in the areas around suitable connection points to the national electricity and gas grids, and with availability of a more than sufficient water supply from the River Don.

4.13.2 The development layout, access routes and travel arrangements, building heights, landscaping and additional habitat creation to provide a net gain in biodiversity have been designed iteratively with input from the assessments of potential environmental impacts. Appropriate mitigation and enhancements have been included in the development design and secured through management plans for construction works, ecology, landscaping and traffic.

4.13.3 The assessment of environmental impacts has concluded that no significant adverse effects are predicted, with implementation of the embedded and proposed further mitigation, save for, possibly, visual effects at the nearest properties to the south edge of the electrolysis plant site, which would have elevated views of the second phase of development in this southern area.

4.13.4 Other effects that were considered potentially significant, and for which further specific mitigation to reduce these to a non-significant level has been put forward, are as follows.

4.13.5 During construction and operation, there would be a localised significant adverse effect on the 'open undulating farmland' local landscape character zone in the immediate vicinity of the electrolysis plant element of the proposed development near to Kintore Substation, but the great majority of this landscape zone together with all other landscape zones would not be significantly affected. There would also be significant adverse effects on four groups of buildings closest to the electrolysis plant and for travellers on a short section of the B977, but with all other building- and route-based receptors (the great majority) not significantly affected. A scheme of landscape planting would reduce long-term visual effects post-construction to a non-significant level save, as noted in paragraph 4.13.3. The Design Principles Statement accompanying the planning application sets out the architectural design and landscape planting masterplan proposed, to guide details to be approved post-consent.

4.13.6 While no significant effects on known archaeological and cultural heritage resources are predicted, there remains the possibility of encountering currently unknown archaeology of value during construction, which could be significant; this would be mitigated to a non-significant level through a programme of pre-construction archaeological investigation and through involvement of an Archaeological Clerk of

Works during construction as required. A Written Scheme of Investigation will be developed with Aberdeenshire Council to be approved pre-construction.

4.13.7 With implementation of the proposed construction and operational traffic management plans (outlined in Volume 3, Appendix 9.1), incorporating a strong sustainable transport solution with a shuttle bus service provided by Kintore Hydrogen for workers to minimise private car access and need for parking on site (likely to be from Kintore rail station and one or more park and ride sites in the Aberdeen area), no significant traffic and transport effects are predicted.

4.13.8 Noise from operating equipment in the proposed development, such as the hydrogen compressors, cooling towers and enclosed ground flare for hydrogen, would be mitigated through design of the equipment and structures to a level that would not cause significant effects at occupied residences or other sensitive receptors. A 'Grampian'-type planning condition is proposed to require that the proposed development cannot be commissioned or operated until the two nearest properties, at Dewsford, have been acquired and vacated. This will mean that no residents of these properties are affected by noise, air quality or visual impacts during operation of the proposed development.

4.13.9 Prior to mitigation, the risk of significant adverse effects (at a local site level) to habitats of value and protected species is predicted due to the construction works and land required for the proposed development. However, this would be mitigated and compensated through habitat protection, habitat creation and protected and invasive species management plans. Principles are set out in the Outline Construction Environmental Management Plan and Outline Biodiversity Enhancement and Management Plan submitted with the planning application, with details to be approved prior to construction (including through protected species licence applications to NatureScot).

4.13.10 No adverse effects on the integrity of European designated sites are predicted.

4.13.11 Protection and enhancement of existing habitat, together with a new area of riparian habitat creation along the east bank of the River Don south of Kintore, would provide biodiversity net gain, which is considered to have the potential (subject to approval of the details post-consent and successful implementation) be a significant beneficial effect of the project. The habitat creation in this area has been proposed after engagement with the River Don Trust.

4.13.12 The socio-economic effects of skilled job creation are assessed to be a benefit that is significant in Aberdeenshire, taking into account opportunities for creating new employment in the region to bring people back into the labour force and provide long-term jobs to existing workers in sectors undergoing change. An Employment and Skills Plan is proposed to maximise these benefits, for approval prior to operation.

4.13.13 The effect on climate change due to the net reduction in greenhouse gas emissions, from producing hydrogen fuel (primarily from renewable electricity) that can substitute for natural gas or other fuels, would be a significant benefit of the proposed development. Hydrogen production by the proposed development would at this one site contribute a substantial proportion of the Scottish government's target for this sector, which is part of national energy and net zero carbon policy.

4.13.14 All other effects were considered to be non-significant on the basis of the embedded or designed-in mitigation forming part of the development proposals.

4.13.15 Other development is occurring and proposed around Kintore Substation, including a new high voltage overhead power line and several potential battery storage developments. Considering the cumulative effects of Kintore Hydrogen Plant together with other consented and proposed developments in the area, no additional or greater significant adverse cumulative effects are predicted. The proponents of other developments will have an equal duty to assess and where necessary mitigate significant cumulative effects.

4.13.16 Overall, the assessment conclusions are that the proposed development will avoid or mitigate potential significant adverse environmental effects, and will have significant beneficial climate change, socio-economic and potential for significant net biodiversity gain effects.

5 EIAR Structure

Table 5.1: Structure of the EIAR

Volume	Chapter	Title
Volume 1	n/a	Non-Technical Summary
	n/a	Glossary, acronyms and units
Volume 2	1	Introduction
	2	Project Description
	3	Consideration of Alternatives
	4	Environmental Impact Assessment Methodology
	5	Scoping and Consultation
	6	Landscape and Visual
	7	Archaeology and Cultural Heritage
	8	Ecology and Biodiversity
	9	Transport and Access
	10	Noise and Vibration
	11	Air Quality
	12	Climate Change
	13	Soils, Geology and the Water Environment
	14	Population and Health
	15	Socio-Economics
	16	Summary of Inter-Related Effects
	17	Summary of Cumulative Effects
	18	Summary of Mitigation, Monitoring and Residual Effects
Volume 3	n/a	Technical appendices
	n/a	Additional figures

6 Glossary, Acronyms and Units

Glossary

Term	Definition
Above ground installation (AGI)	The infrastructure visible above ground at the connection point where the hydrogen export pipeline connection to the National Gas network is made.
Accident and emergency management procedures	Procedures that will be developed by Kintore Hydrogen Ltd to minimise accident risks and respond to accidents or emergencies to protect health, safety and the environment, as required by its PPC Permit from SEPA.
Anode (electrolysis)	A positively charged electrode, which attracts negatively charged ions (oxygen, in the electrolysis process).
Application site	All land within the proposed red line boundary for planning permission.
Cathode (electrolysis)	A negatively charged electrode, which attracts positively charged ions (hydrogen, in the electrolysis process).
Construction Environmental Management Plan (CEMP)	A document setting out the management measures to be employed during construction to avoid or minimise environmental impacts. This document is prepared as a draft (Outline CEMP) for the permission in principle planning application.
Construction phase	The period from the start of construction at the site to completion of the site commissioning.
Construction Traffic Management Plan (CTMP) and Construction Worker Travel Plan (CTWP)	Plans for managing construction traffic, including protocols for delivery of Abnormal Indivisible Loads to site, personnel travel, measures for road cleaning and sustainable site travel measures.
Cumulative effects	The combined effect of Kintore Hydrogen Plant in combination with the effects from one or more other development projects on the same receptor or resource.
Cumulative impacts	Impacts that result from reasonably foreseeable actions of other development projects together with Kintore Hydrogen Plant.
de minimis	An amount or impact that is immaterial or too small to be taken into consideration, often used in greenhouse gas accounting for very minor emission sources not appreciably affecting the total or within the bounds of other uncertainties.
Design envelope	A description of the range of possible elements that make up the Kintore Hydrogen Plant project for the planning permission in principle application, as set out in detail in the project description. This envelope is used to define Kintore Hydrogen Plant for Environmental Impact Assessment (EIA) purposes when the exact engineering parameters are not yet known. This is also often referred to as the “Rochdale Envelope” approach.
Design Principles Statement (DPS)	A document detailing architectural and landscaping design principles for detailed design stage of the proposed electrolysis plant, and providing more detail and further opportunities for mitigation. This is based on an indicative masterplan, that builds on the Planning Parameters Plan. It includes an illustrative landscape masterplan.
Direct jobs	The employment created to fulfil the demand for a good or service. These jobs are generated in the core activities of the project. This is calculated as a product of the UK domestic output and the adjusted labour intensity. Within that, two further more specific definitions are used in the EIA Report. In the context of the impact assessment in Chapter 15, direct jobs/employment refers to on-site employment during the construction work. In the context of the employment and economic benefits modelling in Appendix 15.1, the term also includes employment generated off-site, such as the manufacture of the balance of plant equipment.
Displacement effects	The proportion of intervention outputs/outcomes accounted for by reduced outputs/outcomes elsewhere in the target area.
Drainage Impact Assessment	A document and drawings showing the outline (‘concept’) design for surface water drainage for Kintore Hydrogen Plant.
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
EIA Regulations	The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended).
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Impact Assessment (EIA) Report.
Environmental Impact Assessment Report (EIAR)	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations.
European conservation site or European designated site	A Special Area of Conservation (SAC) or candidate SAC, a Special Protection Area (SPA) or potential SPA, a site listed as a site of community importance or a Ramsar site.
Flood Risk Assessment (FRA)	An evaluation of the baseline flood risk and effect as a result of Kintore Hydrogen Plant. The FRA sets out flood risk mitigation measures, as may be required.
Habitats Regulations Assessment (HRA)	A process which helps determine likely significant effects and (where appropriate) assesses adverse impacts on the integrity of European conservation sites and Ramsar sites. The process consists of up to four stages of assessment: screening, appropriate assessment, assessment of alternative solutions and assessment of imperative reasons of over-riding public interest (IROPI).
Impact	Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact).
Indirect jobs	The employment generated in the supply chain.

Term	Definition
	Within that, two further more specific definitions are used in the EIA Report. In the context of the impact assessment in Chapter 15, indirect jobs/employment refers to jobs off-site, such as manufacturing components of the development. In the context of the employment and economic benefits modelling in Appendix 15.1, the term refers to the employment generated in the upstream industries to fulfil the demand created by the direct employment across the supply chain.
Inert gas	An unreactive gas due to it having a full outer shell of electrons. All gases in group 18 of the periodic table (known as noble gases) are inert, examples being nitrogen or argon.
Inter-related effects	Multiple effects on the same receptor arising from Kintore Hydrogen Plant. These occur either where a series of the same effect acts on a receptor over time to produce a potential additive effect or where a number of separate effects, such as noise and habitat loss, affect a single receptor.
Kintore Hydrogen Ltd or the applicant	The company developing Kintore Hydrogen Plant. Kintore Hydrogen Plant is a subsidiary of Statera Energy Ltd, which has developed a number of battery storage and flexible generation plants around the UK. This is their first hydrogen plant.
Kintore Substation	The existing high voltage transmission network substation operated by SSEN, adjacent to the application site.
L_{A90}	Background noise level. The A-weighted sound level exceeded for 90% of the measurement duration.
L_{Aeq}	Noise parameter describing a sound level with the same energy content as the varying acoustic signal measured.
L_{Aeq}, T	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A – weighted fluctuating sound measured over that period.
Laydown areas	Areas within the application boundary which may be used temporarily during the construction period for offloading and laydown or storage of construction materials, pre-manufactured components, or construction plant.
Leakage	In economics, the proportion of output that benefits those outside of the intervention's target area of the group.
Local authority	A local authority is a body empowered by law to exercise various statutory functions for a particular area of Scotland. These are also referred to as council areas. With regard to the planning function, the local planning authority is Aberdeenshire Council.
Local highway authority	The public organisation responsible for the maintenance of local roads and consideration of the effects of proposed development projects on the road network.
Magnitude	A combination of the extent, duration, frequency and reversibility of an impact.
Measures adopted as part of the project	Enhancement, mitigation or monitoring commitment (which may include process or design measures) intended to avoid, reduce and where possible, remedy significant adverse impacts of a development. These are measures that are

Term	Definition
	either designed-in to the development, or are secured through commitments in the planning application.
Multiplier effects	In economics, further activity (jobs, expenditure or income) associated with additional local income and local supplier purchases.
National Transmission System (NTS)	The network of high-pressure gas transmission pipes operated by National Gas.
Non-statutory designated sites	Non-statutory designated sites are sites which have been designated due to their nature conservation interest, typically through the local planning process, which are usually protected by planning policies but not legally protected.
Off-site jobs	Jobs in a supply chain and services. The result of multiplier effects after allowing for leakage and displacement.
Off-site employment (Jobs and GVA Study in Appendix 15.1)	The employment that will involve labour or the manufacture of materials or equipment outside the Kintore Hydrogen premises. This category includes the manufacture of equipment, including electrolysers and electrical equipment.
On-site employment (Jobs and GVA Study in Appendix 15.1)	The employment that will involve labour occurring within the Kintore Hydrogen premises. This category includes the labour required to construct and operate the facility.
Operational phase	The period when the plant's commissioning tests have been passed and the facility starts to produce hydrogen to generate revenue and supply the gas network.
Outline Ecological Management Plan (OEMP)	A document detailing the management and protection of species and management or protection, enhancement or creation of habitats during the construction and operational phases of the proposed development.
Photowire	A 'type 3' visualisation, under the Landscape Institute guidance, which represents the form and extent of a development overlaid on a photograph.
Predicted environmental concentration (PEC)	The term used in air quality assessments of industrial processes to describe the concentration or deposition of a pollutant (i.e. process contribution (PC) plus baseline).
Process contribution (PC)	The term used in air quality assessments of industrial processes to describe the incremental impact of the proposed development on the concentration or deposition flux of a pollutant.
Project Description	A description, given in Volume 2, Chapter 2, of the design envelope, construction process, activity in operation and future decommissioning options for Kintore Hydrogen Plant.
Rating level	The numerical method by which to determine the significance of sound of a commercial and/or industrial nature, which is then corrected for the character of the sound, if appropriate.
Riparian	A river bank or the area of interface between a river and land, which may include the natural flood zone of the river, and is characterised by habitat adapted to this environment.
Sensitivity	The extent to which a receptor can accept a change, of a particular type and scale.

Term	Definition
Significance	The significance of an effect combines the evaluation of the magnitude of an impact and the sensitivity of the receptor.
Transboundary	Crossing into other European Economic Association (EEA) States.
UK Input-Output Multipliers	Multipliers provide the ratio of the direct impact to calculate the total impact. Type I multipliers, which include the direct and indirect impacts, were used in this study. The model did not calculate the induced jobs from expenditure in an industrial sector. For instance, employment cost multipliers show the ratio of total gross job creation (including direct and indirect jobs) to the direct employment change.
Wireline	A 'type 3' visualisation, under the Landscape Institute guidance, which represents the form of a development in context but not overlaid on a photograph.
Written Scheme of Investigation (WSI)	A plan detailing the protocol for any archaeological investigation to be carried out prior to the construction of Kintore Hydrogen Plant, including procedures for field survey and watching briefs, as may be required.

Acronyms

Acronym	Description
AADT	Annual average daily traffic
AC	Aberdeenshire Council
AC	Alternating current
ACAS	Aberdeenshire Council Archaeology Service
ACoW	Archaeological Clerk of Works
ADMS	Atmospheric Dispersion Modelling System
AEP	Annual exceedance probability
AGI	Above-ground installation
AILs	Abnormal indivisible loads
AIS	Air insulated switchgear
aOD	Above Ordnance Datum
AQMA	Air Quality Management Area
ASH	ASH Design+Assessment Limited
ATC	Automatic traffic count
AWI	Ancient Woodland Inventory
BAT	Best Available Techniques
BEMP	Biodiversity Enhancement Management Plan
BGS	British Geological Survey
BNG	Biodiversity net gain
BoCC	Birds of conservation concern
BoP	Balance of plant
BREEAM	Building Research Establishment Environmental Assessment Method
CAR	Controlled Activity Regulations
CC	Climate change
CEA	Cumulative Effect(s) Assessment
CEMP	Construction Environmental Management Plan
CEnv	Chartered Environmentalist
CFB	Coastal flood boundary
CIEEM	Chartered Institute of Ecology and Environmental Management
CIfA	Chartered Institute for Archaeologists
COMAH	Control of Major Accident Hazards
CMLI	Chartered Member of the Landscape Institute
CRTN	Calculation of Road Traffic Noise
CTMP	Construction Traffic Management Plan
CWTP	Construction Worker Travel Plan
DC	Direct current
DMRB	Design Manual for Roads and Bridges
DMS	Digital surface model
DTM	Digital terrain model
DWPA	Drinking Water Protected Area
ECoW	Ecological Clerk of Works
EIA	Environmental impact assessment
EIAR	Environmental Impact Assessment Report
EPC	Environmental Product Declaration
EPUK	Environmental Protection UK

Acronym	Description
ESDAL	Electronic service delivery for abnormal loads
ESO	Energy System Operator
FEH	Flood Estimation Handbook
FFL	Finished floor level
FRA	Flood Risk Assessment
FTE	Full time equivalent
GDL	(Site on the Inventory of) Gardens and Designated Landscapes
GET	Guidance on Emerging Techniques
GIA	Gross internal area
GIS (substation)	Gas insulated switchgear
GIS (mapping)	Geographical information systems
GLVIA3	Guidelines for Landscape and Visual Impact Assessment, Third Edition
GPP	Guidance for Pollution Prevention
GWDTE	Groundwater dependent terrestrial ecosystem
GWP	Global warming potential
HCA	Homes and Communities Agency
HDD	Horizontal directional drilling
HDV	Heavy duty vehicle
HER	Historic Environment Record
HES	Historic Environment Scotland
HGV	Heavy goods vehicle
HPC	Heavily parallelised compute
HT	Head-time
IEF	Important Ecological Feature
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management and Assessment
INNS	Invasive non-native species
IoA	Institute of Acoustics
IUCN	The International Union for Conservation of Nature

Acronym	Description
JNCC	Joint Nature Conservation Committee
LBAP	Local Biodiversity Action Plan
LCA (landscape)	Landscape Character Area
LCA (carbon)	Lifecycle assessment
LDP	Local Development Plan
LDV	Light duty vehicle
LEPO	Long established of plantation origin
LGV	Light goods vehicle
LI	Landscape Institute
LiDAR	Light detection and ranging
LLZ	Local Landscape Zone
LVIA	Landscape and Visual Impact Assessment
MIEMA	Member of the Institute of Environmental Management and Assessment
NBN Atlas	National Biodiversity Network Atlas
NCN	National Cycle Network
NESBP	North East Scotland Biodiversity Partnership
NESBReC	North East Scotland Biological Records Centre
NGR	National grid reference
NLS	National Library of Scotland
NO_x, NO_2	Oxides of nitrogen; nitrogen dioxide
NPF4, NPF3	National Planning Framework 4, 3
NRFA	National River Flow Archive
NRHE	National Record of the Historic Environment
NRTF	National Road Traffic Forecast
NS	NatureScot
NTS (gas)	National Transmission System
NTS (EIAR)	Non-Technical Summary
NVC	National Vegetation Classification
NVQ	National Vocational Qualification

Acronym	Description
N(V)SR	Noise (and vibration) sensitive receptor
ONS	Office for National Statistics
OS	Ordnance Survey
PAN	Planning Advice Notes
PC	Process contribution
PEA	Preliminary Ecological Appraisal
PEC	Predicted environmental concentration
PEM	Polymer electrolyte membrane
PIEMA	Practitioner of the Institute of Environmental Management and Assessment
PoE	Port of entry
PPC	Pollution Prevention and Control
PPG	Pollution Prevention Guidance
PRF	Potential roost feature
PVA	Potentially vulnerable area
QA	Quality assurance
RAMSAR	The Ramsar Convention on Wetlands of International Importance
RCP	Representative concentration pathway
RSR	Route Survey Report
RTA	Road traffic accident
SAC	Special Area of Conservation
SBL	Scottish Biodiversity List
SEPA	Scottish Environment Protection Agency
SGS	Sub-grid sampling
SIMD	Scottish Index of Multiple Deprivation
SLA	Special Landscape Area
SMP	Soil Management Plan
SNH	Scottish National Heritage, now NatureScot
SPA	Special Protection Area
SPP (planning)	Scottish Planning Policy
SPP (ecology)	Species Protection Plan
SNH	Scottish Natural Heritage
SSEN	Scottish and Southern Electricity Networks
SSSI	Site of Special Scientific Interest
SuDS	Sustainable drainage systems
SWL	Sound power level
T5 DTM	Terrain 5 digital terrain model
TP	Travel Plan
TPC	Travel Plan Coordinator
TS	Transport Scotland
TUFLOW	Hydraulic modelling software
UKCP18	UK Climate Projections 2018
VL	Visualisation location
WSI	Written Scheme of Investigation
ZoI	Zone of influence
ZTV	Zone of theoretical visibility
2D	Two-dimensional

Units

Unit	Description
barg	Pressure (1 bar = 100 kPa). barg refers to bar gauge (i.e. including atmospheric pressure)
dB(A)	Decibel (A-weighted, to represent the human hearing response)
dB L_W	Decibel of sound power
dB R_W	Decibel of weighted sound reduction index
dB L_{Pi}	Decibel of sound pressure level for the i^{th} octave band
dB $L_{Aeq,\ T}$	Decibel of equivalent continuous sound level measured over a period of time, T (A-weighted)
g/s or $g.s^{-1}$	Grams per second (mass emission rate)
ha	Hectare (10,000m^2)

Unit	Description
Hz	Hertz, cycles per second (frequency)
km	Kilometres
kV	Kilovolt (electrical potential)
kW, MW, GW	Kilowatt, megawatt, gigawatt (power)
l/s or $l.s^{-1}$	Volumetric flow per second
m aOD	Meters above Ordnance Datum
mg.l	Milligrams per litre (concentration)
m	Meters
mph	Miles per hour
$m.s^{-1}$	Meters per second (velocity)
$m^3.s^{-1}$	Volumetric flow per second
tCO_2e	Tonnes of carbon dioxide equivalent, i.e. greenhouses gases expressed as carbon dioxide based on their global warming potential
µg/l or µg.l	Micrograms per litre (concentration)
$µg.m^{-3}$ or $µg/m^3$	Micrograms per cubic metre (concentration)